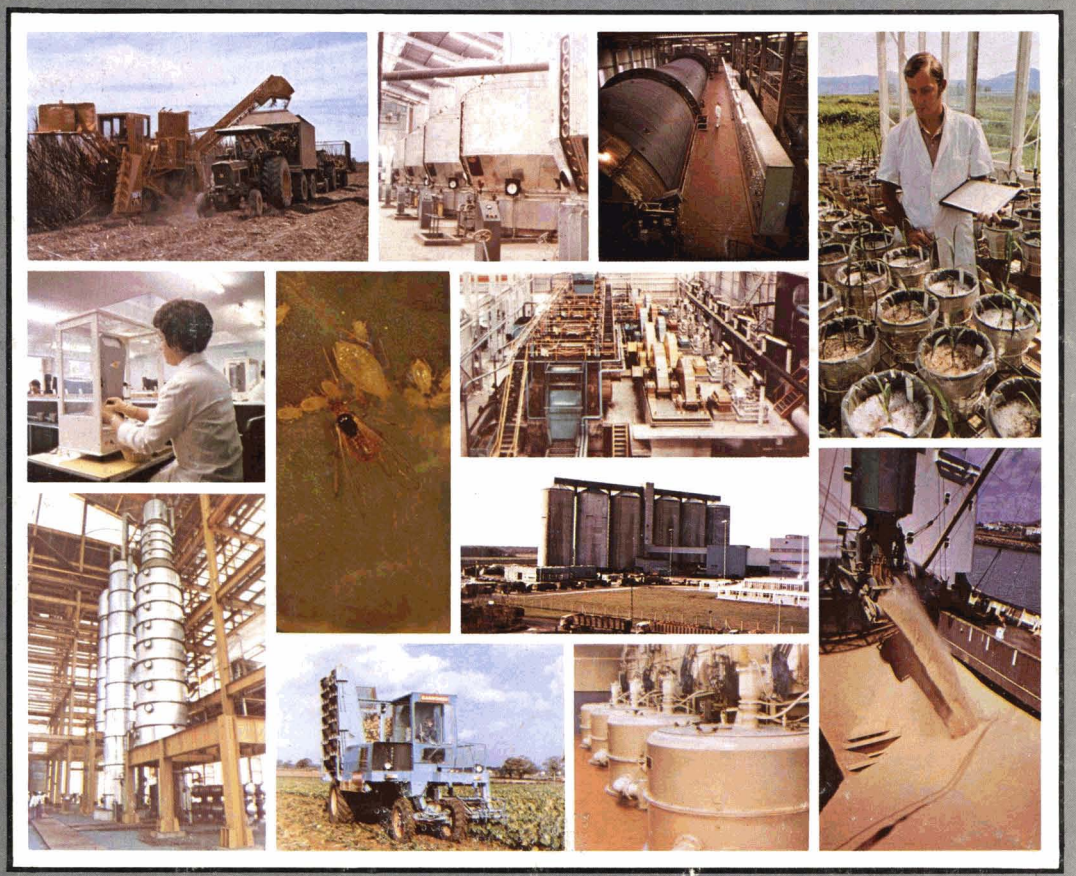
INTERNATIONAL SUGAR JOURNAL

VOLUME LXXXII
ISSUE No. 976



APRIL 1980

ETHREL®.

PLANT GROWTH REGULATOR

The management tool you fly on.

Get an earlier harvest. More sucrose. Increased brix and juice purity. And more.

ETHREL® plant growth regulator gives you a degree of control over your sugarcane harvest you never had before. It accelerates sugarcane ripening and increases sugar content up to 15%. It increases the sprouting of plant and ratoon cane, thereby increasing cane population and yields. And it lowers the content of reducing sugars.

By spraying some of your cane several weeks earlier than usual, you can start harvesting earlier. Then by stagger-spraying blocks of cane and harvesting in the same sequence, you can send an orderly flow of cane to the mill, reducing the mill load during peak periods. *Now, you are in charge.*

And you get a better product—improved juice purity with less molasses and better mill efficiency. More product too—more sugar per hectare.

Get the ethephon that's really a management tool. Get ETHREL ethephon plant growth regulator and take off for a better managed operation and higher profits.

ETHREL plant growth regulator should be used in accordance with label directions and only on those crops registered for use with ETHREL.

ETHREL is a registered trademark of Union Carbide Agricultural Products Company, Inc. for ethephon plant growth regulator.

Ethrel®

Helps nature help you.

UNION CARBIDE

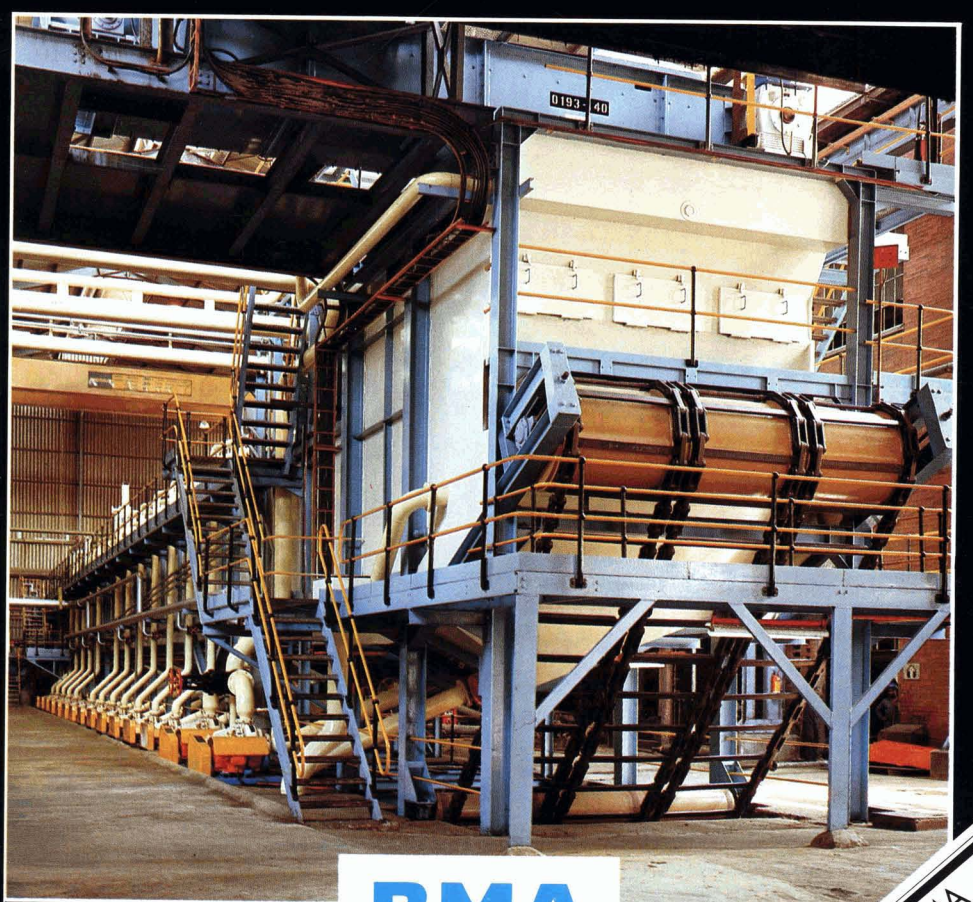
AGRICULTURAL PRODUCTS COMPANY, INC.
INTERNATIONAL DEPARTMENT
AMBLER, PA 19002 U.S.A.

Overall recovery starts with high extraction

BMA cane or bagasse diffusion plants

- * high sugar yield
- * low energy requirements
- * low capital cost
- * low maintenance cost owing to minimum wear
- * improved raw juice quality
- * simple operation by reasonable automation

BMA diffusers for more sugar in the bag!

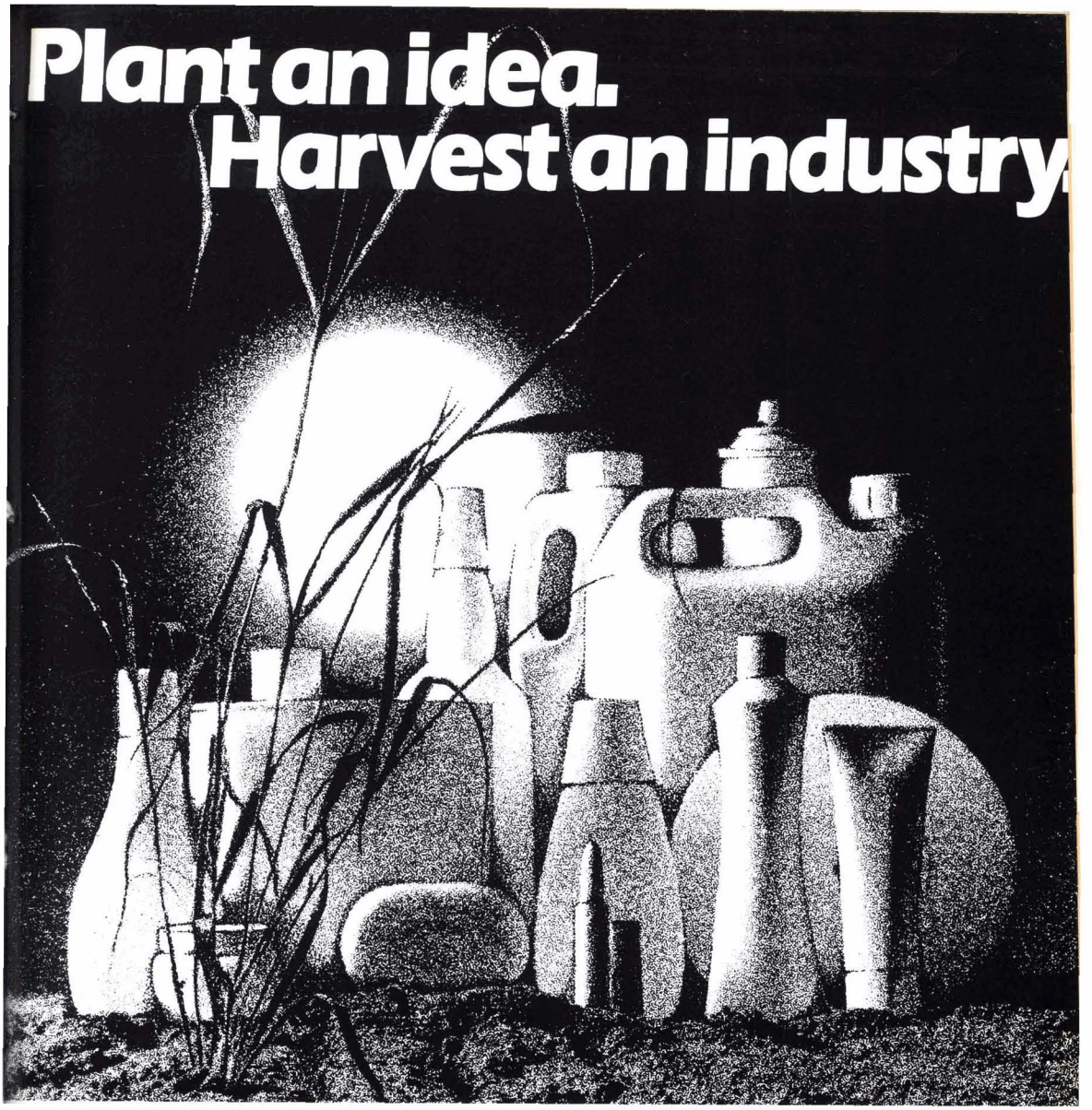


BMA

Braunschweigische Maschinenbauanstalt

D-3300 Braunschweig Federal Republic of Germany
Telephone (05 31) 8 04-1 Telex 9 52 456 a bema d

BMA world-wide at home



The usual effect of a crisis is to accelerate man's inventiveness. Today's major problems are high cost energy and low commodity prices. Tate and Lyle is the world's largest and most experienced independent sugar corporation and its research and development programmes are concentrated on helping to solve these problems.

Power alcohol derived from sugar is one example of maximising the conversion of the sun's energy into liquid fuel at the same time as providing an alternative use for sugar cane. New chemicals made from sugar could soon replace many more oil-based products such as detergents, plastics and cosmetics.

Tate and Lyle's scientists are working to make agricultural industry more efficient all over the world. Our aim is to add value to agricultural production and to make sure nothing is wasted – we even convert certain effluents into protein for animal foodstuffs.

But adding value can also mean better yields, and that means better agriculture. Tate and Lyle provides expertise, not only in sugar, but in all fields of agriculture and is involved in management and training schemes in many countries. If you need help with your agro-industrial development programme, come and talk to us.

Adding value to agriculture

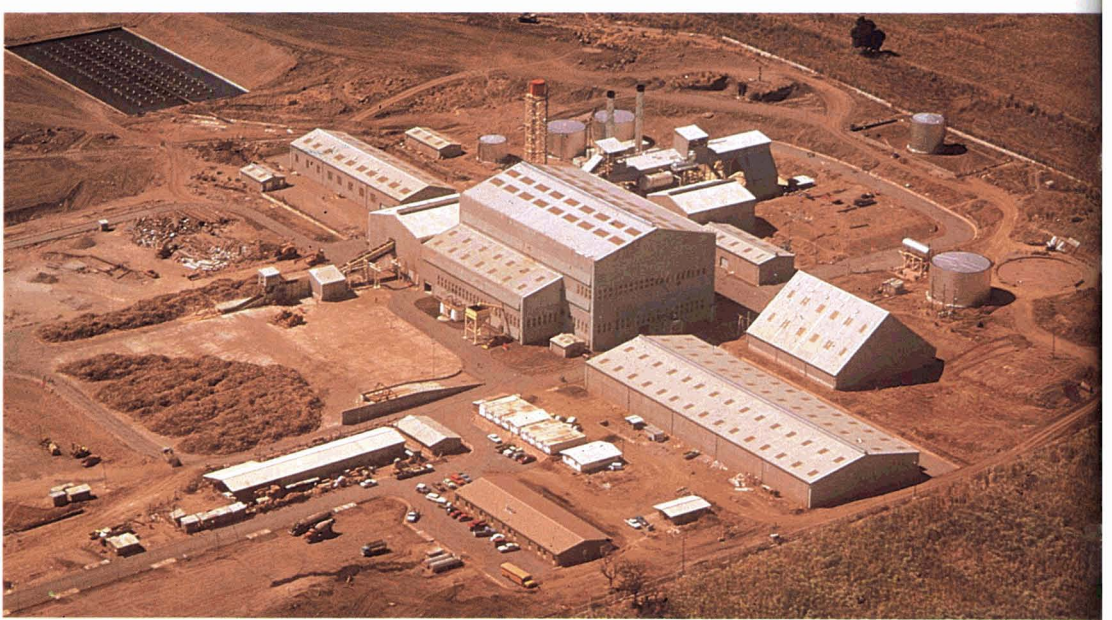
TATE + LYLE

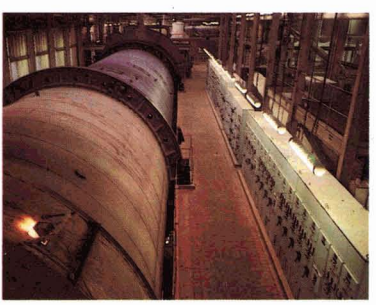
Tate and Lyle Agribusiness Ltd., Cosmos House, Bromley Common, Bromley, BR2 9NA, England. Tel: 01-464 6556.

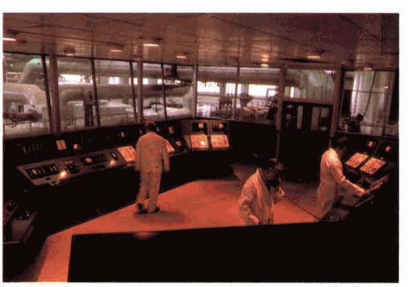
El Salvador . . Pakistan . . Tanzania . . The Philippines . . Somalia . . Malaysia . . Nigeria . . Russia . . Kenya . . The Sudan.

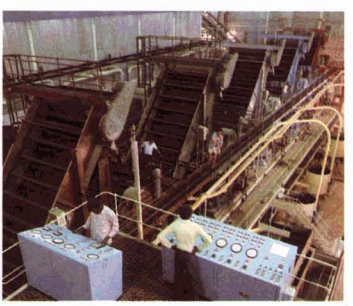
FS have supplied complete cane and beet factories throughout the world's sugar industry. Projects range from turnkey factories, refineries and distilleries through the rehabilitation of existing

FLETCHER AND STEWART









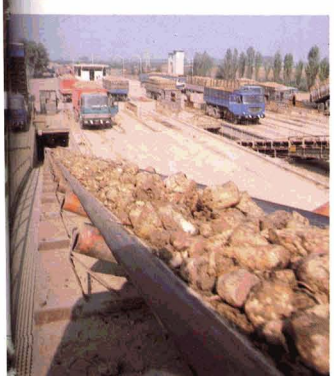
FLETCHER AND STEWART LIMITE

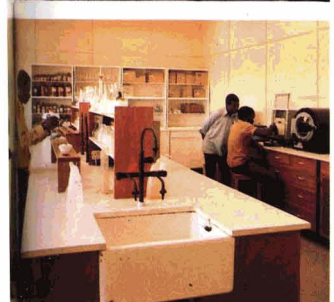
production units to the supply and installation of individual items of process equipment.

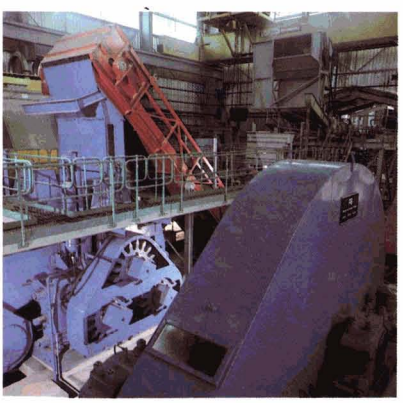
Whatever the requirement, FS has a record of experience covering the world!

FS

WORLDWIDE







ISJ

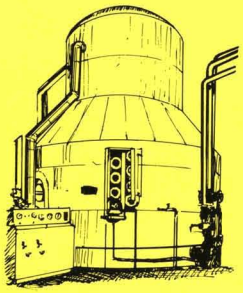
For further information on the complete range of services and products available use the coupon provided.

Please send ..... copies of complete services and product range information pack.

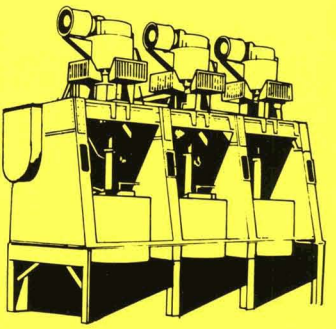
Name .....
Title .....
Company .....
Business .....
Address .....

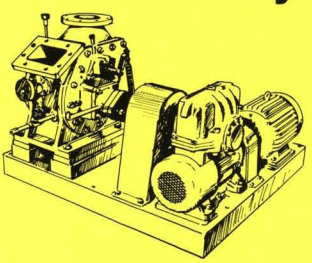
FS PUBLICITY, Fletcher and Stewart Limited, Derby DE2 8AB England

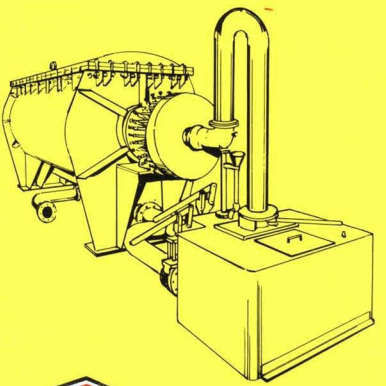
SMITH MIRRLEES

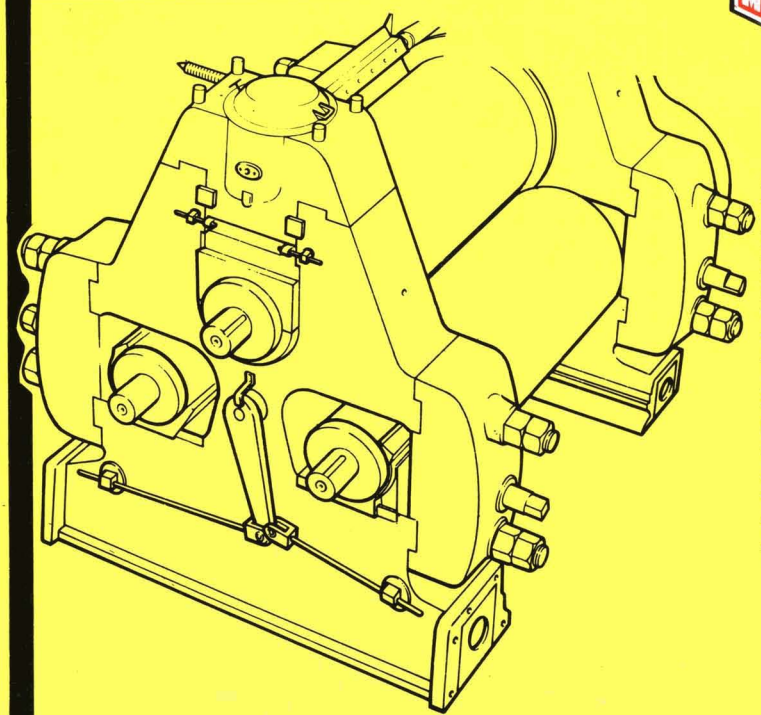


Offer you Over 140 Years' Experience in the Manufacture of Sugar Machinery









A. & W. SMITH & CO.
THE MIRRLEES WATSON CO.
No. 1 COSMOS HOUSE
BROMLEY COMMON
BROMLEY 3R2 9NA
GREAT BRITAIN
Telegrams Tecserve Bromley
Telephone 01-464 6556

Factory:
EGLINTON WORKS
COOK STREET
GLASGOW G5 8JW
Telegrams Engine Glasgow
Telephone 041-429 5441
Telex 77·137

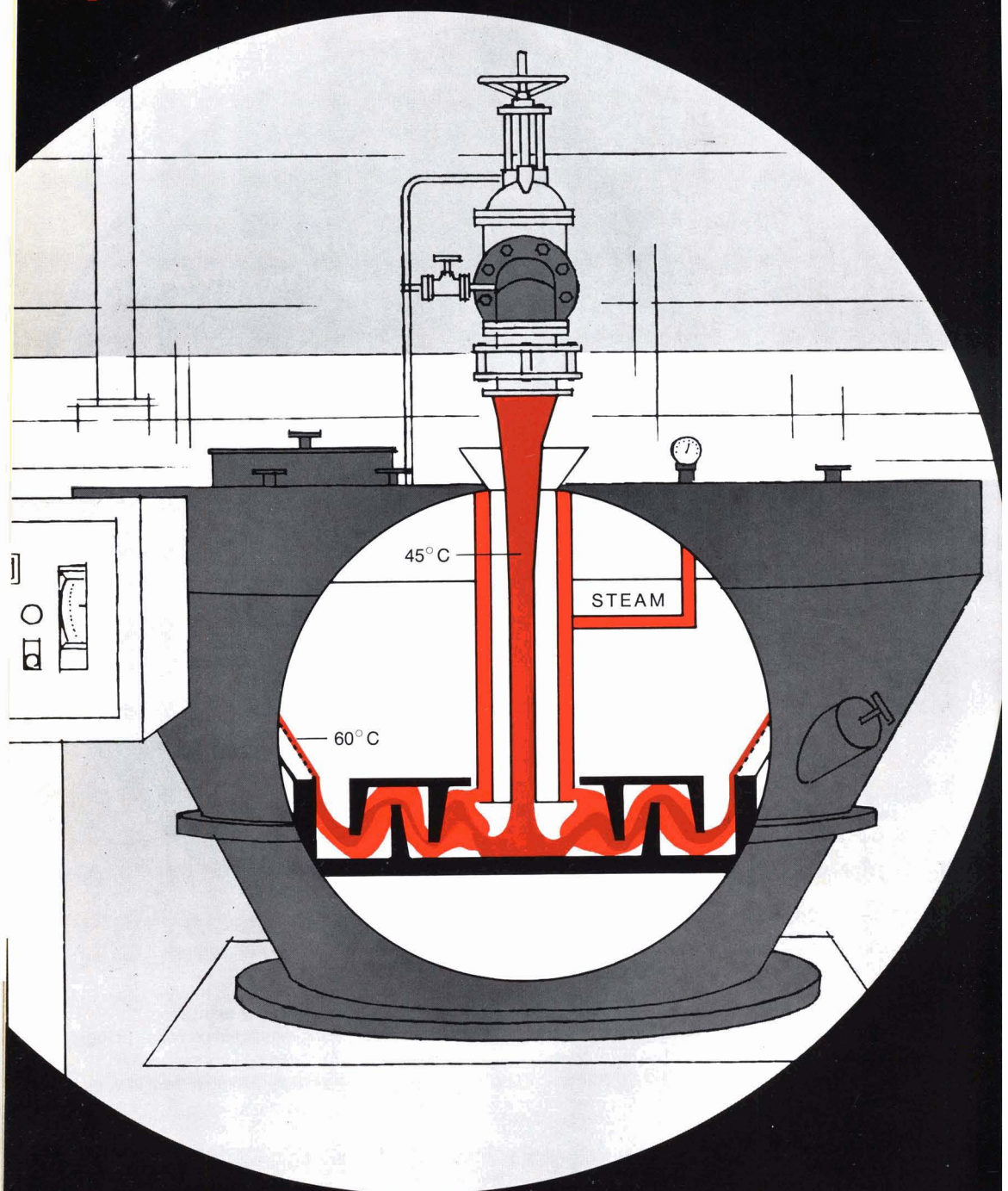
PROGRESS THROUGH EXPERIENCE

A Division of Tate & Lyle Agribusiness Ltd.
A Member of the Tate & Lyle Group.

Konti 10-DC
ein, Lehmann Centrifugal

New with inner heating system

Much more capacity
Better sugar quality
Lowest molasses purity



A member of
MECAN ARBED

HEIN, LEHMANN AKTIENGESELLSCHAFT

D-4000 Duesseldorf 1, P.O.B. 4109
Telex 8 582 740 hld

INTERNATIONAL SUGAR JOURNAL

Volume 82
Issue No. 976

CONTENTS April 1980

UK ISSN 0020-8841

Annual Subscription:
$50.00 post free

Single Copies:
$5.00 post free

Airmail charges quoted on request to

The International Sugar Journal Ltd.,
23A Easton Street, High Wycombe,
Bucks., England HP11 1NX

Published by
The International Sugar Journal Ltd.
23A Easton Street,
High Wycombe, Bucks.,
England HP11 1NX.
Telephone: 0494-29408 *Cable:* Sugaphilos, High Wycombe
Telex: 21792 REF 869

Inquiries regarding advertising should be addressed to the above office or to the appropriate representative:

Australia: J. J. Hindmarsh,
24-26 Kent Street, Sydney 2000.
Tel.: 241-2471. *Cable:* Hindmarshad.

France: MaG-Watt International,
6 rue des Acacias, Vert-le-Grand, 91810 Essonne.
Tel.: 492-00-15.

Holland: G. Arnold Teesing B.V.,
Prof. Tulpstraat 17, 1018 GZ Amsterdam.
Tel.: 020-263615. *Telex:* 13133.

India and South-East Asia:
J.P. Mukherji & Associates Pvt. Ltd.,
P.O. Box 915, Poona, India 411 005.
Tel.: 52696/7 *Cable:* Preproject, Poona.
Telex: 0145-367 JRMASSO.

Japan: Douglas Kenrick (Far East) Ltd.,
Kowa Daisan Building, 11-45 1-chome Akasaka, Minato-ku, Tokyo.
Tel.: (582) 0951-5. *Cable:* Kenrick Tokyo.

U.S.A.—Florida and Latin America:
Mr. Mario A. Mascaró,
7321 S.W. 82nd Street, Miami, FL, U.S.A. 33143.
Tel.: (305) 667-1724.

U.S.A.—New England and mid-Atlantic states:
Mitchell Napier & Associates Inc.,
Suite 812, 342 Madison Ave., New York, NY 10017.
Tel.: (212) 986-0625.

U.S.A.—Southern states, except Florida:
Herbert Martin Company,
2325 Old Rocky Ridge Road, Birmingham, AL 35216.
Tel.: (205) 822-7371.

U.S.A.—Western States, incl. Hawaii:
Roy McDonald Associates Inc.,
Suite 265, Baybridge Office Plaza, 5801 Christie Avenue, Emeryville, CA 94608.
Tel.: (415) 653-2122.

NOTES AND COMMENTS

World sugar prices

The London Daily Price for raw sugar was £221 per tonne on February 1 and £222 on February 29. Between those two dates, however, there had been extraordinary changes, with an increase of £35 per tonne (from £225 to £260) on one day and a peak of £287 on February 14. A statement by President Castro that Cuba would suffer a 1,000,000-tonne loss through disease and other problems strengthened the market at the beginning of the month as did reports of a cyclone approaching Mauritius and of drought in China, and the rise continued even more rapidly in the second week in spite of the news that no cyclone damage had, in fact, been caused, and in spite of the approaching release of the first tranche of ISA special stocks. The New York market has narrow limits to daily price movements and this led to greater activity – and speculation – on the London market.

With the actual release of the first tranche and apparently inevitable release of the remaining special stocks, the availability of an additional two million tonnes of sugar within a period of eight days did produce a downward trend in prices and the LDP declined to £225 on February 20, with a spate of selling tenders by exporting members of the ISA, and, after a short-lived rally, had sunk to £215 on February 28, recovering to £222 the next day.

The LDP(W) showed a premium of £2 at £223 per tonne on February 1 and the large speculative element in the raw sugar fluctuations was also reflected in white sugar values during the month so that they reached a mid-month high of £290 but ended the month at £253. The premium fluctuated considerably between nil and £33 at the end of the month, and appeared to be more a matter of timing of quotations relative to raw sugar than to any specific factors or large tenders for sale or purchase.

International Sugar Agreement

The possibility mentioned in our last issue[1], that the release of special stocks held under the Agreement might be required by the rising price of sugar before the revision meetings of the Council, became fact in February. With the prevailing price reaching 19.0 cents/lb, the first tranche of special stocks was released with effect from February 14 and the second and third tranches during the following week. Exporting members had hoped to delay the later releases but could not get support for this action from importing members. The actual releases were 814,549 tonnes on the first release, 813,553 on the second and 407,864 tonnes on the third and final release of February 21. Thus a total of 2,038,966 tonnes was made available for prompt sale and prompt despatch. At the same time, all restrictions on imports by members from non-members are removed, the only significant result of which is that Colombia will now be able to resume exports to the USA. The developments were noted by C. Czarnikow Ltd.[2] as having probably resulted in the International Sugar Council relinquishing the last economic measures with which they might have hoped to exert some control on sugar prices during 1980.

Exporting members have to inform the Executive Director five working days after the release of each tranche of the quantity actually made available within these release provisions, while within 30 days they must also notify him of the quantity still available out of the sugar which has been released. Relevant shipping documents must be forwarded within 30 days of each export of special stock sugar.

Special stocks cannot be built up again until such time as quotas are reimposed. When the price falls to 14 cents/lb they must be reintroduced while at 15 cents/lb the Council may decide to reintroduce them. These are at current price levels; the Price Review Committee met in London on February 26 to decide whether to recommend adjustment of the various price levels set in 1977 but reached no agreement. Exporters wished trigger prices to be raised to reflect the reduced value of the dollar but the US delegation would not agree, claiming that such a rise would make it almost impossible for the House of Representatives to approve the legislation implementing US membership of the Agreement.

The Executive Director of the ISO said that the Committee recognized the need to reach a decision on adjusting the price range during the Council session starting March 14 when the Agreement's basic export tonnage are due to be renegotiated[3]. The release of special stocks held by exporters seemed to be already having an effect, he claimed, and he added that he had no evidence that there is any shortage of sugar while he considered that speculation had played a very important part in the recent sharp rise in world sugar price.

UK campaign results

The 1979/80 campaign in the UK ended with a final sugar production of 1,154,000 tonnes, an increase of more than 130,000 tonnes on 1978/79. This figure exceeds the country's *A*-quota of 1,040,000 and provides 114,000 tonnes of *B*-quota sugar. According to the Chief Executive of the British Sugar Corporation, it was a good average crop and the result was the sort to be expected from a crop area of 213,500 hectares. More than 7½ million tonnes of beet were grown, at an average yield of 35.9 tonnes per hectare, against 34.7 tonnes.ha^{-1} in 1978. The average sugar content was 17% (16.75% in 1978) giving a sugar yield of 6.1 tonnes.ha^{-1} (5.8 in 1978).

An important feature of the campaign was the increased efficiency of the factories following completion of the Corporation's £150 million expansion and modernization program. This was reflected in generally improved beet throughput and a high sugar extraction rate. Production of dried molassed beet pulp was increased to 657,000 tonnes.

FAO sugar projections to 1985[4]

In its Agricultural Commodity Projections, the Food and Agriculture Organization of the United Nations predicts a more stable sugar market in the period up to 1985. World sugar demand, production and trade are expected to increase "less dynamically" and prices to be brought under control by the International Sugar Agreement.

---

[1] *I.S.J.*, 1980, **82**, 69.
[2] *Sugar Review*, 1980, (1480), 35.
[3] F.O. Licht, *International Sugar Rpt.*, 1980, **112**, 124.
[4] *World Sugar J.*, 1980, **2**, (7), 22-23.

The projections are made on the assumptions that the recent low prices will force exporting countries to cut back on production, that the ISA will continue in more or less unchanged form until 1985 and will prove to be effective in regulating sugar exports, that the EEC will come to some agreement with the other exporting countries to limit its own exports and that most of the increased production up to 1985 will be taken up by increased domestic demand.

On these assumptions, the FAO project that production of centrifugal sugar will increase from 82 million tonnes in 1976 to 103 million tonnes in 1985, a rate of growth of 2.6% compared with 3% for the previous decade. The developing countries are expected to account for over 70% of the increase (with a growth rate in Africa of nearly 6%) owing to expanding domestic demand and with the desire for self-sufficiency, on the basis of present investment levels.

On the other hand, production in industrialized countries will increase only slightly (possibly with a drop of 1,000,000 tonnes in the USA from its peak level of 1976), largely owing to the limitation of market outlets. The EEC is anticipated to increase production by about 1,000,000 tonnes up to 1985, with a rise of 600,000 tonnes in the rest of Western Europe. Eastern Europe is expected to expand production moderately with substantial increase in the Soviet Union to meet increasing domestic demand.

Although sugar demand in the industrialized countries is expected to level off in the next five years, per caput consumption in the developing countries is expected to rise from the 11.4 kg of the period 1972/74 to 14.3 kg in 1985. The overall pattern of the increase is thought likely to show some unevenness, however, being particularly strong in China but weak in South America. Demand in Eastern Europe will also increase considerably and will surpass per caput consumption in the USA by 1985. Sugar demand in the other developed countries, and particularly in the USA, will probably decline by some 2.6 million tonnes with dextrose demand also falling by about 750,000 tonnes owing to severe competition from high fructose corn syrup which is expected to capture about 9% of the US market.

Growth in world trade is expected to fall from the 1.9% of the decade up to 1976 to 1.4% p.a., rising to 21 million tonnes in 1985. Imports by developed countries could be cut back during the forecast period owing to domestic pressures which could tighten the export potential for developing countries. However, this may be offset by the expansion in import demand among other developing countries which is expected to increase from 5,000,000 tonnes in 1976 to nearly 9,000,000 tonnes in 1985; this implies a doubling of the growth rate to 6.4%. This prediction is based on the assumption that oil exporting countries will finance import requirements and that the Asian centrally planned economies will import to make up for domestic production shortfalls.

The above predictions are made on the basis of constant prices, but in fact there is expected to be an upward drift of prices although these will be restrained by increasing competition from HFCS, so that there will be no repeat of the 1974/75 price explosion. However, it is also thought possible that the tendency towards oversupply might continue, which would add substantially to the downward pressure on prices which would necessitate considerable adjustment to the present mechanism.

Indian sugar situation

The Indian Minister of Agriculture has denied reports that the Government planned to nationalize the country's sugar industry[1]. He said that the dual-price system introduced in December would be continued and blamed high prices on a shortfall in production and dislocation of public distribution which followed. Under the system, the sugar factories have to deliver 65% of their output to ration shops at a "fair price" set by the Government, making up losses by selling the remainder on the open market.

Because of anticipation of Government action trading has been at the minimum level needed for day-to-day business. Sugar factories are going short of cane which is being diverted to gur and khandsari production and a number have shut down in Punjab and Haryana while in western Uttar Pradesh they are working at only 30-40% of capacity. Factories are obliged to pay almost double the official level for cane.

Europe beet sugar production, 1979/80

The International Association of Sugar Statistics recently reported the results of its inquiries of member countries as to their beet sugar production figures for the past campaign and these have been published by F. O. Licht[2], supplemented with Licht's own latest estimates for non-IASS member countries including those of East Europe. The figures are reproduced below:

	1979/80	1978/79	1977/78
	tonnes, raw value		
Belgium/Luxembourg	991,000	902,000	791,000
Denmark	492,000	442,000	566,000
France	4,313,000	4,063,000	4,268,000
Germany, West	3,088,000	2,997,000	3,076,000
Holland	927,000	1,034,000	905,000
Ireland*	192,000	204,000	182,000
Italy*	1,698,000	1,730,000	1,355,000
UK	1,250,000	1,109,000	1,032,000
Total EEC	*12,951,000*	*12,381,000*	*12,175,000*
Austria	408,000	357,000	495,000
Finland	91,000	103,000	70,000
Greece*	337,000	354,000	294,000
Spain	764,000	1,132,000	1,198,000
Sweden	350,000	339,000	343,000
Switzerland	118,000	107,000	85,000
Turkey	1,065,000	1,096,000	1,082,000
Yugoslavia*	870,000	776,000	766,000
Total West Europe	*16,954,000*	*16,645,000*	*16,506,000*
Albania*	40,000	20,000	12,000
Bulgaria*	240,000	180,000	210,000
Czechoslovakia*	930,000	885,000	939,000
Germany, East*	720,000	780,000	780,000
Hungary*	511,000	553,000	486,000
Poland*	1,580,000	1,763,000	1,850,000
Rumania*	650,000	602,000	775,000
USSR*	7,600,000	9,100,000	8,825,000
Total East Europe	*12,271,000*	*13,883,000*	*13,877,000*
Total Europe	29,225,000	30,528,000	30,385,000

* Non-IASS member.

The IASS figures are not far removed from the previous latest estimates by Licht, but the East European estimate is considerably lower, with 39,000 tonnes less expected in Hungary, 40,000 tonnes less for Poland and a major revision of 500,000 tonnes less expected in the USSR where the reports of low beet tonnages are confirmed by purchases of sugar from the world market by the Soviet Union.

[1] *Public Ledger*, March 1, 1980.
[2] *International Sugar Rpt.*, 1980, **112**, 82.

International Society of Sugar Cane Technologists

Of the 1959 members of the Society no less than 962 attended the 17th Congress in Manila during February 1-11. Arrangements followed the programme already announced[1], although the post-Congress tours in Indonesia were all cancelled for lack of support.

Details of the sugar installations visited appear elsewhere and proved of great interest to the delegates of the Factory Group, as did the field demonstrations and research centres to the Field Group members participating in their program of visits.

Fig. 1.

At the initial plenary session, the General Secretary-Treasurer, Carlos Bell Raymond, introduced Monsignor Antonio Fortich, Bishop of Manila, who performed the invocation ceremony, after which members were welcomed by the General Chairman, Roberto S. Benedicto. Mrs. Benedicto then introduced Mme. Imelda Marcos, wife of the President of the Philippines and also Minister of Human Settlements and Governor of Metropolitan Manila, who addressed the members.

She emphasized the large role played by the sugar industry in the economy of the Philippines, more than 5 million people or some 11% of the population being directly or indirectly dependent upon it. The severe economic effects of the past few years of prices below production costs, attributed to subsidized exports from Western Europe, have resulted in damage to an industry for which the equipment has in many cases been supplied from countries which have made it impossible for it to operate economically. Mrs. Marcos stressed the importance of the International Sugar Agreement and the Philippines' strict observance of its rules, and hoped that it could ensure stability in the years ahead.

Mr. Benedicto then introduced President Ferdinand Marcos who spoke of the work of the Society and paid tribute to its tradition of free exchange of technical information between sugar producers (Fig. 1). He described the history of the Philippines sugar industry with its close links with the USA between the end of the 19th Century and 1974 when the Sugar Act expired. The subsequent ill-effects of reliance on an over-suppied free world market has caused considerable problems and the President described the establishment and work of the Philippine Sugar Commission in developing the country's sugar industry. His country had faith in the future of sugar and he prayed that the world industry would be stabilized in the 1980's with the Society continuing to spearhead technological advances.

On each of the next five days the presentation of technical papers was preceded by a general plenary session in which all the membership was addressed by a guest speaker. The first was Donald E. Nordlund, Chairman and President of A. E. Staley Mfg. Co., one of the main producers of HFCS in the USA, who spoke on the high-fructose syrups and their competition with sugar. He described their history and current status, and concluded from forecasts and trends that, although production and consumption in the US and Japan might grow, the future of HFCS in the EEC was less promising and that, overall, the product would have a negligible impact on the world cane sugar industry in the next decade.

On Wednesday February 6, Mr. William K. Miller, Executive Director of the International Sugar Organization, in a presentation entitled "The Politics of Sugar" discussed the International Sugar Agreement and its effects since 1978, as well as the likely changes to be brought about by the revising meetings due in March. While the world price of sugar remained below the floor of the intended price range up to the end of 1979 it would have been even lower had the Agreement not been in force during the previous two years, which represents a measure of success. Prices were likely to remain strong this year, although there was probably enough sugar available to meet all reasonable requirements. A continuing problem was the lack of adherence to the Agreement by the EEC and its lack of restraint equivalent to that of the exporting members of the ISA in regard to stockholding and exports limitation.

The world's largest single user of sugar is the Coca-Cola Company and John D. Mount, Vice-President and Director of Purchasing, provided the next day's address. He claimed that the high standards set by his company for its raw sugar supplies had resulted in raising the standard of sugar generally available. While Coca-Cola

[1] *I.S.J.*, 1979, **81**, 352.

had authorized the use of HFCS in its formulations, this would not be adopted in areas which were cane sugar producers, and there would continue to be great demand for crystal sugar, including for powdered soft-drink mixes, while the potential of use for alcohol and other non-food uses could drastically affect the availability and economics of sugar production.

Owing to difficulty in reaching Manila, Dr. Helmut Ahlfeld, co-author with Mr. G. B. Hagelberg of a paper on "The sugar industry in a changing economic climate", was unable to present it and it was read by Donald K. Luke. The paper examined trends in consumption of sugar and indicated that optimistic projections should be treated with caution, while HFCS would have an impact on demand. Energy problems and rising costs presented new difficulties which required a reassessment of production methods in field, factory and refinery to cope with continual cost increases.

The final address, by Dr. M. C. Bennett, discussed some economic implications of power alcohol and pointed out the importance of government action in countries which sought to replace part of their oil import requirements by domestically produced alcohol. He emphasized the flexibility which was available in countries where a number of carbohydrate-containing crops were cultivable and where switching of raw material, depending on what was currently in surplus and so cheapest, could lead to alcohol production at lowest cost. He suggested that it might become of advantage to produce only a single strike sugar, of very high pol, with the uncrystallized sucrose in the *A*-molasses used as fermentation feedstock. This would, however, require a rethinking of the role of the refiner.

At the closing plenary session of February 11, Mr. J. L. Du Toit presided, Mr. Benedicto being unwell. Mr. Bell Raymond presented a brief report on the inter-Congress period and Dr. G. D. Thompson presented the report of the Resolutions Committee. Among these were a commendation of the practice of holding plenary meetings each day with invited speakers, that French be given equal status with Spanish in respect of summaries of papers and simultaneous interpretation, publication of a daily newsletter at Congresses and of ISSCT newsletters between Congresses, as well as the preparation of a new edition of "Sugar cane diseases of the world".

Mr. Owen Sturgess, Chairman of the Administrative Committee asked that the Committee's recommendations for a completely new Constitution be accepted and this was done. The new Council, formerly Regional Vice-Chairmen, then elected a Board of Trustees, five to serve until 1983 and five until 1986. Dues for the next three years were then announced: ordinary members would pay $50 but would not be entitled to a copy of the *Proceedings*; Affiliated and Institutional members (e.g. technologists associations and research groups) would pay $100 and would receive a *Proceedings*, as would corporate members who would pay $750.

The proposal by Dr. B. B. Ramaiah of India that the invitation of Cuba to the Society to hold its 1983 Congress in that country should be accepted was carried and it was announced by Ing. Oscar Almazán, General Secretary-Treasurer for the 18th Congress, that the General Chairman would be Sr. Luis O. Gálvez T. and the General Vice-Chairman J. L. Du Toit. A post-Congress tour would be arranged in Yucatan, Mexico.

The final banquet, at which awards were made to sectional chairmen and vice-chairmen, speeches of thanks from the various regional spokesmen, etc. concluded the Congress on the evening of February 11.

Sugar cane success in Western Australia

By GEOFF MORRIS

Experimental sugar cane crops at the Ord River irrigation project in Australia's north-western corner are producing yields more than double the Australian average. The results have enhanced prospects for the establishment of a cane industry there to produce sugar or ethanol. The 76,000-ha (187,720-acre) irrigation area, watered by the Ord River Dam, was opened up to farming in 1962 in a move to develop Western Australia's tropical north for intensive agriculture. There has been success with rice, oilseed, peanuts, mung beans, various grain crops, bananas, mangoes and vegetables, but sugar cane seems to have the greatest potential.

High-yielding varieties have produced 259 tonnes per ha (114 long tons per acre) of plant cane. In Queensland, which produces 95% of Australia's sugar, average plant cane yield is about 115 tonnes.ha^{-1} (46 tons. acre^{-1}). First, second and third ratoon crops on the Ord have yielded 150 tonnes.ha^{-1} (60 tons. acre^{-1}).

The sugar yield from the plant cane has been as high as 33 tonnes.ha^{-1} (13 tons. acre^{-1}), compared with the Australian average of about 12 tonnes.ha^{-1} (5 tons. acre^{-1}). Ord River conditions are ideal for cane, with excellent weather (including a nine-month dry season), plenty of water, and an absence of major cane pests or disease, according to the Western Australian Department of Agriculture. The State Minister for Agriculture, Mr. Dick Old, has described the commercial future for Ord sugar cane as "increasingly promising". He says it could be an important source of ethanol, helping to extend Australia's fuel supplies. A hydro-electric scheme, which has been allowed for in the Ord Dam's design, could provide the energy needed for the distillation process. On present production figures and using current technology, the Ord cane could produce more than 30,000 litres of ethanol per hectare.

Sugar cane at present covers just over 100 ha (247 acres) of the irrigation area. Numerous varieties are being tested over a five-year period (1977-81) to determine the most successful varieties and their agronomic requirements.

Fig. 1. The manager of the pilot cane farm fires a plot before harvesting

The Philcite exhibition

Concurrent with the 17th ISSCT Congress was an exhibition of sugar agricultural and process equipment and products at the PHILCITE exhibition centre located near the Philippines International Convention Center where the Congress meetings were held.

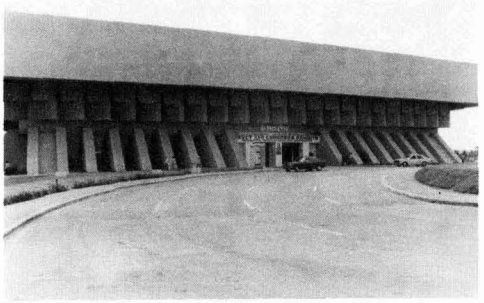


Fig. 1

Fig. 2

Fig. 3

Within the exhibition were display stands while at the rear was an open-air display of machinery. The stands included those of the following companies:

Massey-Ferguson, featuring their range of cane harvesters, tractors, field implements, planters, etc.;
Cofuna S.A., a company licensing their process for preparation of a compost fertilizer from bagasse and filter-cake;
Molave Trading Inc., the Philippines agency for a number of laboratory suppliers including Bausch & Lomb optical instruments and Sauter balances;

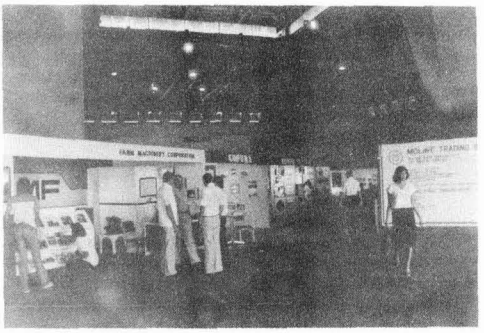


Fig. 4

Belgor Instruments Inc., the Philippines agency for Shimadzu laboratory instruments;
Fabcon/Unice, the well-known suppliers of process chemicals, machinery, and a recent juice and syrup clarification process;
Planters Products Inc., producers of herbicides and other agricultural chemicals;
FMC Inc., agricultural chemical producers;
Braunschweigische Maschinenbauanstalt, whose display featured their continuous centrifugals and cane diffuser;
Johannes Schuback & Sons, the Philippines agency for Kernchen automatic saccharimeters, DDS automatic controls and Fontaine screens;

Fig. 5

A. Goninan & Co. Ltd., suppliers of cane mills;
J & L / Honiron Engineering Co. Inc., whose displays featured cane harvesters, cultivation equipment and samplers, etc.;
Kuenzle & Streiff Inc., Philippines agency for the West German Zeiss optical instruments company, Sartorius balances, Karl Kolb laboratory supplies, etc.;
Jardine Davies Inc., the Philippines agency for Renold Ltd. power transmission equipment and General Tubing products including evaporator tubes;
Toft Bros. Industries Ltd., featuring their cane harvesters;
Philippines Laboratory Furniture & Equipment Co.;
Microbiological Laboratory Inc., Philippines agency for Ohaus balances and Radiometer pH meters and conductivity meters, Karl Fischer titration equipment, etc.;
Hawker Siddley Canada Ltd., makers of a cane separation unit;
Atlantic Gulf & Pacific Co. of Manila Inc., Philippines agency for Betz water treatment chemicals, Dunlop hoses, Smith welding equipment, APE-Allen turbines and Honiron sugar machinery;
Ciba-Geigy S.A., agricultural chemical producers;
FAG Kugelfischer Georg Schäfer & Co., bearings manufacturer;
Marubeni Corporation and **Hitachi Zosen**, whose joint stand featured the considerable number of complete cane sugar factories they have supplied to the Philippines;
CAMECO, suppliers of a wide range of cane harvesters and cultivation machinery;

The Philcite exhibition

Fig. 6

Edward J. Nell Co., Philippines agency for Worthington turbines, Schmidt & Haensch laboratory instruments, Walkers sugar machinery, Plymouth locomotives, Masoneilan valves and Spirax-Sarco economizers and steam traps;
USI Phil Inc., Philippines agency for Caterpillar tractors and Rome ploughs;
Tate & Lyle Agri-Business Ltd., whose stand featured the consultancy services offered in agronomy, raw sugar production and refining, the Talo range of control equipment, automatic saccharimeters, etc. and the Talodura syrup clarification process;

Fig. 7

Rhone-Poulenc S.A., parent company of May & Baker Ltd., who produce weed-control chemicals for sugar cane;
Diadem International Trading & Services Corporation, Philippines agency for Fred Hausmann Ltd. bagasse dryers and briquetting presses;
Nils Weibull AB, manufacturers of centrifugals and sugar silos;

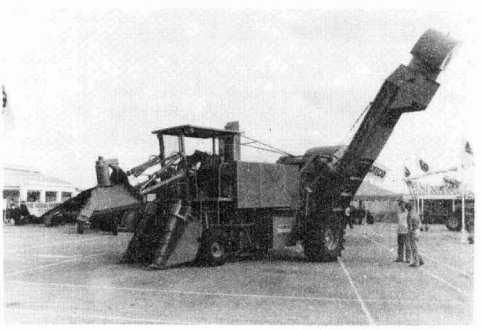


Fig. 8

Metcon (Australasia) Pty. Ltd., whose stand featured sprinkler and drip irrigation equipment and the wide range of Don cane harvesters and agricultural implements;
Shinko Electric Corporation and **Yoshimine Boilers Industry Co. Ltd.**, whose joint stand with Marubeni Corporation featured the power generation and boiler house installations supplied in sugar factories where Marubeni was the main contractor;

Fig. 9

SIMASGA, the Australian group which includes suppliers of agricultural and factory equipment for the cane sugar industry;
Fapmo-Seres, suppliers of cane sampling and laboratory equipment;
Walkers Ltd., suppliers of mills and other cane sugar equipment, including complete factories;

Fig. 10

A.P.E.-Allen Ltd., steam turbine and turbo-generator manufacturers;
Fletcher and Stewart Ltd., suppliers of cane sugar factories in the Philippines as well as in many other countries;
Dorr-Oliver Inc., who featured their clarifiers, filters, juice screens, etc.;
Engineering Equipment Inc., Philippines agency for Dorr-Oliver Inc., who also produce mill roller pinions, wheels and axles;
Polychem Industries Ltd., Philippines agency for Noord-Nederland Machinefabriek B.V. pumps, Veco screens, Ewart chains, Rudolph automatic saccharimeters and Surescreen screens;
Surescreen Sales Pty. Ltd. who separately were exhibiting their screens and strainers;
Maschinen & Technik Inc., Philippines agency for Siemens electrical equipment, KSB pumps, and Gebr. Becker filters;
General Diesel Power Corporation, Philippines distributors of GM diesel engines and transmission;
Stake Technology Ltd., Canadian inventors of a process for bagasse digestion to produce cattle feed;
Farrel Company, manufacturers of cane mills, knives and reduction gearing;
B. B. Fischer & Co. Inc., Philippines agency for Ajax Pumps Pty. Ltd. of Australia, Terry steam turbines, TI (Export) tubing, Tsubakimoto chains, Eimco filters, Envirotech equipment, Synflex hoses, etc.;

Republic Planters Bank, established by the Philippine Sugar Commission to finance development of the country's sugar industry;
Zanini S.A. Equipamentos Pesados, suppliers of complete sugar factories and a wide range of individual plants for the cane sugar industry; and
Finnsugar Engineering, featuring their patented process for recovery of sugar from molasses, and plants for production of other sugars.

Fig. 11

In the outdoor exhibition, the equipment on display included Massey-Ferguson tractors and cane harvester (Fig. 5) a Toft 6000 harvester (Fig. 6), a Caterpillar tractor with a bulldozer blade and Rome cultivation equipment (Fig. 7), a Cameco cane harvester (Fig. 8), a John Deere 8-wheel tractor and ploughs, etc. (Fig. 9),

Fiat tractors (Fig. 10), and a large display by G. A. Machineries Inc. of Ford and County tractors and Howard rotavators, (Figs. 11, 12). Also exhibited outside was the Eutectic-Castolin process for welding and building-up of worn parts and protective maintenance welding for sugar factory equipment.

Outside the main Philcite exhibition and located between it and the Convention centre was the booth where Intercate (Pacific) Inc. were showing a film which demonstrated the Tilby cane separation process and the boards and products which could be made from the rind fraction, including synthetic wood panels, etc.

Fig. 12

Victorias Milling Co. Inc.

Victorias Milling Co. Inc. (VMC) is one of the biggest integrated sugar operations in the world. Its raw sugar factory, with three mill tandems, crushes 24 hours a day the whole year round and can handle up to 12,000 tonnes of cane per day, while its refinery, the first and biggest in the Philippines, produces an average of 1350 tonnes per day and supplies 65-70% of the country's refined sugar needs.

Aside from the raw sugar factory and refinery, VMC also owns and operates a distillery with a daily capacity of 35,000 litres of alcohol, a machine shop and foundry, a General Engineering Services group, an oxy-acetylene plant, a dry-dock, an insurance agency, etc. The Company also maintains an agricultural research and experiment station and is the first private firm in the Philippines to establish such a facility. After nine years of breeding and selection, variety VMC 67-611, for example, was released in March 1976. It was the first to be released as a product of the cane breeding programme started in 1967 and, at October 1977, about 900 ha had been planted to the new variety in the VMC district. The 1975/76 and 1976/77 crossing campaigns also saw the production of more than 2,000,000 seedlings yearly. The Company also offers free extension services to cane planters in the district in the form of soil, juice and fertilizer analyses.

Raw sugar factory

The main cane supply to the factory comes from 34,000 hectares in the VMC mill district. Other cane is purchased from different localities including a nearby island. Combined sources assure the company of a potential supply of 1.8 - 2.5 million tonnes of cane annually.

Generally, the cane received at the mill is transported by rail cars or by trucks and is weighed on a 30-tonne platform scale. That from a nearby island is transported by means of barges and tugboats, and finally to the mill by rail. Cane brought by rail is unloaded to the mill feed cane carrier by means of a rake-type unloader (Fig. 1) and cane from trucks is hoisted by a moveable derrick crane to the feeder table or to a mill yard stockpile for later recovery and feeding to the mill carrier.

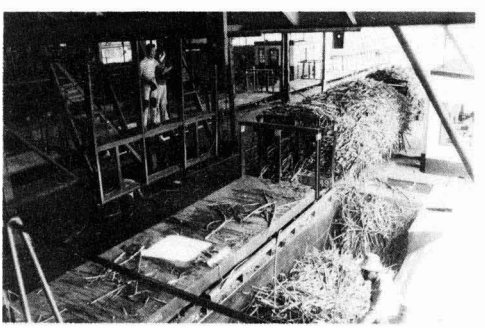


Fig. 1

VMC has three tandems; the A-tandem is a 15-roller unit comprising a 3-roller crusher and four 3-roller mills, all 34 x 78 inc, with a crushing capacity of 2400 tcd. Cane preparation is accomplished by a set of Farrel knives and a Gruendler shredder. The B-tandem is a 17-roller unit comprising a 2-roller crusher and five 3-roller mills, all 34 x 78 in, with a crushing capacity

of 2880 tcd; a set of Farrel knives and a Gruendler crusher are used for cane preparation. The C-tandem is an 18-roller unit with a 3-roller crusher and five 3-roller mills, all 36 x 78 in, with a crushing capacity of 5280 tcd. Cane preparation is by two sets of Farrel knives (Fig. 2). Combined rated capacities of the tandems is 10,560 tcd.

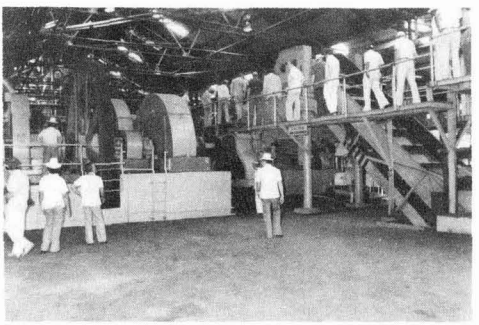


Fig. 2.

Mixed juice is weighed with two Servo-Balans scales and one Maxwell-Boulogne scale. It is heated by a battery of eight juice heaters. Four 20 ft dia. Dorr clarifiers are used and four Oliver-Campbell vacuum mud filters. The clear juice is evaporated to 69-70°Bx in three quadruple-effects with three pre-evaporators and three triple pre-evaporators.

The factory uses nine vacuum pans for *A*- and *B*-massecuites and four pans for *C*-massecuites. Ten Western States high-speed automatic 48 x 30 in centrifugals are used for *A*- and *B*-massecuites and 12 high-speed 40 x 30 in water-driven Roberts machines and twelve Western States continuous centrifugals for *C*-massecuite. A new model continuous Western States machine is under test.

The twelve boilers are rated to generate 17,602 h.p.; 13,102 h.p. for the raw sugar factory and 4500 h.p. for the refinery. The latter uses 4000 h.p. for process steam and 500 h.p. for power. The boilers have 16 furnaces with a grate area of 1309 ft^2. Bagasse produced by the factory is burnt, together with that purchased from other sugar factories and supplementary wood and fuel oil.

At the mill site there are two raw sugar warehouses of 48,200 tonnes combined capacity while another raw sugar warehouse at the VMC dock outside the mill has 23,400 tonnes capacity.

VMC operates the second largest railroad system in the Philippines, consisting of 370 km of track, 30 locomotives (diesel and steam) and more than 3000 cane cars of 8-tonnes and 12-tonnes capacity.

Refinery

Supplies come from the raw sugar factory boiling house and from other sugar factories. It is weighed in two Servo-Balans scales, affined and spun in eight Western States centrifugals. After melting, liquor is carbonatated using milk of lime and CO_2 from the boiler flue-gases, the latter being purified by passage through gas scrubbers against a counter-current of Na_2CO_3 solution. Eight Suchar, one Mirrlees and eight Sweetland pressure filters are employed, filter-aid being added to improve filtration and colour removal. Four Johnson plate and frame filter presses are used for polish filtration.

Liquor decolorization is accomplished using bone char and CAL carbon. There are five cylindrical CAL columns of 2640 ft^3 capacity each, and twelve 1000 ft^3 char columns. The decolorization station is also equipped with three Herreshoff kilns for carbon regeneration and five char revivifying kilns, a Kipp-Killy gravity separator, storage bins, etc.

Fine liquor is concentrated to about 70°Bx in three triple-effect evaporators and sent to the pan floor. VMC uses three modules, each consisting of a vacuum pan, a strike receiver, a centre feed mixer, three automatic centrifugals, a granulator and a bucket elevator, for its straight 4-boiling system. Sugar from the 4th boiling is remelted in sweet-water and returned to the remelt liquor. Part of the syrup from the last purging is sent to the recovery house for processing and part sent to the affination station to mix with the affination syrup.

The recovery house is equipped with three low-grade continuous centrifugals, two automatic batch machines for *A*-sugar and two for *B*-sugar, two automatic centrifugals for affination, six Blanchard crystallizers, *A*- and *B*-sugar bucket elevators, a low-grade and two high-grade vacuum pans.

Refined sugar is packed in 50-kg polyethylene bags while some is also packed in 5-kg bags for domestic use. Bagged sugar is transported to the refined sugar store by a series of conveyors for fast and efficient handling.

The VMC distillery

The distillery uses blackstrap molasses as raw material and incorporates three distillation units having a combined capacity of 37,000 litres per day. There are 25 fermentation vats which can hold up to 180,000 litres, and a yeast dryer with a capacity of 1½ tonnes per day and, as an adjunct to the distillery, a plant which treats distillery waste water before discharge to the river.

The foundry

Victorias Milling Co. Inc. went into the foundry business to meet the growing demands of its mill for cast products. In addition to supplying rollers for its own tandems, VMC serves the mill roller requirements of all the 14 sugar factories on the island of Negros.

Cast parts for rolling stock (locomotives and cane cars) made of steel, iron or bronze, form the second largest product volume of the foundry, followed by centrifugal pumps of various sizes.

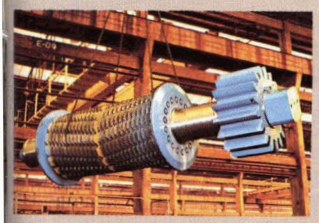
The capacity of the foundry is such that it can pour a single casting weighing as much as 20 tonnes. VMC has five melting units, comprising two cupolas with melting capacities of four and seven tonnes each per hour, one induction furnace of 3000 lb capacity, an oil-fired graphite crucible with a capacity of 750 kg and an oil-fired open-hearth furnace with a capacity of 800 kg.

Waste water treatment plant

In its program to maintain ecological balance, VMC has put up a waste water treatment plant consisting of an oil separator, solids separation system, neutralization, aeration and finally lagooning and dilution before discharge to the river.

Switzerland campaign results 1979/80[1]. – The Frauenfeld sugar factory sliced 367,107 tonnes of beet in the 1979/80 campaign at an average rate of 4768 tonnes per day. The Aarberg factory sliced 414,292 tonnes at an average daily rate of 4407 tonnes. From the total of 781,399 tonnes the two factories produced 108,421 tonnes of white sugar, 32,854 tonnes of molasses, 191,773 tonnes of wet pulp and 12,664 tonnes of dry pulp pellets.

[1] *Zuckerind.*, 1980, **105**, 101-102.



El azúcar representa una importante fuente de energía en el mundo entero. El extraerlo de la caña de azúcar con eficiencia es siempre una tarea difícil que depende sobre todo de las características y de la calidad del equipo utilizado.

El nombre Farrel es conocido y respetado mundialmente en el campo de la producción azucarera. Hace más de un siglo que sus técnicos están construyendo y perfeccionando los equipos para la molienda de la caña de azúcar.

Zanini, a través de su asociación con Farrel, adquirió la tecnología necesaria para llegar a lo que es lo más importante: fabricar los mejores trapiches del mundo: TRAPICHES ZANINI - FARREL.

En varias regiones del mundo, en las más rigurosas condiciones de trabajo, los Trapiches Zanini - Farrel fueron puestos a prueba y demostraron su alto grado de eficiencia, destacándose por su mayor capacidad de molienda.

Los trapiches son fabricados en varias dimensiones, pero Zanini también puede suministrarlos en tamaños especiales para proyectos específicos.

Si quiere conocer todo lo que hay que saber acerca de los trapiches Zanini, basta consultarnos. Y si quiere obtener mayores informaciones acerca de la calidad de los trapiches Zanini y de los trapiches Farrel, consulte o visite los mayores y mejores centrales azucareros del mundo: Cia. Agrícola Fazenda São Martinho (BRASIL), Usina Santa Elisa S.A. (BRASIL), Cia. Industrial e Agrícola São João (BRASIL); El Palmar (VENEZUELA); Central Romana (REPÚBLICA DOMINICANA); San Martin del Tabacal (ARGENTINA); Glades Sugar Cooperative (E.E.U.U.); United States Sugar Co. at Clewiston and Bryant, Florida (E.E.U.U.); Motsorongo (MÉXICO); San Cristóbal (MÉXICO); Victoria's Milling Co. (FILIPINAS); Del Cauca (COLOMBIA); etc.

TRAPICHES ZANINI-FARREL:

Zanini fabrica trapiches en las siguientes dimensiones (en pulgadas):

30" x 54"	36" x 72"	43" x 90"
30" x 60"	37" x 78"	44" x 96"
34" x 66"	42" x 84"	

pero también puede suministrarlos en tamaños especiales.

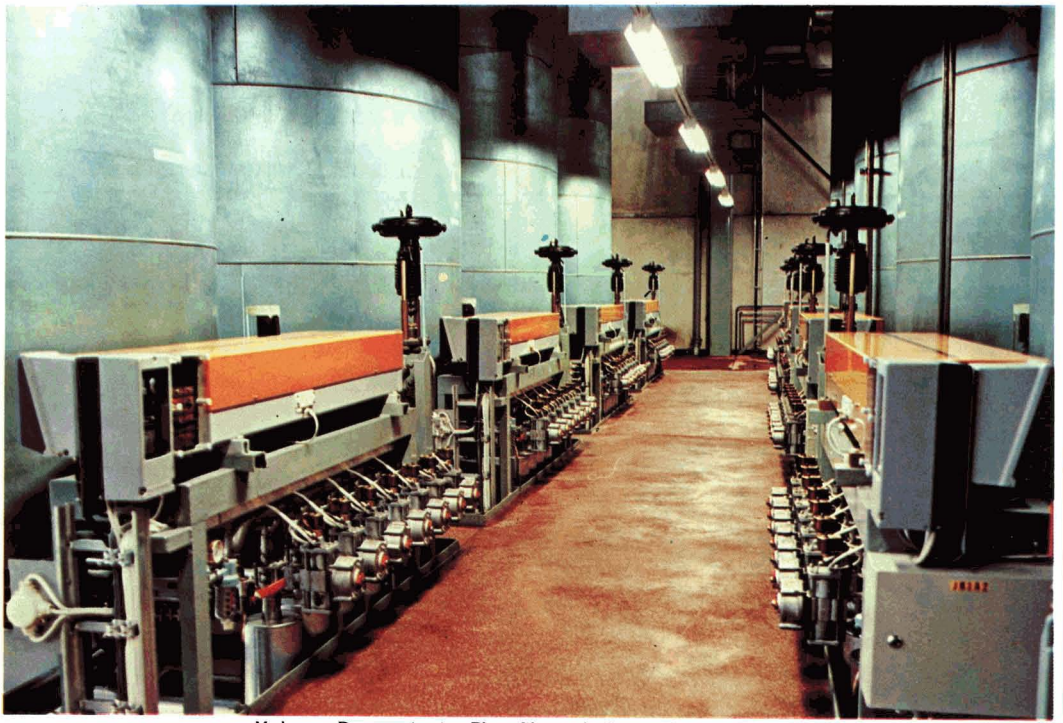
Representando mayor seguridad para el cliente, los trapiches Zanini - Farrel son suministrados con dos (2) años de garantía contra cualquier defecto de fabricación.

zanini s/a
equipamentos pesados

Fábrica: Km 4 da Rodovia Armando de Salles Oliveira
Caixa Postal, 139 - 14160 Sertãozinho - SP - Brasil
Teléfono: (0166) 42.2255
Telex: 0166.315 - ZANI BR
Oficina Central: Avenida Paulista, 460 - 18º andar
01310 São Paulo - SP - Brasil
Teléfono: (011) 285.5122
Telex: 011.22901 ZANI BR - 011.21550 ZANI BR

Zanini y Farrel tienen al mundo entero para certificar el resultado de la tecnología que ofrecen.

Fator



Molasses Desugarization Plant, Naantali Sugar Factory, Finland.

The experts know how to improve

in molasses desugarization

in sugar refining

your sugar output

your sugar quality

Cane and Beet Molasses

↓

Finnsugar – Pfeifer & Langen Molasses Desugarization Process

↓

Dark and light color syrups
Liquid sugar
Fructose rich syrups
Raw and white sugar

Engineering, a division of the Finnish Sugar Company, is in an excellent position to offer various services to the world's sugar industry both as consultant and plant supplier. The different activities thus extend from consultancy and preparation of feasibility studies up to the engineering and delivery of complete turn-key industrial plants with appropriate training and management. Besides sugar refining, the program includes the handling and utilization of by-products – with special emphasis on molasses desugarisation and ion exchange technology, production of isomerose, cattle feed, and various other products.

Raw Sugar

↓

Finnsugar Refinery Process

↓

Refined granulated sugar
Liquid sugar
Lumpsugar
Sugar loaves

The Finnish Sugar Company runs one of Europe's most modern sugar refineries and one of the world's largest molasses desugarization plants. Being independent of any machinery manufacturing group, Finnsugar

FINNSUGAR ENGINEERING

Finnish Sugar Co. Ltd.
Finnsugar Engineering
SF-02460 KANTVIK, FINLAND
Phone Helsinki 298 5131
Telex 121076

Central Azucarera Don Pedro

The original mill at Nasugbu, Luzon, was built by the Roxas family in 1912 but favourable conditions led to its replacement by a new Mirrlees Watson mill in 1927. Initially with a capacity of 1200 tcd, the factory has undergone a series of expansions and modernizations so that its rated capacity is now 6500 tcd and production averages two million piculs of sugar (127,000 tonnes).

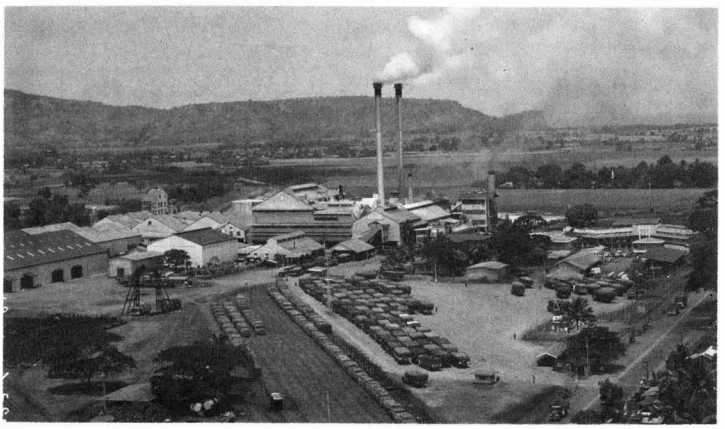


Fig. 1

Cane from 25% of the mill area is delivered in the company's rail system which operates 15 diesel locomotives and 125 km of track. The remaining cane is delivered by planters in trucks and semi-trailers. Two platform scales – a 50-tonne Fairbanks-Morse unit and a 22-tonne Howe Richardson unit – are used, while there are three systems of unloading – a tilting platform, hydraulically-operated mechanical unloaders and electric winches for rail cars.

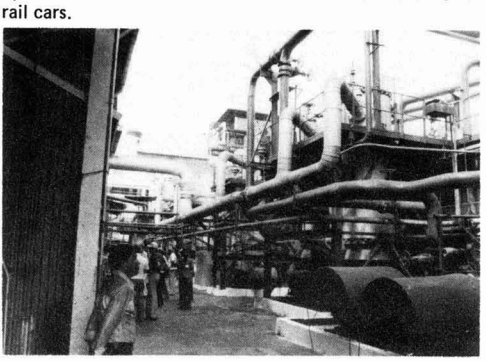


Fig. 2

The preparation station includes a cane leveller, a set of cane knives and a turbine-driven "Unigrator" which has replaced a cane shredder. The tandem includes a 2-roller crusher and five 3-roller mills, all 37 x 78 in, the drive being by two 1800 h.p. multi-stage turbines and each mill having a forced feed roller . A "Lotus" roller[1] has been fitted for 1979/80 as the top roller of the 5th mill and is expected to reduce juice reabsorption and bagasse moisture by improved drainage efficiency. The last three mills serve as dewatering mills since bagasse from the second mill is conveyed to a BMA-Egyptian type diffuser of 6500 tcd capacity, installed in 1970 (Fig. 2). Exhausted bagasse from the tail end of the diffuser is brought back to the mill house and fed to the 3rd mill.

A John Thompson (Australia) Ltd. boiler was installed in 1969 with a capacity of 200,000 lb.hr^{-1} at 150 psig, with a pneumatic spreader stoker, automatic combustion control, etc. A new Foster Wheeler pinhole grate boiler of 300,000 lb.hr^{-1} capacity and 400 psig working pressure is being installed as is a Hausmann bagasse dryer which will use boiler flue gases to reduce bagasse moisture from 53 to 35%. It will be the largest suspension-type bagasse dryer in the world.

Mixed juice is sampled, weighed, screened and heated to 220°F in two stages. It is limed under automatic pH control and flocculants added, after which it is settled in four modified Bach clarifiers and a new Sucro AMS continuous clarifier seen at the right in Fig. 3. The mud is filtered on four Oliver rotary vacuum filters, the latest and largest also being shown in Fig. 3.

Clear juice is thickened from 15-18°Bx to 65-70°Bx in a quadruple-effect evaporator, the first effect of which comprises four vessels serving as pre-evaporators. Syrup is clarified by the Talodura system which has brought about an appreciable reduction in massecuite viscosity and improved crystal quality.

A three-boiling system is used but is modified to a two-boiling system if syrup purity falls below 80. Low-grade strikes are seeded with a slurry in alcohol and boiled with the aid of a Taylor supersaturation instrument. Low-grade sugar is mingled with magma to act as a footing for the *A* and *B*-strikes. Of the ten pans in the boiling house, four are for low-grade. A "washed sugar" is made from a boiling magma footing with

Fig. 3

[1] *I.S.J.*, 1980, **82**, 31.

sodium bisulphite as a bleaching agent.

Seven automatic 48 x 36 Western States centrifugals are used for *A*- and *B*- massecuites and the sugar combined as the commercial product. "Washed sugar" is purged in four Hepworth batch machines, while low-grade sugar is cured in two semi-automatic Western States and 10 continuous BMA centrifugals.

Power is generated by a 5000 kW Worthington turbo-generator and a second unit of 2500 kW capacity. A 1250 kW General Electric unit serves as an emergency back-up unit. During shut-downs power may be purchased from the public grid, while two diesel generators are available as stand-by units.

Warehouses store raw sugar in bulk at the factory and have a capacity of 1,027,500 piculs (65,250 tonnes); a fifth warehouse at the Wawa wharf holds a further 60,000 piculs (3810 tonnes).

The distillery has three columns with a combined capacity of 35,000 litres per day and operates for approximately 300 days per year. Dry yeast and liquid carbon dioxide are recovered as by-products of distillery operation. The CO_2 plant, with a rated capacity of 24 tonnes.day^{-1}, was supplied by Distillers Co. (CO_2) Ltd. and commissioned in 1978. The plant embodies a number of innovations including improved carbon purifiers which eliminate the need for $KMnO_4$ scrubbers and yield a high-purity product now being supplied in refrigerated liquid CO_2 road tankers (Fig. 4) to brewers, soft drink bottlers and ice-cream manufacturers serving the Philippines. The liquid CO_2 is stored in two 52-tonne bulk vessels equipped with contents gauges linked to a remote alarm which indicates when they are full. A transfer pump discharges the CO_2 into the road tankers for delivery to Metropolitan Manila, some 100 km away.

Fig. 4

AIDSISA sugar factory

The Agro-Industrial Development Company of Silay-Saravia Inc. was organized in 1962 and bought the old 1500 tcd Central Guamaní plant from Puerto Rico for re-erection near Silay City, Negros Occidental, about 15 km from Bacolod City. In 1966 a new mill from Japan was installed and the capacity raised to 3000 tcd. With the installation of a De Smet diffuser in 1968 – the first of its kind in Asia – and further additional plant in 1974, capacity was raised to its present 4000 tcd. Crushing runs from October to mid-May and production in the 1978/79 crop reached 1,120,000 piculs (71,125 tonnes).

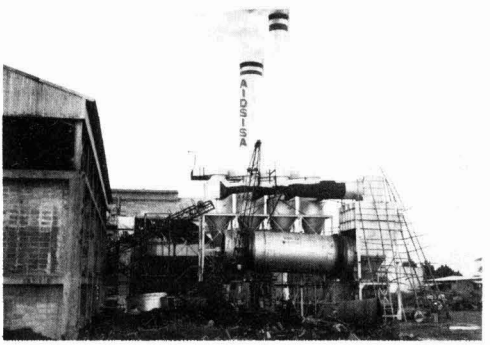


Fig. 3

Fig. 1

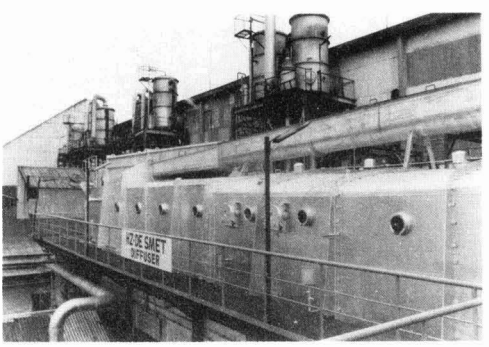


Fig. 2

In 1975 AIDSISA installed the first dry cane cleaner in Asia (Fig. 1). Three feeding tables carry cane to a series of conveyors over which it passes, trash being separated by an air blast. The clean cane goes through, two sets of knives and a shredder to a turbine-driven

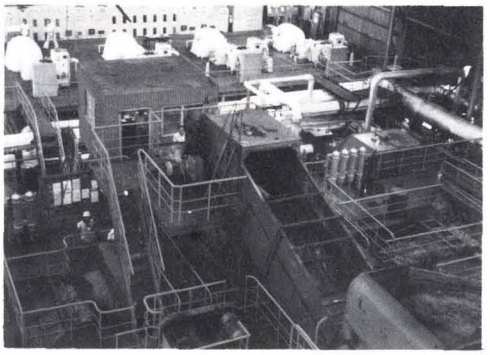


Fig. 4

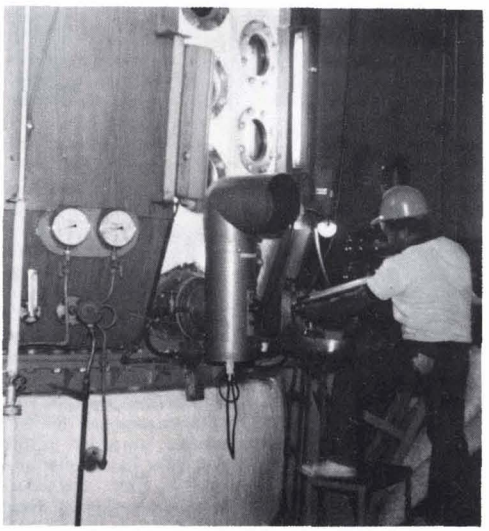


Fig. 5

first mill from which the bagasse is conveyed to the diffuser. This is a 125 ft long HZ-Ts 45/3/9 unit (Fig. 2) in which residence time averages 45 minutes. The diffuser bagasse is sent to two dewatering mills which also use 38 x 74 inch rollers and are turbine-driven. A new Stearns-Roger bagasse dryer (Fig. 3) has been installed which will raise the bagasse heat value and obviate the need for supplementary fuel while providing a surplus which can be sent to neighbouring mills which are short of fuel. The power house (Fig. 4) is next to the mill and has three 1200 kW and one 1400 kW turbo-generators with diesel standby units.

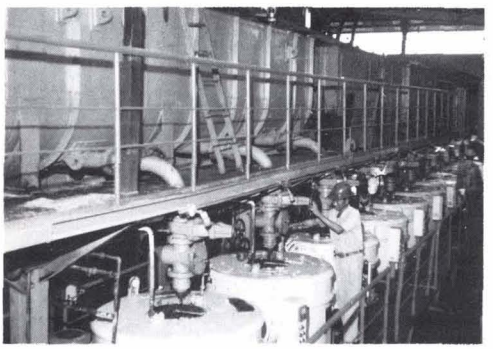


Fig. 6

Juice is limed, heated and clarified in two 255 m^3 Graver-type settlers before passing to a pre-evaporator and two quadruple-effects of which the first effect is common to both. The boiling house includes six calandria pans (Fig. 5), three with mechanical stirrers and two operated automatically using DDS and Siemens automatic controllers. The centrifugal station includes five fully-automatic Selwig & Lange high-grade batch machines and ten Hein, Lehmann continuous low-grade machines (Fig. 6) of 3 tonnes.hr^{-1} capacity.

Hawaiian-Philippine Company

The Hawaiian-Philippine Company was estabished in 1918 and crushed its first crop of cane in 1921, since when it has been in continuous operation, apart from the war years and reconstruction period, 1941 - 47. Crushing capacity has grown from the initial 1500 tcd to its present level of over 7200 tcd at peak periods. The record of 7765 tonnes was reached during the 1978/79 crop year, on December 14, 1978. Production figures for the past seven crop years have been as follows:

1978/79	1,911,465.88 piculs	(121,386 tonnes)
1977/78	1,777,970.48 "	(112,908 ")
1976/77	1,973,048.89 "	(125,297 ")
1975/76	2,032,613.45 "	(129,079 ")
1974/75	1,895,551.00 "	(120,375 ")
1973/74	1,922,539.84 "	(122,089 ")
1972/73	2,057,848.03 "	(130,682 ")

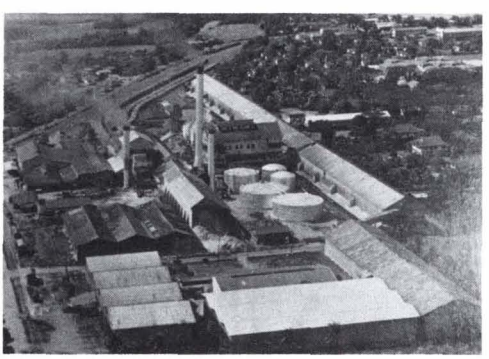


Fig. 1

Hawaiian-Philippine Company

Originally, cane hauling was via a railroad network only. In 1968 a new system was introduced which containerized the loading of cane on trucks. This van system is a feature of cane hauling operations unique to the Company. At present one-third of the mill's cane supply is delivered through the van system and two-thirds by the railroad network, which extends to 164 km of 36 in gauge track.

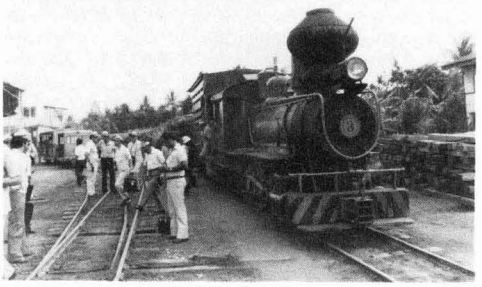


Fig. 2

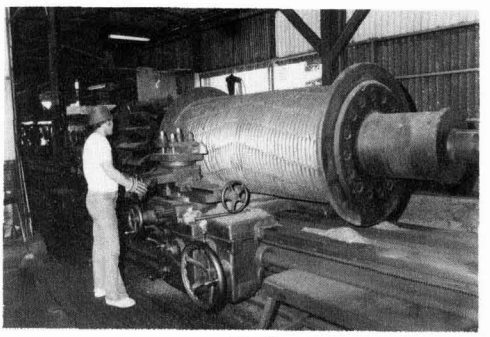


Fig. 5

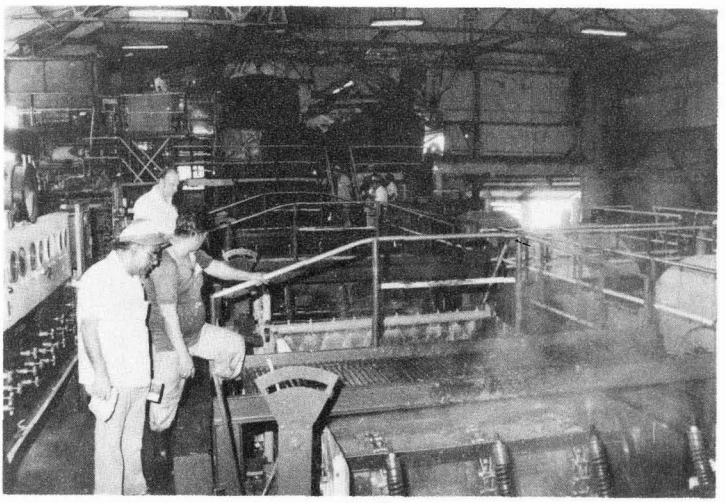


Fig. 3

In addition to six diesel locomotives the company operates nine bagasse-fired steam locomotives (Fig. 2) and a total of 1475 cane cars which bring the mill's supplies from a total of 546 planters and a cane area of 19,386.48 hectares. The cane passes through two sets of knives and an 84-inch Gruendler shredder to the 5-mill 38 x 78 inch Honiron tandem with individual turbine drives (Fig. 3). Juice is settled in four Dorr clarifiers and the mud filtered on three Oliver Campbell filters. It passes to an evaporator system which comprises ten vessels; Fig. 4 shows the control panel for an experimental installation in which Houseman (Burnham) Ltd. are treating the juice with their scale reducing agent Miltreat.

The factory has seven vacuum pans of which two are for low-grade, while final massecuites are cooled in 18 water-cooled crystallizers operated continuously in three series. The high-grade massecuite is treated in a single air-cooled crystallizer. Six fully-automatic Western States batch centrifugals are used to cure *A*-sugar and eight semi-automatic machines for low-grade strikes. Additionally, two W.S. continuous machines and four Silver continuous machines are used for low-grade massecuite.

Eight Babcock & Wilcox boilers and one from John Thompson (Australia) are used for steam raising, while three Worthington turbo-generators produce 6500 kW and three diesel generators have a combined capacity of 2600 kW. The factory has workshops for maintenance and repairs and Fig. 5 shows a mill roller being regrooved on site.

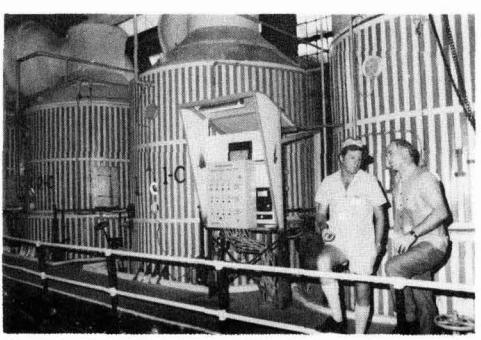


Fig. 4

Sucrose hydrates - a refiner's problem

By H.E.C. POWERS

Refrigeration storage of food has now become so much a part of modern life that a problem which occurred some years ago may be more frequently encountered by refiners. "Iced" cakes – covered with fondant sugar – had been stored at sub-zero temperature and had become covered with small mounds. These, when exposed to room temperature, slowly changed, first revealing miniature volcanoes (Fig.1). These

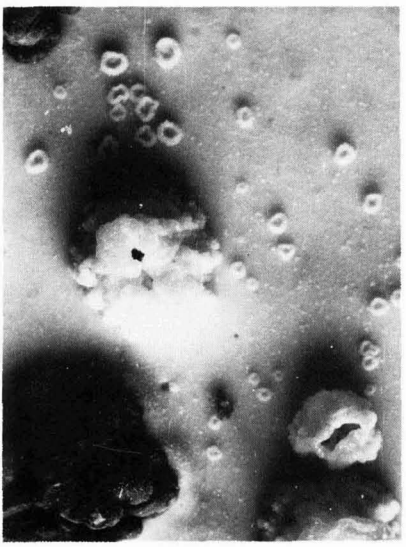


Fig. 1. Excrescences on icing soon after removal from deep freeze

continued to change, the "volcano" opening increasingly (Fig.2), and the whole mound was eventually replaced by a pool of clear syrup plus air bubbles (Fig.3).

This kind of eruption is, to put it mildly, unattractive in any iced food dainty and yet was a natural phenomenon under the conditions applying. Sucrose hydrates, which can crystallize from solution at sub-zero temperature, had done so in the icing sugar layer, the nuclei drawing the necessary extra water molecules from the surrounding icing layer. The hydrate crystals formed the mounds which were stable so long as the temperature remained below freezing point. Once the cakes were brought out and exposed to room temperature, the hydrate crystals dissociated and "melted", the sucrose then dissolving in the excess of water to form the clear syrup.

Two hydrates have been studied in some detail[1,2], *viz*. the hemiheptahydrate $C_{12}H_{22}0_{11}$,3½ H_20 and the hemipentahydrate $C_{12}H_{22}0_{11}$,2½ H_20, while a number of others are indicated by microscopic and X-ray studies. Phase diagrams of the two main hydrates are given in the reference papers and the point is made in one paper that the maximum rate of hydrate formation is at about -10°F (-23°C), which is close to the temperature used in commercial freeze-storage. Frozen fruit has also been reported as exhibiting this hydrate development, in this case said to resemble a mould growth. The crystals under the light microscope appear to be predominantly acicular in shape.

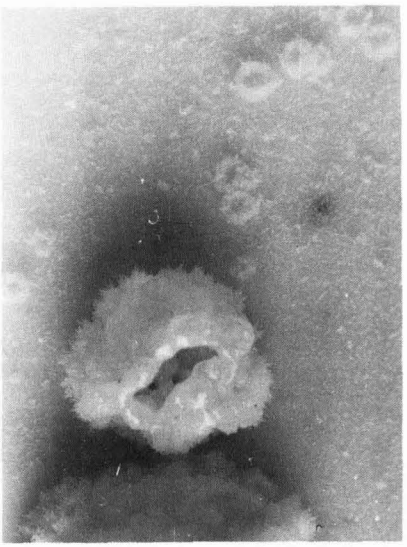


Fig. 2. Needle-like crystals at commencement of dissolution

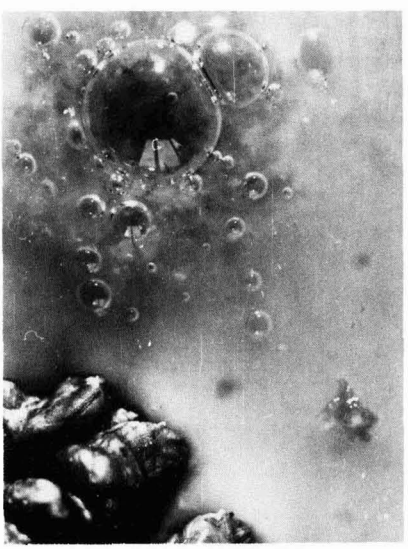


Fig. 3. Late stage of dissolution

[1] Young & Jones: *J. Phys. Colloid Chem.*, 1949, **53**, 1334-1350.
[2] Young, Jones & Lewis: *Food Research*, 1951, **16**, 20-29.

A selection index in sugar cane clones used at Kibaha

By J. N. R. KASEMBE*

Introduction

Success in sugar cane breeding is primarily determined by availability of variability in breeding populations and effectiveness of consequent progeny selection after hybridization[1]. Variability of parent varieties can be ensured by importation and local collection of clones into the breeding plots. While seedling populations are highly variable, consisting of thousands of new (or potential) varieties, Skinner[2] has reviewed the selection procedures. In order to accelerate evolution, several plant breeders have tried to devise means of increasing the effectiveness of selection. Skinner *(loc. cit)* has reported the proven-cross system as important in increasing the efficiency of selection, although Walker[3], much earlier than Skinner, had found that the proven-cross method was not of much value.

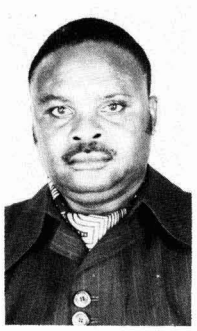
In order to improve the quantitative characters of some varieties, such as yield, sucrose in juice, fibre etc., a recurrent selection technique has been adopted at Kibaha. The general combining ability of a source population of varieties has been determined in crosses with some common tester parents from experimental crosses. Here the idea was not to test the proven-cross method against a biparental cross method from varieties of wanted characters and assessing heritability; but rather to develop a method of testing progeny by comparison with their parents and the standard or check varieties in sugar cane estates in Tanzania.

Apart from the character, number of millable canes (with which a significantly high positive correlation with cane yield exists[4,5] and is in turn directly related to sugar yield), other characters studied are Brix, sucrose (computed from Brix), juice %, stalk weight and stalk number (millable canes). Sucrose yield per unit area was computed and then compared with the Variety Indices calculated from the rest of the characters.

In this study a Variety Index was formulated and tried over eleven related varieties.

Materials and methods

Eleven related varieties were used; these are:-



J. N. R. Kasembe

Variety		*Parents*
(1) EA 6906	=	(2) Co 718 x (3) CP 44-101
(4) EA 6909	=	(5) N:Co 349 x CP 44-101
(6) Co 421	=	(7) POJ 2878 x (8) Co 285
(9) N:Co 376	=	Co 421 x (10) Co 312
(11) N:Co 310	=	Co 421 x Co 312

EA 6906 and EA 6909 are local varieties bred at Kibaha. Their parents include an American variety, CP 44-101, an Indian variety, Co 718, and one from South Africa, N:Co 349. Co 421, N:Co 310 and N:Co 376 are standard varieties popular in Tanzania. The parents of these last three varieties are included in these investigations in order to compare their Indices.

All the eleven varieties were planted in an 11 x 11 Latin square experiment on September 21, 1976 and harvested on July 21, 1977, ten months later. Each plot was 4.5m x 4.5m with 1.5m spacing between rows and 0.5m spacing within the row. Harvesting was done from the middle row 6 stools, i.e. 3m of middle row length. The standard (or check) variety was still Co 421 although this was also a "treatment" variety. At harvest, hydrometric Brix (B), was measured, fibre content and juice content (J) were computed, mean stalk weight (W) calculated from the weight of ten stalks, and the tiller number per stool (T) and stool number per plot (N) were counted. Eventually the sucrose yield from 4.5m^2 was computed from the sucrose % fresh weight of extractable juice from 10 stalks in each variety (*vide* Farquhar[6]). The Variety Index for each treatment was calculated from the formula

$$_jK = \frac{T \times W \times B_T \times J_T}{10{,}000} \times \frac{N}{10}$$

where $_jK$ is the Variety Index
T is tiller number of millable canes at harvest
N is number of stools per 4.5m^2 plot
W is mean weight of a single stalk
B_T is Brix divided by 1.5 to estimate sucrose % and then the result transformed using Angular Transformations of percentages to degrees (after Fisher & Yates[7])
J_T is Juice % (= 100 – Fibres %) transformed by Angular Transformations

Theoretical aspects

The yield of any variety is dependent on the proportion of extractable sucrose it has in the stalks, the

* Principal Research Officer, Sugarcane Breeding Station, Kibaha, Tanzania.

1 Empig, Lapastora, Guiban & Manalo: *Sugarcane Breeders' Newsletter.* 1976, **37**, 26-31.
2 *Proc. 14th Congr. I.S.S.C.T.*, 1971, 149-162.
3 *Proc. 11th Congr. I.S.S.C.T.*, 1963, 469-483.
4 Mwandemele: "Inheritance of some quantitative characters in sugar cane (*Saccharum* spp.)". M.Sc.Thesis, 1977.
5 Khairwal & Babu: *Sugarcane Breeders' Newsletter*, 1975, **36**, 58-61.
6 *ibid.*, 52-55.
7 "Statistical tables for biological, agricultural and medical research", 6th Edn. 1963.

amount of juice with that high sucrose content and the total weight of cane obtained which in turn is dependent on T x N x W.

Sucrose % and juice % have been transformed in order to make them more appropriate to the other data under investigation, since T, N and W are linear functions.

In this exposé, heritability (h^2) *per se* has not been included as that will be presented in another paper. Therefore this work emphasises the Index as formulated at Kibaha for use in selection mainly for yield. At Kibaha this formulation is referred to as KIVA which stands for Kibaha Index for Varieties.

Results

The varietal characteristics for some quantitative parameters are clearly shown in Table I. While Figure 1 shows a clear correlation between the Indices and the quantity of sugar given per unit area, with r = + 0.94 (significant as P = 0.05). The best fit, which is the line depicting the regression of sucrose per plot on variety index, also demonstrates the line on which most varieties will be located in a diagram like this.

Discussion

The results have shown that the higher the $_jK$ index the higher the output of sugar per unit area. Since the index utilizes some of the most important quantitative characters, it can furnish a selection criterion in order to classify either the parents of the intended biparental crosses or the progeny. An index above 0.37 is good

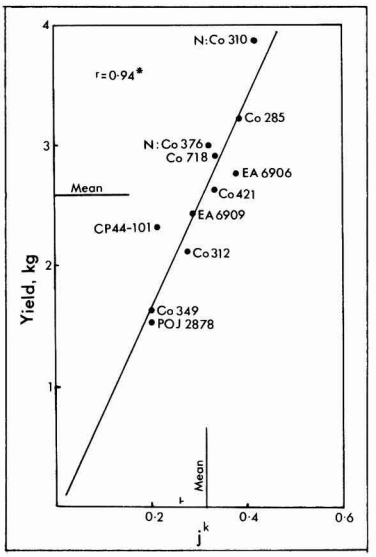


Fig. 1. Variety constant (= clone constant) $_jK$ *vs.* sucrose yield per plot

Table I. Components of quantitative characters and their related Variety Indices

Variety	Sucrose % (Brix % ÷ 1.5)	Sucrose Degrees (B_T)	Fibre %	100 − Fibre %	Juice Degrees (J_T)	$\frac{10 \text{ stalk wt.(kg)}}{10_{(W)}}$	Tiller number per stool (T)	Stool number per plot (4.5m²) (N)	Clone (or variety) Constant(K)	Sucrose yield per plot (kg)
Co 421	10.71	19.09	12.00	88.0	69.73	0.71	7.2	5	0.34	2.48
EA 6906	11.05	19.37	13.32	86.7	68.61	0.74	7.8	5	0.38	2.79
CP 44-101	18.43	25.40	13.77	86.2	68.19	0.92	7.8	3	0.37	2.32
N:Co 310	18.55	25.55	12.33	87.7	69.47	0.61	9.5	5	0.52	3.86
EA 6909	17.25	24.58	12.81	87.2	69.04	0.58	9.1	4	0.36	2.45
Co 312	16.43	23.89	13.38	86.6	68.53	0.47	11.2	4	0.34	2.14
Co 718	18.15	25.25	13.15	86.9	68.78	0.57	10.6	4	0.42	2.97
N:Co 349	15.75	23.42	12.75	87.3	69.12	0.83	9.2	2	0.25	1.53
N:Co 376	18.23	25.25	13.84	86.2	68.19	0.53	11.1	4	0.40	3.03
Co 235	15.82	23.42	14.61	85.4	67.54	0.49	12.3	5	0.47	3.21
POJ 2878	16.37	23.89	13.03	87.0	68.87	0.69	7.4	3	0.25	1.63

General formula is $_jK = \frac{1}{10{,}000} \times T \times W \times B_T \times J_T \times \frac{N}{10}$ B_T and J_T are Angular Transformations[7].

enough for our variety selection at Kibaha, since any variety which has a higher index will tend to yield more sugar than 2.58 kilograms for an area of 4.5m².

Variety N:Co 349 seemed to have a lower number of stools per area of treatment. This may have been caused by the low germination of its setts or a higher death rate during its growth period. Since poor or good stand is a varietal characteristic, no attempt was made to compute an index assuming 100% stand which would have given a wrong picture of the varietal performance.

Variety N:Co 310 has an index of 0.52, while N:Co 376 has index of 0.40. Both these varieties have common parents i.e. Co 421 and Co 312, which have the same index of 0.34. Therefore, N:Co 376 has shown an improvement of about 17.6% above the mean and above its parents while N:Co 310 has shown an improvement of about 52.9% above its parents. Under our conditions at Kibaha these two varieties were the best under experimental conditions. The locally bred varieties EA 6909 and EA 6906 showed an improvement of about 16% above the mean and 3% above the male parent respectively, while Co 421 showed an improvement of 36% above the female parent.

This index has been formulated for use in both parental section and progeny selection. The heritability component will be discussed elsewhere.

Summary

An index and its measurement are described for comparison of the yield characteristics of individual cane varieties.

Un indice de sélection des clones de canne à sucre, utilisé à Kibaha

On donne un indice qui permet la comparaison des caractéristiques de rendement des variétés de cannes à sucre et on décrit la facon de la mesurer.

Ein in Kibaha verwendeter Selektions-Index für Zuckerrohrklone

Ein Index und seine Bestimmung werden beschrieben für den Vergleich der Ertragscharakteristika einzelner Rohrsorten.

Un indice empleado a Kibaha en la selección de clones

Se describen un indice y su medición para comparación de las caracterîsticas de rendimiento de individuales variedades de caña.

SUGAR CANE AGRONOMY

Effect of subsoiling on irrigation and sugar cane production. L. H. Sigala V. *Bol. Est. Exp. Occidente* (Venezuela), 1972, (97), 29-46 *(Spanish)*. – Comparative trials were made in which ridges were disc harrowed or subsoiled to a depth of 50 cm, or subsoiling to a depth of 40 cm carried out on each side of the stools and the surface disc harrowed. The treatments were compared in respect of cane yield over three ratoon crops; it was found that subsoiling to 50 cm gave the highest aggregate yield of cane (averaging 129.4 tonnes.ha^{-1}) against 117.1 tonnes.ha^{-1} for the untreated control. The rate of yield decline was also greater without treatment, and treatment increased the amount of water taken up during irrigation.

Effect of sources, levels and number of applications of nitrogen on sugar cane. G. Segura L. and E. Martínez M. *Bol. Est. Exp. Occidente* (Venezuela), 1973, (99), 15-30 *(Spanish)*. – Nitrogen was applied at three levels (100, 150 and 200 kg.ha^{-1}) as ammonium sulphate, urea and ammonium nitrate, either at planting alone, with half-doses at planting and six weeks later, or one-third at planting and at 6-week intervals. The yields of plant cane and first ratoons were determined for each treatment and are tabulated. With plant cane, the effect of number of applications was variable as was that of the level of N, although urea gave higher yields on average than ammonium sulphate and nitrate. With first ratoons, ammonium nitrate gave highest yields, as did the highest N level, and two applications were generally better than one or three.

Possible causes of "stripping" or "barren" places in zones cultivated with sugar cane. R. Pinto M. and F. Gómez A. *Bol. Est. Exp. Occidente* (Venezuela), 1974, (103), 3-10 *(Spanish)*. – Poor growth in such areas is considered to be due to a higher degree of soil salinity, excessive slope of the furrows, or high subsoil compaction.

Correlation between some levels of nutrients in sugar cane leaves. F. Gómez A. *Bol. Est. Exp. Occidente* (Venezuela), 1974, (103), 11-20 *(Spanish)*. – Samples from different cane varieties of different ages were analysed and correlations examined between different components. Positive and highly significant correlations were found between moisture and N, Ca and Mg, while there was a negative and highly significant correlation between N and P.

A preliminary report on the soil fertility status of TSC's plantations. C. C. Wang and I. J. Fang. *Taiwan Sugar*, 1978, **25**, 160-167. – More than 6000 samples have been collected from 167 of the Taiwan Sugar Corporation's 190-plus plantations and analysed. Details of soil type, pH, organic matter, available phosphorus, exchangeable potassium, calcium plus magnesium and zinc are being recorded in a computer memory and similar analyses are to be recorded every 4-5 years so that, in coordination with treatments applied, the requirements for liming and fertilizer application may be assessed.

Persistence of soil-applied herbicides. S. Y. Peng. *Taiwan Sugar*, 1978, **25**, 168-171. – The toxicity of residues of nine herbicides to other crops than sugar cane, as reported earlier[1], are discussed, and the cumulative effects of Perflan applied in two consecutive cane crops (1975/76 – 1976/77) are tabulated and examined. Without further application in the second ratoon crop of 1977/78 persistence terminated.

Tillering and early growth of sugar cane setts in response to pre-plant treatment with 2-chloroethyl phosphonic acid. D. Eastwood. *Trop. Agric.*, 1979, **56**, (1), 11-16. Healthy setts of cane from three varieties (B 4362, UCW 5465 and HJ 5741) were immersed for 30 minutes in solutions of 0, 500 and 5000 μg.cm^{-3} of the title acid (as Ethrel 68-250). After blotting dry, the setts were planted in 20-sett boxes and daily records kept of sprouted buds, numbers of tillers, etc. At the higher concentration the sprouting rate was lowered but tiller development stimulated, except in UCW 5465. At the lower concentration there was no effect on sprouting or tiller development. Seven weeks after sprouting, the aerial portions of plantlets from treated setts showed reduced total mass, shortened height to the dewlap of the first visible leaf, decreased ratio of leaf blade mass to primary stalk mass, increased numbers of leaves per primary stalk and decreased phyllochron. The top visible leaf blade was smaller but contained more water than leaves from control plants. The changes were more pronounced at the higher Ethrel concentration.

On the possibility of raising short-duration crops of sugar cane. K. K. Prasadarao, B. Gopalan, D. V. N. Raju and B. J. Rao. *Indian J. Sugarcane Tech.*, 1978, **1**, 1-7. Cane of CoA 7601 and Co 997 varieties was planted in alternate months from the last week of January to the end of November 1977 and harvested when 6 and 8 months old. The planting material used was 6-weeks old rayungans and the harvested cane was examined for stalk population, length of millable cane, sucrose % juice and reducing sugars % juice, as well as purity coefficient, cane and sugar yield. It was found that cane grown from rayungans and harvested at 8 months could have a remunerative sugar content, CoA 7601 giving a distinctly better performance than Co 997.

Studies on the use of slow-release nitrogen fertilizer – urea acetaldehyde – in sugar cane cultivation. R. S. Sachan and R. G. Menon. *Indian J. Sugarcane Tech.*, 1978, **1**, 38-40. – Comparative trials showed that there was no significant difference between cane yields where nitrogen was added to the soil as urea in three applications or as urea acetaldehyde in a single application, although the yield increased with higher N addition in each case.

Recent trends in area, production and productivity of sugar cane in India. J. Lal and S. K. Bhatnagar. *Indian J. Sugarcane Tech.*, 1978, **1**, 50-56. – Comparative data show that cane area growth rates were lower in Bihar, Uttar Pradesh and West Bengal than in other parts of India, while the western region of Uttar Pradesh had higher rates of area, production and productivity growth than other regions of the state. Production is expected to increase by more than 42% in Tamil Nadu by 1986/87 but by smaller proportions in other states.

[1] Peng & Liu: *Rpt. Taiwan Sugar Research Inst.*, 1975/76.

CANE PESTS AND DISEASES

Complacency will lead to disaster! A. I. Linedale. *Cane Growers' Quarterly Bull.*, 1978, **42**, 46-47. — The author warns against complacency in respect of plant cane, which should be of top quality and disease-free. Control of the spread of major diseases, such as Fiji disease, depends on care in preparation of the sources (at least a year before expected use) from which plant cane is to be taken; no contamination must be allowed, so that machinery must be sterilized, while everything should be done to ensure a crop of top quality. Inspection of plant sources and surrounding cane for disease is essential during the growing season, and many factors must be considered in the final selection of plants. Additional restrictions applying where quarantine has been imposed are also mentioned.

Eye spot disease in Q 99 causes concern. T. G. Willcox. *Cane Growers' Quarterly Bull.*, 1978, **42**, 47. — The symptoms of eye spot are briefly described and the history of its occurrence in Queensland (where it was first recorded in 1970) mentioned. Light-to-moderate infection of Q 99 was discovered in 1978; although it is considered unlikely that there would be any appreciable fall in yield as a result of the disease, the variety is very popular in the area, and planting of alternative varieties is recommended.

Bad drainage increases chlorotic streak damage. C. R. Nalder. *Cane Growers' Quarterly Bull.*, 1978, **42**, 48-49. — By means of photographs, the author shows how chlorotic streak is most prevalent and causes greatest damage in badly drained areas. Before planting, the cane should be inspected for internal and external symptoms of the disease, and regular hot water treatment is necessary to maintain a healthy plant source, the treated cane then being planted on the highest part of the farm. Drains must be regularly maintained.

Control methods for the cane rat *Holochilus brasiliensis balnearum* **Thomas.** M. A. Costilla and H. Izquierdo. *Circ. Est. Exp. Agríc. Tucumán*, 1978, (207), 1-6 *(Spanish)*. — Species of rat which occur in Argentina cane fields are mentioned, the most important being the title rat. Its preferred natural diet is grain, but it infests cane fields, especially when its natural food supply is diminished by prolonged drought or severe winters. It attacks the basal internodes, and a regular check should be made to detect its presence by noting damage, presence of droppings and trapping. Preventive measures include complete harvesting of all the cane, including that damaged, cleaning of paths and roadways and of irrigation canals, especially near the water source, which act as habitats for rats, and protection of predators. Chemical control, applied *e.g.* when 20-30 stalks are damaged per 500 m of row, uses mostly anticoagulants, zinc phosphide, thallium sulphate, etc.; the baiting technique is described.

Rat problem in sugar cane. D. K. Butani and R. K. Bhatnagar. *Indian Sugar Crops J.*, 1978, **5**, 21-25. — A survey is presented of the literature on the rat as a cane pest as well as of other rodents, including field mice, bandicoots and gerbils. The nature and extent of damage caused, species involved, and control by mechanical, chemical and biological methods are described.

Evaluation of some insecticides against sugar cane black bug *Macropes excavatus* **Distt. (Hemiptera:Lygaeidae).** Y.P. Madan, J.N. Gupta, S.C. Bhardwaj and R.A. Singh. *Indian Sugar Crops J.*, 1978, **5**, 26-27. — Trials with a total of 11 insecticides in two locations for control of the black bug showed that, on combined effectiveness and economic grounds, the best was Malathion, followed by Sevimol, Endosulfan and Phenthoate.

Control of diseases by hot water treatment of sugar cane seed material. S. C. Gupta, K. P. Verma, M. P. Singh and S. C. Misra. *Indian Sugar Crops J.*, 1978, **5**, 28-29, 36. Treatment of setts with hot water at 50°C for 2 hours effectively eliminates infection by albino or grassy shoot disease, but does not control red rot. Treatment at 50°C for 2 hours or 52°C for 1½ hours controls smut disease.

A note on some new observations on sugar cane top borer, *Tryporyza nivella* **F.** O. P. Singh. *Indian Sugar Crops J.*, 1978, **5**, 30. — Observations are recorded in respect of exit holes made by the borer in different areas of India; it has also been found that borer-damaged cane, as well as cane damaged by top rot, developed aerial roots at the top nodes.

A note on the evaluation of insecticides for control of sugar cane scale, *Melanaspis glomerata* **Green.** O. P. Dube. *Indian Sugar Crops J.*, 1978, **5**, 31-32. — An account is given of trials with four chemicals for control of the scale insect. Judged by reduction in infestation, the most effective of the four in July, August and September 1972 was Disulfoton at 3 kg a.i. per ha, while in October 1972 the most effective was Monocrotophos at the same rate.

The IISR wide-swath spray boom for spraying tall crops of sugar cane. N. S. L. Srivastava and K. Singh. *Indian J. Sugarcane Tech.*, 1978, **1**, 57-62. — A portable spray-boom constructed of aluminium has been developed by the Indian Institute of Sugarcane Research and is operated by a 4-man team, one of whom carries the boom, two operate foot pumps to pressurize the spray chemical, and the fourth brings the water and chemical. The boom is of square-section 25-mm tubing and carries a T-bar with spray nozzles at either end; it is fed by plastic pipes from the foot pumps. With suitable adjustment, the nozzles provide a swath up to 10.4 m wide, and one hectare can be sprayed in about two hours. The cost is low enough for it to be afforded by every Indian farmer.

Control of white grub *Holotrichia serrata* **F. in sugar cane at Padegaon.** A. S. Patil, P. R. Moholkar, D. G. Hapase and B. S. Shevale. *Proc. 28th Ann. Conv. Deccan Sugar Tech. Assoc. (India)*, 1978, (I), 81-90. — A total of 17 insecticides were tested for control of white grub and all found to be effective. For the adsali crop, the highest yield was given by use of Carbaryl at 12.5 kg a.i. per ha and for the suru crop Quinalphos G at 8 kg a.i. per ha. In both cases, the best return on investment on insecticide was with BHC at 12.5 kg and 10 kg a.i. per ha, respectively.

SUGAR BEET AGRONOMY

Lightweight topper speeds up harvesting on sand land. D. Charlesworth. *British Sugar Beet Rev.*, 1978, **46**, (4), 26. – In order to obtain more even topping of beet grown in sandy soil, a Yorkshire farmer built a lightweight unit with an aluminium drum which does not dig so deep into the ground and permits more even topping at a rate 50% above that achieved with a conventional unit.

New approaches to nitrogent application – timing, method and amount. A. P. Draycott. *British Sugar Beet Rev.*, 1978, **46**, (4), 31-33. – Most fertilizer (P, K, Na, Mg) can be applied well ahead of drilling and incorporated in the soil by ploughing or later cultivations, but N must be applied near the time of drilling to avoid leaching and provide maximum benefit. Machines are being tested which apply nitrogen neat to the row on the soil surface, at or after drilling; application in this way reduces loss and ensures availability to the crop in the early stages of growth while having no adverse effect on establishment. Experiments are in progress to determine whether, in commercial practice, such a technique is preferable to simple broadcasting of the N fertilizer immediately before or after drilling. Where tops are ploughed-in, optimum N dosage for maximum profit is about 85 $kg.ha^{-1}$; higher amounts reduce sugar content and increase tops weight. Where tops are used as animal fodder, maximum overall profit is obtained with 120 $kg.ha^{-1}$ N.

Two more ways to beat the blow. K. Matthews and J. Armstrong. *British Sugar Beet Rev.*, 1978, **46**, 43-44. The two techniques described for prevention of wind erosion of light soils involve the use of Vinamul 3270, a water-based dispersion of a polyvinyl acetate copolymer which is sprayed onto the soil and binds the surface[1], and the planting of barley seed in interrows which grows and holds the soil, being either burnt at drilling time or just before emergence of the beet or killed slowly by application of Dalapon herbicide.

The Glassford technique. P. Mumford. *British Sugar Beet Rev.*, 1978, **46**, (4), 45. – This method of avoiding wind erosion involves rolling the soil when wet and waiting for it to dry out well, forming a crust. A single pass is made with a spring-tined cultivator at right-angles to the intended beet rows, and drilling carried out the next day with a precision unit having solid wheels fore and aft of the seeder units. These crush the seedbed to a fine tilth directly on the rows but leave the clods between the row.

Cultivation trials on heavy soil types. A. Kennedy. *British Sugar Beet Rev.*, 1978, **46**, (4), 54. – A report is presented of trials on comparative methods of cultivation of heavy soils for beet growing. Against a standard technique of autumn ploughing followed by cultivation with power harrow, spring-tine cultivator or Dutch harrow in the spring, higher yields were obtained by production of a "stale seedbed" by ploughing and cultivation in the autumn followed by one or two passes with a Dutch harrow in the spring (one and two passes gave best results, respectively, in two locations).

Chisels in place of ploughs for beet soils. E. Dalleinne. *Hautes Etudes Betterav. Agric.*, 1979, **11**, (41), 29-30 *(French)*. – While use of a chisel plough instead of a mouldboard plough on a loam soil of low clay content gave an excellent surface to the seedbed and increased the emergence percentage of the beet, the practice does suffer from two major disadvantages, *viz.* a considerable growth of early weeds and excessive compaction of the subsoil, particularly under the effects of rain and tractor wheels, leading to marked clodding, while the difference between the surface and subsoil layers leads to beet fanginess.

Possibilities for increasing the campaign sugar content of harvested sugar beet. A. Kovařík, L. Schmidt, Z. Jaroš and R. Bureš. *Listy Cukr.*, 1978, **94**, 265-272 *(Czech)*. Statistical analysis was made of data concerning beet composition, storage losses and campaign lengths in Czechoslovakia over a 15-year period, with a view to establishing how it would be possible to increase sugar yield. The results indicated that it would be better, for those factories operating a protracted campaign, to start the campaign earlier (September rather than October), harvesting being based on the order of ripeness of the beets in individual fields and extended to early November. Storage should be restricted to, say, 17 days (the average of the 1971-75 period) in contrast to 22 days (the average for 1975). Storage losses can be reduced by using forced ventilation and by chemical treatment of the piled beet.

From field to factory. T. P. J. Dyke. *Sucr. Belge*, 1978, **97**, 407-412. – See *I.S.J.*, 1979, **81**, 275.

Beet equipment on demonstration in 1978. A. Vigoureux. *Le Betteravier*, 1979, **13**, (127), D – E *(French)*. – Brief descriptions, accompanied by photographs, are given of beet harvesters and loaders demonstrated at various sites in Belgium during 1978.

Coated or uncoated seed. R. Vanstallen. *Le Betteravier*, 1979, **13**, (127), F *(French)*. – While the percentage of gaps in the row is smaller with unpelleted seed than with pelleted seed sown by precision drill and is only slightly affected by wear of the feed mechanism, the percentage of doubles when unpelleted seed is sown by a worn drill is much greater than in the case of pelleted seed, which is only slightly affected. Whereas most of the beet seed sown in Belgium is genetic monogerm, the flattened form of this seed creates difficulties in mechanical drilling, so that the seed should be pelleted. Although there is almost no difference between pelleted and unpelleted seed as regards germination power, pelleted seed generally is superior in monogermity; however, for the same variety, pelleted seed sometimes has slightly lower germ vigour. The higher price of pelleted seed is balanced by the percentage of doubles when unpelleted seed is sown.

Effects of decapitation and growth substances on subsequent growth of sugar beet. D. K. D. Gupta, R. K. Mandal and S. Deb. *Indian J. Sugarcane Tech.*, 1978, **1**, 41-46. – Removal of the apex 70 days after sowing and application, a week later, of growth-

[1] *I.S.J.*, 1978, **80**, 63.

promoting substances (gibberellic acid, kinetin and cycocel) were examined as methods for increasing the growth of the storage roots of sugar beet. Apex removal induced greater partitioning of carbohydrates in favour of the root through increased photosynthetic rates in the remaining leaves. Gibberellic acid appeared to have an almost equally beneficial effect on the intact and "decapitated" plants in terms of leaf area index, dry matter production and crop growth rate, while kinetin favoured higher sugar concentration by delaying senescence of the leaves. Cycocel appears to increase sugar concentration by reducing shoot size relative to the root.

A five-row tractor-drawn seed drill for sugar beet. N. S. L. Srivastava and R. N. S. Yadav. *Indian J. Sugarcane Tech.*, 1978, **1**, 68-71. – A 5-row seed drill for sugar beet, designed at the Indian Institute of Sugarcane Research, is described and illustrated. Sowing is uniform in spacing and depth, and costs less than manual planting using a dibber or in the wake of a plough.

Sugar beet mechanization. C. J. Baskerville. *Paper presented to UK Sugar Beet Conf.*, 1979, 3 pp. –While seedbed cultivation is vital to the crop, work on improvement is continuing but no dramatic breakthrough in new equipment design is expected. Limiting the number of cultivations is likely to give the greatest sugar yield. The new N.I.A.E. drill has two stages: the first picks up seed at slow speed (so avoiding unfilled spaces) and feeds to a delivery wheel which rotates at the same speed as the drill's forward speed, so that the seed drops vertically with no bounce. Adjustments now provide optimum conditions for seed growth, *i.e.* removal of dry cloddy soil, drilling down to moisture and covering with 30 mm of soil. A prototype strip drill forms a slit 200 mm deep by 13 mm wide to allow tap root growth, and is followed by a rotary cultivator for a 200 mm wide strip in front of the drill itself. Increasing the working depth of the lifter wheels of beet harvesters has reduced underground losses but increased dirt tare. Harvesters with lightweight toppers are now available and work on a profile topper which allows 8% more beet to be sent to the factory is in progress.

The economics of sugar beet on the farm. M. C. Thompson. *Paper presented to UK Sugar Beet Conf.*, 1979. Examination of capital and labour costs, etc., for varied conditions confirms that the sugar beet is a valuable crop to UK farmers.

Experiments to determine the significance of nutrient supply for sugar beet quality. III. Micro-nutrients. K. Bürcky and C. Winner. *Zuckerind.*, 1979, **104**, 44-49 *(German)*. – In experiments to determine the effect of trace elements on beet germination, growth, yield and quality, the individual elements were added separately to nutrient solutions of known analysis and fed to the pot-grown seeds. While the absence or deficiency of any one of the elements caused a significant fall in yield and quality, increase in the concentration of the available elements beyond the optimum levels also caused a fall in yield, so that the establishment of an optimum ratio between the various nutrients is important as regards beet quantity and quality. The results are also discussed in relation to the nutrient supply and buffering capacity of field soils. The trace elements studied had the following increasing order of toxicity to germination (at equivalent molar concentrations): Mn < B < Zn < Fe < Mo < Cu.

Nitrogen fertilization: fixed recipes are bad. Problems with heavy soils. W. C. von Kessel. *Die Zuckerrübe*, 1979, **28**, (1), 7-11 *(German)*. – The author discusses the folly of applying N at the same rate year after year, regardless of the soil and crop requirements and without heed to climatic conditions. The importance of determining the amount of available N in the soil (N_{min}) at various times during the growing season is stressed, and reference is made to experiments conducted between 1974 and 1978 at various locations in West Germany.

N_{min} investigations on sugar beet in the Uelzen district. J. Steinhagen. *Die Zuckerrübe*, 1979, **28**, (1), 12-14 *(German)*. – Determination of the available N in samples of sandy and sandy loam soils in the Uelzen region of West Germany and of the effect of N application rate on beet parameters with and without irrigation showed that analysis for N_{min} was liable to considerable error where the soil was of low fertility, so that no recommendations on N application rate would be advisable; although the accuracy of the method improves with increase in fertility and with increasing proportions of organic manure, there is still the risk of error with such soils. However, the method is of value as a rough guide to the N requirements of the crop. The usual effect of increasing N application rate on beet (increased yield but reduced sugar content) was found, with or without irrigation.

New approaches to site-specific nitrogen fertilization. C. Winner. *Die Zuckerrübe*, 1979, **28**, (1), 17-18 *(German)*. – The question of the value of the N_{min} method (determination of soil N available to the crop) for evaluation of N requirements and application rates in a given locality is discussed. It is considered that, despite its weaknesses (possible error in soil sampling, particularly in May after basal dressing of N, and the restriction of the analysis, and hence evaluation, to the time at which the sample was taken), the method is useful as a direct measure of available N rather than a mere estimation. N_{min} determination in February/March is especially useful as a guide to more accurate basal dressing application, while even in May the findings are of value in helping the farmer to check the N "dynamics" of the soil. However, at present, the method is not sufficiently location-specific and is too "simplified" for the individual case.

Agricultural practices with a bearing on reduction in weeding. F. Schmock. *Die Zuckerrübe*, 1979, **28**, (1), 26-28 *(German)*. – The author examines several aspects of West German beet agriculture in relation to their effect on weed control. Particularly mentioned is the effect of plant spacing, and tables of data indicate the economics of manual and chemical weed control with manual thinning and with drilling to stand. With increase in the plant spacing from 6.1 cm in 1968 to 19.8 cm in 1977, the costs of organic manuring and weed control tended to fall, then rose steeply in 1974-76 to the same level as in 1968, but in 1977 were lower than 10 years previously. It is stressed that the complexity of the relationships between the many factors involved in beet agriculture precludes development of a standard practice for a given locality or farm size, and so decision on any one measure must rest on the effect of the measure on other parameters.

BEET PESTS AND DISEASES

The susceptibility of beet varieties to Cercospora infection. T. Kiss. *Cukoripar*, 1978, **31**, 92-94 *(Hungarian)*. Trials have shown that 150 varieties are susceptible to *Cercospora beticola;* the adverse effect on beet sugar and ash content and beet and sugar yield are indicated, and the positive effect of seed treatment with "Brestan 60" fungicide on sugar content and yield demonstrated in the case of five important varieties together with "Beta poli m/102" as standard. It is suggested that trials of imported varieties should include tests for leaf spot control.

Increasing beet yield by reducing root rot and leaf disease injuries. E. Kiss. *Cukoripar,* 1978, **31**, 161-165 *(Hungarian)*. — Trials on control of root rot diseases showed that the effectiveness of fungicide sprays could be increased by 15-25% by pretreating seed with a mixture of fungicides (best results being given by 400 + 150 + 150 + 150 g per quintal of Quinolate V4X + Dexon + PCNB + Fundazol) and applying a basal dressing of 30-50 kg.ha^{-1} of a 1:2:3 N:P:K mixture. Leaf diseases were also best controlled by spraying with a systemic plus a contact fungicide. The use of leaf growth stimulants increased the efficacy of this treatment.

Sugar beet growth, pests and disease in Belgium, 1977. L. van Steyvoort. *Publ. Trimest. Inst. Belge Amél. Betterave,* 1978, **46,** 157-171 *(Dutch, French)*. — A survey is presented of conditions in beet fields in 1977. No major incidence of pests occurred. Of diseases, the only one causing any marked loss was *Ramularia beticola,* a leaf spot occurring in September in fields where bolters had been topped mechanically and the debris allowed to trail across the growing beets, leading to loss of some three-quarters of the foliage.

Relative efficacy of certain insecticides for the control of cutworms (*Agrotis* spp.) attacking sugar beet (*Beta vulgaris*). R. K. Joshi. *Indian Sugar*, 1978, **28**, 267-268. Trials were made in two years of the relative performance of ten insecticides for the control of cutworms at Sri Ganganagar, India. The best material was Aldicarb at 1 kg a.i. per ha, which gave minimum populations and highest yields of beet; the next best treatments were Phorate and Heptachlor at the same dosage.

Fungicidal treatment of beet seed. A. Lebrun. *Hautes Etudes Betterav. Agric.*, 1979, **11**, (41), 7-17 *(French)*. The major diseases caused by fungi introduced into the seed at germination or immediately after emergence of the seedling are described, with details of symptoms, method of determination and biology of the pathogen; the notes are accompanied by photomicrographs. Fungicidal trials over a 3-year period are reported. Exceptionally good results in the control of *Phoma betae* have been achieved with Rovral, but it is inadequate against *Pythium ultimum*, while CGA 48988 (methyl 2- [N - (2 methoxyacetyl) 2,6-xylidino] propionate) and a parallel product CGA 38140 have given outstanding results in control of *P. ultimum*, and would probably give equally good results against downy mildew *(Peronospora farinosa)*. Captafol has proved excellent against both *P. betae* and *P. ultimum*, while a number of other fungicides named have given moderate-to-good results.

Pesticides for 1979. A. Dunning and G. Maughan. *British Sugar Beet Rev.*, 1978, **46**, (4), 9-10. — Factors which affect the relative efficiency and assessment of pesticides are listed and the effect of soil physical and chemical properties on Aldicarb (Temik), recommended for control of Docking disorder, described. The effect of rainfall on the incidence of the disorder, associated with leaching of the chemical, is discussed and mention made of comparative trials with Yaltox, Vydate and Dacamox; all treatments improved plant populations between 4 and 7% while yield effects would be determined at harvest. Soil-inhabiting pests (springtails, millepedes, symphalids, pygmy beetles and wireworms) occurring in various parts of the UK beet area are surveyed with notes on recommended methods of control.

Pelleting of sugar beet seed for control of seedling mortality due to *Pythium*. K. Singh, S. N. Srivastava and S. R. Misra. *Indian J. Sugarcane Tech.*, 1978, **1**, 63-67. A number of adhesive materials and solid carriers were tested for pelleting sugar beet seeds, and a combination of 0.1% methyl cellulose with bentonite clay found to be the most suitable. Incorporation of Dexon or Thiram fungicides in the pellets reduced seedling mortality due to *P. aphanidermatum* to a greater extent than conventional seed treatment. Of the two, Dexon gave significantly better control of the disease, the lowest mortality (12.8%) being given with incorporation of 10 g Dexon per kg of seed.

***Penicillium cyclopium* and *Penicillium funiculosum* as sugar beet storage rot pathogens.** W. M. Bugbee and G. E. Nielsen. *Plant Disease Reporter*, 1978, **62**, 953-954. The two organisms are identified as beet storage rot pathogens, the second for the first time. Both were as virulent as *P. claviforme* and more virulent than *Phoma betae* or *Botrytis cinerea* on two germplasms developed for resistance to the two last-mentioned. They were less virulent on a breeding line selected for combined resistance to *P. betae, B. cinerea* and *P. claviforme.*

Insecticides to apply at sowing. L. van Steyvoort and E. Seutin. *Le Betteravier*, 1979, **13**, (128), 15 *(French)*. Advice is given on application of insecticides, either by incorporation of microgranules in the furrow or by spraying the soil before drilling to combat the underground pests (or by combining both methods). The pests to be controlled and chemicals to apply are indicated.

Pest control: what is worthwhile? J. Mumford. *British Sugar Beet Rev.*, 1979, **47**, (1), 14-15. — A survey was carried out in various parts of the UK on the incidence of pests and the damage they caused as an example of the calculation of the economic value of treatment with control chemicals. To make such a judgment requires knowledge of what pests are likely to attack, how much loss they cause, alternative control means and their costs, embodying a realistic appraisal of their effectiveness.

BEET BREEDING AND VARIETIES

New aspects of spring work in the cultivation of sugar beet cuttings and seed. A. Stefanescu, A. Nicolau, C. Patrascoiu and N. Popa. *Prod. Veg., Cereale si Plante Tehn.*, 1978, **30**, (2), 25-30 *(Rumanian)*. – Aspects of beet seed production in the unirrigated zone of northern Rumania and in the irrigated south of the country are discussed and recommendations given on the basis of experimental work.

New aspects of sugar beet seedling production in companion cropping on irrigated lands. A. Stefanescu, C. Patrascoiu and G. Stefan. *Prod. Veg., Cereale si Plante Tehn.*, 1978, **30**, (6), 17-20 (*Rumanian*).–Information is given on recommended means of growing seedlings for beet seed production, with maize as companion crop. Aspects discussed are irrigation, seedbed preparation, drilling time and seed spacing; optimum conditions are indicated, under which high-grade seed is obtainable. Results of trials with two beet varieties are reported.

New monogerm sugar beet varieties and their proper use. M. Jassem. *Gaz. Cukr.*, 1978, **86**, 159-164 *(Polish)*. Details are given of monogerm beet varieties available and planted in Poland, and trials are reported. Advice is given on practices to obtain the best results from the varieties mentioned.

Effect of polyploidy of beet on absorption of fertilizing elements. G. G. Lucci and S. Landi. *Ind. Sacc. Ital.*, 1978, **71**, 130-133 *(Italian)*. – The influence of ploidy level on ion absorption by roots was studied and sugar beet chosen for the investigation owing to its well-defined chromosomic variations and to the fact that for this crop selection work has long directed cultural practice towards the use of polyploid plants. Diploid, triploid and tetraploid seeds were carefully selected so that heterosis could be avoided as much as possible. Roots obtained after 100 hours' germination time were excised and incubated in a nutrient solution containing suitable concentrations of K^+ or NO_3^-. Measurement of ion uptake efficiency showed that the tetraploids have a root absorption efficiency for these ions about twice as high as that of diploids, triploid efficiency being intermediate. K^+/NO_3^- ion competition in absorption was also observed.

A new approach to beet breeding research. W. Hollowell. *British Sugar Beet Rev.*, 1978, **46**, (4), 17-18. – In the opinion of Prof. O. Bosemark, of the Hilleshög Seed Company, the full effect of hybridization in the beet crop has not yet been achieved, mainly because of the restriction placed on the breeding programme by the need to rely on the limited gene bank available in the form of the male-sterile lines. For the future, basic breeding research is hoped to lead to advances as great as those involving the use of male-steriles and monogermity. One approach is the possibility of using a form of tissue culture for testing new material raised in the glasshouse and so reducing markedly the time to produce a new variety and allowing a much wider range of populations to be examined.

Sugar beet breeding today. S. Ellerton. *British Sugar Beet Rev.*, 1978, **46**, (4), 41-42, 44. – A survey is given of factors influencing the work of beet breeders, of breeding objectives and breeding methods.

Results of sugar beet varietal trials. N. Roussel and W. Roelants. *Le Betteravier*, 1978, **12**, (126), 11-14 *(French)*. – Results are given of beet varietal trials conducted in Belgium in 1978, covering varieties already listed on January 1, 1978 and newly recommended ones admitted to the list during the year as a result of high performances. Both early- and late-ripening varieties were tested.

Yield and stability of some sugar beet (*Beta vulgaris* L.) varieties. B. K. Tripathi and H. M. Srivastava. *Indian J. Sugarcane Tech.*, 1978, **1**, 8-12. – The performance and stability of 16 beet varieties were studied by trials in a number of locations. They varied significantly in their response to the environment in terms of root and sugar yields, although the genotype x environment interaction with respect to sucrose % was not significant. The diploid open-pollinated cultivar Ramonskaya 06 was a good yielder with average stability. Among anisoploid varieties, Maribo Magnapoly, Kawe Megapoly and Kawe Gigapoly recorded higher gross sugar than the rest and were more suited to environments conducive to high yields.

The importance of variety in sugar beet agriculture. L. Magassy. *Cukoripar*, 1978, **31**, 168-170 *(Hungarian)*. The significant role played by monogerm varieties in beet breeding is discussed, and the aims and directions of beet breeding are indicated. The properties of certain selected varieties are compared with those of Beta Monopoli N.1, established as standard monogerm variety in Hungary in 1974.

Thermal stability and amino-acid composition of thick juice obtained from sugar beet in the Ramonskaya varietal series. A. R. Sapronov, L. I. Ryazantseva, P. E. Shchepetnev and V. P. Ovsenev. *Sakhar. Prom.*, 1979, (2), 39-43 *(Russian)*. – The thermal stability and amino-acid composition of sulphited thick juice and the free amino-acid in both sulphited and unsulphited thin and thick juices were determined for three beet varieties: Ramonskaya polyploid hybrid, Ramonskaya 06 and Ramonskaya 100. Sulphitation was carried out by adding sodium sulphite or by adding SO_2 to pH 7.5 (at 20°C) and then sodium sulphite. Juice from Ramonskaya polyploid hybrid was found to have the lowest total amino-acid content and the lowest reducing sugars content (after 30 hours' heating) as well as lowest colour content and highest thermal stability, while juice from Ramonskaya 100 was of lowest quality. The effect of sulphitation method is shown by differences in the values of the various parameters.

KWS and its sugar beet breeding activities. Anon. *Zuckerind.*, 1979, **104**, 136-137 *(German)*. – Beet breeding work at KWS Kleinwanzlebener Saatzucht AG in West Germany is described and new tasks in beet breeding indicated (resistance breeding by cell culture in a petri dish, fusion of different plant parts and transfer of genetic information from other organisms to beet).

CANE SUGAR MANUFACTURE

Sugar cane cultivation, sugar and alcohol industries in Brazil. P. J. M. Rao. *Maharashtra Sugar*, 1978, **3**, (12), 9-85. – A comprehensive survey of the Brazilian sugar industry is presented which covers the geography of the country, its climate and topography, history of the sugar industry, cane varieties, Planalsucar and Copersucar organizations and their functions, diseases, agricultural mechanization, sugar factory equipment, national sugar production data, amorphous sugar manufacture, the national alcohol programme, and sugar machinery manufacture. An appendix gives details of the Brazilian plan for sugar and alcohol for 1976/77.

Vapour cell: a case study. G. S. Jain and B. N. Bhowmik. *Indian Sugar*, 1978, **28**, 241-245. – An account is given of the installation of a vapour cell or juice pre-evaporator located before the quadruple-effect, whereby the exhaust steam demand of the evaporator was reduced and syrup Brix could be increased by about 3 units, incoming juice being at 20-21°Bx against 14.5°Bx previously. The shortage of exhaust steam supply was cured, and it was possible to clean the evaporators less frequently, increase the amount of cane crushed and improve extraction by use of more imbibition.

A report on the liquid ring gas pump. C. L. Hu. *Taiwan Sugar*, 1978, **25**, 173-176. – Small units of this design of pump have been used to produce vacuum in Taiwan sugar factories, and larger units are being installed for vacuum production and for carbonatation gas systems. The working principle is described and the influence of gas and seal water temperatures discussed. These are sufficiently great that pumps of the same specification may perform very differently in different plants. In particular, inadequate supply and low pH of water can affect the pump by corrosion and other damage, and little experience can be called on to remedy such problems. Some suggestions are offered for improvement of pump operation.

A simple method of measuring factory overall time efficiencies. M. F. Gielink. *S. African Sugar J.*, 1978, **62**, 556. – A Kienzle production time recorder model ZSN006 was fitted at Noodsberg Sugar Co. to the first cane carrier feeding the cane knives. It records any stop of more than 30 seconds on a chart which has 1-minute graduations and makes 8 revolutions per 24 hours, thus providing a simple and accurate record of daily stops and total crushing season lost time.

New method of sealing leaks in sugar milling plants. Anon. *S. African Sugar J.*, 1978, **62**, 577, 579. – The abrasive nature of massecuite is such that gland leaks from crystallizers and air leaks into vacuum pans are a problem. At the Sezela sugar factory a proprietary sealing material and process, Furmanite, was employed during the off-season; this involves insertion of a soft brass caulking wire between the flanges, followed by injection of the Furmanite material through the bolt holes.

Sushira the bagasse loss reducer. S.S. Sirohi and N.K. Garg. *Maharashtra Sugar*, 1978, **4**, (1), 191-194. – Sushira is a chemical additive for imbibition water invented at the National Sugar Institute, Kanpur, and marketed commercially by Diftech India of New Delhi. Trials on its use over two 2-day periods with periods before, intermediate and afterwards when it was not used showed that application of 15 ppm reduced the bagasse pol by about 0.5% absolute and bagasse moisture from about 52% to approx. 46%.

Continuous sampling system in sugar factories. B.B. Pawar. *Maharashtra Sugar*, 1978, **4**, (1), 209. – Factory performance improvement involves the reduction of losses, and the author believes that periodical sampling of bagasse, filter cake and molasses can prevent the prompt adjustment to the process which might be required, so that he recommends the adoption of continuous sampling of such materials.

Preparation of seed magma and the elongation of crystals. L. Carrazana, C. Pérez and M. Fernández. *ATAC*, 1978, **37**, (1), 31-47 *(Spanish)*. – Sugar was boiled in a pilot plant on a seed magma prepared either from *C*-sugar and water, a 1:1 water:syrup mixture or syrup, and the resultant massecuites sampled and compared. The purities were high compared with industrial-scale boiling and the colour variation was great, indicating lack of uniformity in the boiling. The colour of the sugar could not be correlated with that of the magma because of the difference in molasses elimination efficiency between the laboratory equipment and industrial centrifugals. Measurements were made of the dimensions of crystals after washing with alcohol; most of the distribution curves were very different from the normal distribution, so that average dimensions were taken in order to determine the coefficients of elongation. Distribution curves are presented for the different variations, and it is concluded that when the polysaccharides content in the process is not high, the degree of elongation with a water magma is not large. It is recommended that the magma should be made with a 1:1 syrup:water mixture and never with syrup alone.

Diffusion. J. H. Payne. *Anais do IV Seminario Copersucar da Agroindustria Açuc.*, 315-325; through *S.I.A.*, 1978, **40**, Abs. 78-1424. – Principles of cane extraction by diffusion are discussed with reference to a diagram of cane structure, and Hawaiian practices of cane preparation, juice displacement, bagasse dewatering and press juice recycling are explained; a material balance flowsheet is given and results are compared with those of milling. Extraction can exceed 97% with $< 15\%$ dilution of absolute juice if the preparation gives a displaceability index of $> 94\%$ open cells. The hot slippery bagasse leaving a Silver Ring diffuser contains approx. 650% water on fibre; after prior drainage and/or compression, it is dewatered by presses or by rough-surfaced mills with large grooves. The press juice contains approx. 1% suspended solids, of which approx. 70% pass through a 325 mesh sieve; however, they settle rapidly without addition of chemicals, and the sediment is readily separated by a top-fed rotary vacuum filter.

BEET SUGAR MANUFACTURE

Purification of juice from frozen and thawed beet. V. D. Novoseletskii, D. P. Oleinik, K. P. Zakharov, R. G. Zhizhina, N. I. Zharinov and A. Ya. Limanskaya. *Sakhar. Prom.*, 1978, (12), 22-24 *(Russian)*. — By modifying diffusion and liming conditions, it was possible to process beet which had been frozen and then thawed and was characterized by a high level of rotting and colloids as well as a cell juice pH (at 20°C) of 4.5-5.0; the resultant sugar had a colour content of only 1.8°St. Diffusion water was treated with SO_2 to pH 7, and monocalcium phosphate used to reduce the pH to 6.5-6.7, so permitting a temperature of 70-72°C in the middle section of the tower diffuser. Prelimed juice at pH 9.7-10.0 was exposed to only 1-2 minutes' main liming, in order to stabilize the non-sugars in the settled colloidal complex. The juice pH was maintained at a high level until evaporation.

Methods of treating sugar factory waste water. A. Terze. *Hellenic Sugar Ind. Quarterly Bull.*, 1978, (35), 253-308 *(Greek)*. — The quantities of water used for various purposes in the sugar factory, its fate and changes in composition are examined with the aid of a number of flow diagrams. Means of reducing the pollution load, including measures to reduce the sugar content and solid impurities such as beet fragments and leaf particles, are indicated, and use of recycling and closed circuits as a means of reducing the quantity is discussed. Treatment by lagooning and the activated sludge method is described, and use of the treated water for irrigation purposes suggested.

Problems in developing the organization and execution of repairs in sugar factories. J. Wolański and M. Trepka. *Gaz. Cukr.*, 1978, **86**, 269-272 *(Polish)*. — Problems involved in repair work and machinery overhauls in Polish sugar factories are discussed and recommendations made regarding tools, materials and personnel as well as the overall organization of the work.

New developments in repair work in sugar factories. K. Sachar. *Gaz. Cukr.*, 1978, **86**, 274-276 *(Polish)*. Various aspects of maintenance and repair work in sugar factories are described, including spraying of furnace walls with corrosion-resistant materials, use of high-pressure water jets for surface cleaning, application of epoxy resin to equipment surfaces in contact with corrosive materials such as juice, and the use of machining with, *e.g.*, milling machines, lathes, borers and planing machines, to regenerate components.

Means of preventing premature wear of sugar factory equipment. W. Kempista. *Gaz. Cukr.*, 1978, **86**, 277-280 *(Polish)*. — Failures and premature wear of sugar machinery and components can be prevented by, *e.g.*, correct use of flexible couplings between transmissions and equipment and of bearings and journals for shafts, especially those carrying considerable loads such as in diffusers and screw conveyors, by damping vibrations from pump rotors, correct choice of chain and bucket elevator speeds, etc. These measures are discussed.

Technical progress in the field of sugar factory machinery repairs. A. Sobolewski. *Gaz. Cukr.*, 1978, **86**, 280-282 *(Polish)*. — The author briefly discusses the value of arc welding for regenerating worn components, the use of suitable adhesive to repair broken conveyor belts, and mechanical expansion of evaporator tubes.

Selection of pumps for juice with carbonatation mud. B. Mosiewicz. *Gaz. Cukr.*, 1978, **86**, 282-283 *(Polish)*. Guidance is given on selection of screw pumps for handling juice-carbonatation mud mixture or pulp.

Large sugar factories with columnar equipment. W. Woźniakiewicz. *Gaz. Cukr.*, 1978, **86**, 284-286 *(Polish)*. With increase in the size of factories to handle greater quantities of beet (up to daily slices of 10,000 tonnes), various problems arise, both as regards capital costs and technological factors connected with larger equipment and feedline diameters (*e.g.* difficulties of circulation and adequate mixing); while approaches to solution of the problems are generally successful, the author considers that it would be more sensible to plan factories in which as much as possible of the equipment is columnar, such as at present used for certain stations (tower diffusers, carbonatation vessels, vertical liming tanks, vertical crystallizers) but also including Kestner-type evaporators and small-diameter columnar vacuum pans. A typical flow diagram is presented.

Liquid spray sulphiters for juice and syrup. S. A. Zozulya *et al. Sakhar. Prom.*, 1979, (1), 8-12 *(Russian)*. — The sulphitation vessel described comprises a vertical tank with a feedline at right angles to the top of the side wall; the juice or syrup is fed into the feedline through a perforated disc and comes into contact with SO_2 gas metered through a valve at right angles to the liquid stream (adjustment of the valve aperture serving to regulate pH). An internal cyclone at the top of the tank acts as exhaust gas-liquid separator and as supplementary mixer for the inflowing gas and thin film of juice or syrup. Comparison of performance data for the new vessel and a conventional spray-type sulphiter shows that the new design is superior as regards gas utilization and juice or syrup decolorization.

Noise characteristics of workplaces in beet sugar factories and refineries. M. A. Makhatadze *et al. Sakhar. Prom.*, 1979, (1), 17-19 *(Russian)*. — Details are tabulated of noise levels of various pieces of machinery in operation, and the equipment is classified under five noise emission categories, *viz.* not exceeding comfort level, between comfort level and 6 db, 6-11 db, 11-20 db and > 20 db.

Automation of partial removal of thick juice for storage and its processing during the inter-campaign period. E. A. Koval'chuk, M. Ya. Kanevskii, A. L. Shoikhet, A. A. Knyazev, U. M. Rudenko and V. I. Radalovskii. *Sakhar. Prom.*, 1979, (1), 30-34 *(Russian)*. — A system developed for automatic control of thick juice Brix (at 67° ± 2°) before storage for subsequent post-campaign processing is described. Thick juice from the flash-evaporation vessel (concentrator) after the evaporator is split into two streams, one passing to sulphitation while the other is sent to a supplementary evaporator, after which it is either transferred to store or is sulphited. (This

permits constant use of the supplementary evaporator and creates favourable conditions for control.) A small portion of the thick juice from the supplementary evaporator is allowed to flow to a Brix meter and thence to a holding tank. Thick juice flow from the supplementary evaporator is stopped and partial recycling allowed to take place if the Brix is too low; if the Brix is too high, 2nd carbonatation juice is injected, although steam, instead of juice, gave excellent results in supplementary tests. The thick juice then passes via weighers to storage tanks where its pH is measured automatically; if this is too low, alkali is injected, and if it is too high, flow to the tanks is stopped. Other controls for thick juice flow to the tanks and from the tanks to processing are mentioned.

Development of systems for automation of inclined diffusers. V. I. Mikhailov, R. Z. Fel'dman and L. A. Shirokov. *Sakhar. Prom.*, 1979, (1) 34-38 *(Russian)*. Details are given of a system of automatic controls for a number of parameters in a A1-PDS inclined diffuser, particularly juice Brix, throughput and sugar content in exhausted cossettes.

Measures for remedying the inadequate capacity of crystallizers. R. A. McGinnis. *Sucr. Belge*, 1978, **97**, 399-406 *(French)*. – It is stated that at many sugar factories in the USA the residence time of low-grade massecuite in crystallizers is too short to permit adequate molasses exhaustion. Tabulated values are given of molasses purity ranges, retention time ranges and crystallization temperature ranges for a number of companies. The effect of temperature on crystallization rate, whereby a 10°C rise in temperature approximately doubles the rate, is discussed, and it is suggested that one method of solving the problem of inadequate crystallization is to boil at as high a temperature as possible without degraduation of sucrose or non-sugars (*e.g.* approx. 80°C), and then gradually reduce the temperature so as to maintain the supersaturation at the required level, finishing the boiling at about 70°C. Factors to be considered in connexion with high-temperature boiling are listed. It is stressed that the measure cannot be used in all circumstances, and that molasses exhaustion can be improved by a number of other means. Other factors frequently responsible for poor exhaustion are also listed.

A method of generating summer current in the sugar industry. H. Huber and H. Licha. *Zuckerind.*, 1979, **104**, 25-29 *(German)*. – A number of possible approaches to the generation of power in sugar factories during the inter-campaign period are examined. The most suitable scheme is one incorporating a back-pressure turbine from which the exhaust steam passes to two heat exchangers; the exchanger for the primary circuit heat steam feeds to a secondary circuit exchanger, any excess being fed to an accumulator from which the heat can be recirculated to the primary heat exchanger when required. However, a heat efficiency of 84% and low energy costs are obtained with this scheme only when high-pressure boiler stages are used; if low pressures are applied, a large quantity of waste heat occurs which generally cannot be accumulated or used economically. To overcome this problem, a diesel engine is proposed as an additional unit. The waste heat from this is returned to the boiler, while the heat contained in the cooling water of the diesel unit is recovered by passing it through a cooler and mixing with secondary steam. By this means, the quantity of waste heat is reduced and the economics and heat efficiency are identical to those for the high-pressure scheme.

Does an oilgas-fired lime kiln meet the requirements of the carbonatation process? F. Sobek. *Zuckerind.*, 1979, **104**, 30-32 *(German)*. – Details are given of one of the twin lime kilns at Ghazvin sugar factory in Iran, which has been converted from coke firing to oilgas firing using the Sobek system. The plant incorporates four reactors, located on a platform built around the lime kiln, in which the heavy oil is atomized in an ultrasonic field and mixed with combustion air by means of the newly developed twin-stream, tangential turbulence system. In an adjoining chamber the oil spray is oxidized and cracked. Since a low-pressure system is involved, no structural changes to the kiln were necessary, only addition of the reactors, gas generating plant and the requisite piping. At a maximum temperature of 195°C, the flue gas CO_2 content was 30-32.2%, while the residual CO_2 content in the burnt lime was below 0.5%.

A new sulphur burner for the sugar industry. Z. Kalata. *Zuckerind.*, 1979, **104**, 32-37 *(German)*. – A description is given of a Polish-built and -designed sulphur burner, the prototype of which was installed and tested at Swidnica sugar factory.

Automatic boiling control with micro-computer – boils without water! H. Diekers. *Zuckerind.*, 1979, **104**, 37-38 *(German)*. – Brief mention is made of an automatic boiling system installed on a white sugar pan at Wabern sugar factory. Pre-programmed for all types of massecuite, the system can "think for itself", so that if any process disturbances occur, it can activate the necessary corrections. By omitting water drinks, it permits a reduction in boiling time and optimum energy utilization.

Investigation of a new type of apparatus for drying sugar in a fluidized bed. D. Babav, S. Sendov and L. Bozhkov. *Nauch. Tr., Vissh Inst. Khranit. Vkusova Prom.*, 1973, **20**, (3), 103-113; through *S.I.A.*, 1978, **40**, Abs. 78-1453. – A fluidized bed dryer/cooler with novel air-distributing grid is described and the testing of its prototype is reported; an industrial version to process 12.5 tonnes of sugar/day, designed on the basis of the test data, is outlined with technical data and a diagram. The observed aerodynamic losses and mass transfer rates confirmed the high efficiency of the new grid; its design precludes the passage of crystals through air inlet holes, and decreases crystal breakage to 0.1-0.2%. The moisture content of sugar was decreased from approx. 0.5% to about 0.05% within 15 min by air at 105°C entering at > 1 m.sec^{-1}; then air at about 17°C cooled the sugar to 30-35°C in approx. 30 min. Compared with existing Soviet and Czechoslovakian fluidized bed dryer/coolers, the new design is more compact and consumes less power.

A new method of supersaturation measurement. R. F. Madsen and G. R. Moller. *Sugar J.*, 1978, **41**, (6), 11-16. The use of supersaturation for control of vacuum pan operation is discussed and a new technique for its measurement, based on changes in dielectric behaviour of syrup and massecuite in the VHF radio frequency range, is described. Automatic boiling control systems based on the principle are in commercial production and are described together with the benefits accruing.

SUGAR REFINING

The role of composition of liquor ash and of the ionic form of the resin in decolorization of refinery syrups. M. Vender. *Proc. 1976 Tech. Session Cane Sugar Refining Research,* 131-149.—In ion exchange decolorization, the ionized molecules of colorants displace ions originally attached to the resin. Strong base resin and favourable feed pH are essential for good decolorizing performance. Inorganic and low M.W. organic anions in the feed reach the active exchange sites and at least part of these are displaced by the colorant ions. The ionic form of the resin is very important, Cl^- and CO_3^{--}-form resins being efficient decolorizers, whereas resins in silicate and phosphate form are almost inactive. Strong acidic anions on the resin do not significantly influence liquor pH, whereas weak anions tend to raise the pH above that of the feed, which may influence decolorization and subsequent processing. A high concentration or unfavourable composition of liquor ash is a more probable cause of inferior decolorizing of some liquors than peculiarities in colorant composition. In such a case, correction should be by selection of a suitable ionic form of the resin and by manipulation of liquor ash. Ca and Mg can cause reversible deterioration of decolorizing performance and lead to turbidity in decolorized liquor. Iron and copper can cause irreversible damage to the resin.

Raw sugar quality considerations at Savannah sugar refinery. H. R. Priester. *Proc. 1976 Tech. Session Cane Sugar Refining Research,* 183-191.—The raw sugar quality is an important factor in sugar refinery operation, and at Savannah routine analysis is made on the raws and on process liquors to ensure quality maintenance. Problems have arisen through high colour and loss of pol in raw sugars from south Florida which have been stored and transported at too high a temperature. By ensuring that the temperature is kept below 100°F, the problems may be avoided.

Raw sugar quality standards. R. M. Gerstenkorn. *Proc. 1976 Tech. Session Cane Sugar Refining Research,* 192-194.—Examination of ash contents of sugar refined at a plant using phosphatation, granular carbon and ion exchange showed that product ash was only related to the ash in washed raw sugar, *i.e.* the input ash. This permits an estimation to be made of product ash, so that it is possible to arrange blending of products for supply to appropriate markets.

Atlantic Sugar's experience with "Talofloc"-"Taloflote". W. F. Barton. *Sugar J.,* 1978, **41,** (2), 21-25.—See *I.S.J.,* 1978, **80,** 35-39.

Process computers in sugar refining. J. W. deCelis. *Sugar J.,* 1978, **41,** (2), 27-28.—Application of computers to refinery process control is discussed generally, with references made to papers on the subject presented at past meetings of Sugar Industry Technologists Inc.

Experience in operation of Odessa sugar refinery by saving of energy resources. B. M. Shisel' and I. S. Leibman. *Sakhar. Prom.,* 1978, (10), 23-28 (*Russian*).—In the period 1970-77 the consumption of steam and electricity at Odessa gradually fell as a result of various measures which are discussed. These include: wetting of superheated steam for process purposes; three-stage heating of process water (i) by steam and gases withdrawn from vacuum pans for creation of vacuum, (ii) by steam created by boiling of condensate, and (iii) by condensate recycled to the power house; pre-concentration of syrup, using a vapour-condensate mixture; stabilization of the CO_2 content of the gas in a carbonatation vessel by recirculating the water, in which some CO_2 often becomes dissolved during pumping into the vessel (this system obviates the need to intensify lime kiln performance in order to make up for the lost CO_2); use of waste gas to remove moisture from spent active carbon; and other measures introduced to reduce power consumption in the centrifugal station, etc.

The technological scheme for raw sugar processing at Gorodeiskii sugar factory. L.S. Alekseeva. *Sakhar.Prom.,* 1978, (11), 38-43 *(Russian).* — Details are given of the processes used at this Soviet factory in the refining of cane raw sugar, and performance data are given for 1975-78.

LABORATORY STUDIES

Determination of the dry solids content of sugar solutions. P. Kadlec, R. Bretschneider and A. Dandár. *Zuckerind.*, 1978, **103**, 1042-1044 *(German)*. – The method previously described[1] has been applied, in comparative tests, to molasses solutions, syrups and sugar solutions; comparison was made with values obtained by the standard method. For the new method, which is at least 30 min shorter than the conventional procedure, a Pulfrich refractometer with interchangeable prisms was used with monochromatic light. An average different of ± 0.03% was within experimental error. A program (PULFR) has been developed for conversion of refractive index to dry solids values. Refractometer error is ± 0.02% for pure sucrose, ± 0.03% for molasses solutions and ± 0.06% for technical sugar solutions.

The difference between the sugar content of beet and of cossettes. A. E. Popov and A. N. Mikhailenko. *Sakhar. Prom.*, 1978, (12), 53-55 *(Russian)*. – The authors discuss the differences found between the sugar content in beet and cossettes as found at two factories in the course of specific investigations. In both cases, the fall in sugar between samples of beet about to enter the factory for processing and cossettes was only partly accounted for by the sugar determined in flume water, and it is stressed that all extraneous matter should also be analysed for sugar for the sake of an accurate loss balance.

Freezing-point data on aqueous solutions of sucrose and sodium chloride and the Hortvet test: a reappraisal. J. H. Prentice. *Analyst*, 1978, **103**, 1269-1273. – Sucrose solutions have been used as standards for cryoscopic measurements applied to determination of the freezing point of milk[2], but more modern methods employ thermistor cryoscopes based on reference solutions of sodium chloride, and the relationship between the two is discussed.

Investigations on chlorine absorptivity and consumption by Class I and II waters in a sugar factory with the aim of disinfection. A. I. Sorokin, A. P. Parkhomets, V. Z. Nakhodkina, O. M. Sorokina and E. V. Ivashchenko. *Sakhar. Prom.*, 1979, (1), 12-17 *(Russian)*. – Investigations on treatment of Class I waste water (cooling water and condensate) and Class II waste water (flume-wash water) with sodium hypochlorite are reported. From the results, empirical formulae have been developed for determination of chlorine absorptivity and hence optimum dose (as a function of COD) to permit recycling of the water.

Application of enzymatic determination of galactose and raffinose in the sugar industry. F. Hollaus. *Ernährung*, 1979, **3**, 14-15 *(German)*. – The method of Schiweck & Büsching[3] for galactose and galactose-containing compounds such as raffinose and stachyose is briefly described. The use of identical quantities of lead acetate to pre-clarify molasses has been found, in recovery tests, to cause varying raffinose losses (up to 15% of the quantity added); however, while the method is not suitable for absolute determination of raffinose[4], it is considered of value as a means of correcting for raffinose in sucrose determination by polarization, and is also sufficiently sensitive for raffinose determination in white sugar. For raffinose determination in raw juice, the galactose content must first be established, and this allowed for in the raffinose calculation. Enzymatic determination is particularly of advantage over paper and thin-layer chromatography because of the ease with which the results can be quantitatively evaluated.

Experimental programming for laboratory calculations. M. de Paulo. *Anais do IV Seminario Copersucar da Agroindustria Açuc.*, 411-416; through *S.I.A.*, 1978, **40**, Abs. 78-1519. – A program is formulated for mechanical or magnetic calculation of cane extraction parameters, using, *e.g.*, a Hewlett Packard HP-25 or HP-65 calculator; such calculations save 3-4 man-hours/day at a routine control laboratory.

Collaborative study on the determination of trace elements in dried sugar beet pulp and molasses. II. Fluoride. P. B. Koster, D. Hibbert, R. T. Phillipson and G. Steinle. *Zuckerind.*, 1980, **104**, 49-53 *(German)*. See *I.S.J.*, 1979, **81**, 4-8.

Sugar analysis by high-performance liquid chromatography using silica (gel) columns. K. Aitzetmueller. *J. Chromatogr.*, 1978, **156**, (2), 354-358; through *Anal. Abs.*, 1978, **36**, (1),71. – Sugars and polyhydric alcohols of food interest were separated by high-performance liquid chromatography on a stainless steel column (24 cm x 7 mm) packed with a slurry of LiChrosorb Si 60 (5 μm) in aqueous 90% methanol. Before use, aqueous 80% acetonitrile (500 cm^3) containing 0.1% of HPLC Amine Modifier I (NATEC, Hamburg) was pumped through the column. The eluant composition ranged from 15 to 40% of water in acetonitrile (containing 0.01% of the Amine Modifier), depending on the composition of the sample, and the flow rate was 2 $cm^3 . min^{-1}$.

Collaborative study on the determination of trace elements in dried sugar beet pulp and molasses. II. Fluorine. P. B. Koster, D. Hibbert, R. T. Phillipson and G. Steinle. *Sucr. Belge*, 1979, **98**, 3-9 *(French)*. See *I.S.J.*, 1979, **81**, 4-8.

Determination of sucrose in molasses by high-performance thin-layer chromatography. F. Hsu, D. Nurok and A. Zlatkis. *J. Chromatogr.*, 1978, **158**, 411-415; through *S.I.A.*, 1979, **41**, Abs. 79-252. – A method is described which is rapid and has higher precision than previous TLC methods. Two 18-min runs using 90:10 acetone: water as solvent gave good separation of sucrose from reducing sugars; the spots were revealed with aniline: diphenylamine:acetone:H_3PO_4 and scanned by spectrophotometer. It was necessary to include a sucrose calibration curve on each plate. Results showed good agreement with those obtained by isotope dilution.

---

[1] Kadlec & Knap: *I.S.J.*, 1975, **77**, 283.
[2] Hortvet: *Ind. Eng. Chem.*, 1921, **13**, 203.
[3] *I.S.J.*, 1970, **72**, 120; 1976, **78**, 28.
[4] Hollaus *et al.*: *ibid.*, 1978, **80**, 313.

BY-PRODUCTS

Preventing the death of yeast during its growth on vinasse. A.G. Zabrodskii *et al. Ferment.Spirt.Prom.*, 1977, (8) 14-16; through *S.I.A.*, 1978, **40**, Abs.78-1181. Sudden complete death of yeast growing on vinasse has occasionally been observed, probably owing to the presence of 0.02% NO_2 or $\geq$0.035% SO_2; measures for avoiding such conditions are suggested. Such death occurs only in the first growing vessel, where (a) aeration has not volatilized any SO_2 present, (b) the high yeast concentration rapidly consumes all the O_2 supplied, creating conditions in which certain bacteria convert NO_3^- to NO_2^-. Molasses often contains 200-2000 nitrite-forming bacilli per g; even if some survive into vinasse, their multiplication is suppressed if the proper low pH (4-4.5) is maintained.

Systems study of fuels from sugar cane, sweet sorghum and sugar beets. III. Conversion to fuels and chemical feedstocks. E.S. Lipinsky, R.A. Nathan, W.J. Sheppard and J. L. Otis. *Rpt. US Dept. Commerce* (National Technical Information Service), 1976, BMI-1957-V-3, 166 + 9 pp; through *S.I.A.*, 1978, **40**, Abs.78-1188. Technical and economic prospects are discussed in detail. Of the three crops, sugar cane appears to offer most potential for conversion to fuels and chemicals in the short and intermediate term. Ethanol and ammonia are the most promising of the numerous chemicals which could be produced; fermentation technology for making ethanol from cane juice or molasses is well established. Hydrolysis of bagasse to fermentable sugars for ethanol production has long-term possibilities. The feasibility of anaerobic digestion of bagasse to produce synthetic natural gas is considered; prospects for the process are poor, owing to long residence times and low yields. Bagasse seems to be the most economical source of furfural, but the market is limited; the residue from furfural production could be used to manufacture synthesis gas.

The fertilizer value of beet leaves. R. Vanstallen. *Le Betteravier*, 1978, **12**, (125), 11-12 *(French)*. – Beet leaves incorporated in the soil contain 0.5% N, 0.18% P_2O_5, 0.88% K_2O and 0.1% MgO, but the quantities available to the first crop after incorporation are very much lower. However, they are still such that account should be taken of them in calculating the amount of fertilizer to apply. Moreover, the organic matter they contain is comparable to that removed annually from the field, so that incorporation helps maintain a temporary balance. On the other hand, farmyard manure is better than leaves as regards supply of organic matter, since leaves decompose rapidly in the soil and do not provide a stable humus.

Hydrotransport of flume mud over great distances. Z. Zareba and M. Dudek. *Gaz. Cukr.*, 1978, **86**, 259-260 *(Polish)*. – At Krasnystaw factory, flume-wash water is treated in settling tanks from which the mud passes to a sump, whence it is pumped along a pipeline to waste land 4 km from the factory. Some 70,000 tonnes of mud is produced annually. Advantages of the scheme include a reduction in the land requirement of the actual factory site by about 5 ha (which would otherwise have been needed for the temporary storage of the mud), the lack of need for personnel and conventional means of removing the mud from the factory site, and the eventual upgrading of the waste land soil through incorporation of the mud of high humus content.

Effect of thermal treatment on the properties of sugar cane bagasse hardboard. M.Z. Sefain, N.A. Fadl and M. Rakha. *J.Appl.Chem.Biotech.*, 1978, **29**, (2), 79-84; through *S.I.A.*, 1978, **40**, Abs.78-1193. – Hardboard samples were prepared from bagasse pulp to which 0, 1.5 or 3.0% phenol-formaldehyde resin had been added, and were heated at 140, 160, 180 or 200°C for up to 8 hr. Boards containing resin had higher initial bending strength, lower thickness swelling and better water resistance than those without resin. With increasing heating time and temperature, bending strengths decreased, the decrease being slight at 140° and marked at 200°; thickness swelling decreased and water resistance improved, the changes being smaller in resin-containing boards than in those not containing resin.

Utilization and treatment of vinasse. Anon. *Paper presented at 2nd Intern. Congr. ARTAS* (Réunion), 1978, 17 pp *(French)*. – Methods by which vinasse can be utilized include application to soil in diluted or undiluted form, either by spraying or in irrigation ditches, mixing with bagasse for composting and subsequent use as fertilizer, or concentration by evaporation to recover nutrients. These are described in turn, as are various forms of treatment, including lagooning with or without aeration, coagulation, auto-flocculation and biochemical means, such as the anaerobic ammonification processes used in Cuba and India, and neutralization by means of yeast. Fodder yeast recovery from vinasse is also mentioned.

Results of investigations in the field of continuous fermentation of mixed substrates. U. Setzermann and G. Zimmer. *Lebensmittelind.*, 1978, **25**, 443-445 *(German)*. – Experiments on continuous fermentation of sulphite liquor to produce fodder yeast showed that addition of molasses to increase the reducing matter resulted in a higher yeast yield (on both a volume and a time basis). Optimum parameters for growth of *Candida utilis* were established from the literature; the optimum sulphite:molasses ratio was governed by the oxygen supply in the fermenter, the possibility of heat withdrawal from the fermenter, and the capacity of the plant, particularly for separation and drying, but biomass productivity tended to rise (but not linearly) with molasses quantity to a maximum at nearly 60% molasses.

Measurement of the pressure head of sugar solutions by liquid extraction. J. Šmejda. *Listy Cukr.*, 1978, **94**, 239 *(Czech)*. – Disadvantages of level determination via hydrostatic pressure measurement using a mercury column are discussed, and a description is given of a system for determination of molasses level in a tank. It involves measurement of the pressure exerted by the molasses on trichloroethylene in the tube connecting a specially designed sampling column (into which the molasses flows through a port in the side of the tank) to a manometer. Results of tests were satisfactory, and no faults occurred in the system.

Storage experiments on bagasse. -. Muliah. *Berita Selulosa*, 1975, **11**, 1-10; through *S.I.A.*., 1978, **40**, Abs. 78-1319. – The effects of the method of storage of fresh bagasse were studied in the laboratory. The contents of water-soluble acids and total water-soluble materials varied with the method of storage and storage time. When fresh bagasse was piled, the temperature immediately increased and could reach 40-42°C in the centre of the pile. When bagasse was stored in the open air for 3 or 6 months, the weight and fibre content decreased slightly. When it was stored in static water the fibre content decreased markedly.

Cellulose to sugars: new path gives quantitative yield. M. R. Ladisch, C. M. Ladisch and G. T. Tsao. *Science*, 1978, **201**, 743-745; through *S.I.A.*, 1978, **40**, Abs. 78-1325. – Bagasse and other agricultural wastes were treated for 12 hr at room temperature with the solvent Cadoxen (5% cadmium oxide dissolved in 28% aqueous ethylenediamine). When the treated bagasse was incubated for 24 hr at 45°C with cellulose from *Trichoderma reesei* (formerly *T.viride*), conversion of α-cellulose to dextrose was approx.99%, compared with about 10% for untreated bagasse and about 75% for bagasse treated with ethylenediamine alone.

Chemical studies on sugar cane wax as a by-product in some cane sugar factories in Egypt. M. Abdal-Akher, A. M. Youssef, R. S. Farag and A. M. Helmi. *Chemie, Microbiol., Tekhnol. der Lebensmittel*, 1977, **5**, (2), 42-44; through *S.I.A.*, 1978, **40**, Abs. 78-1326. – Crude wax was extracted with petroleum ether from filter cake and clarification mud from four Egyptian factories. Yields were 10.1-20.5%; physical and chemical properties of the samples are tabulated. The crude wax was fractioned by means of ethanol-benzene into hard wax and fatty matter. The latter contained large amounts of lauric, myristic, palmitic, stearic, oleic and linoleic acids.

Good harvesting, ensilage and planned feeding of sugar beet leaves. E. Hempe. *Die Zuckerrübe*, 1978, **27**, (6), 14-15 *(German)*. – The advantages of feeding beet leaf silage to dairy and beef cattle are discussed and advice given on harvesting, treatment and feeding; it is ensilage to which greatest attention must be paid, since this will determine the profitability in terms of milk and beef.

Cattle feeding in sugar beet farming. G. Pommerehne. *Die Zuckerrübe*, 1978, **27**, (6), 20-21 *(German)*. – Since cropping alone is inadequate to give the required returns from agriculture, the author considers that dairy cattle offer a good sideline, as beet leaves and dry pulp can be used to complement normal fodder. Advice is given on feeding of cattle in winter and summer and on the requirements for profitable cattle raising.

Silage made from sugar cane bagasse treated with sodium hydroxide. H. J. Andreis and R. P. DeStefano. *Sugar J.*, 1978, **41**, (5), 13-16. – Caustic soda has been used in the past to treat roughage feeds, and is thought to increase swelling of the lignocellulose present, allowing greater penetration by rumen micro-organisms. Bagasse was sprayed uniformly with 5% NaOH (as a 5% solution) in a special horizontal mixer in 1-ton batches and after 20 minutes mixed with 15% blackstrap molasses containing 0.8% wet weight basis urea and water to give a final moisture content of 60%. Corn was added at the rate of 12% and the mixture fermented in large plastic bags (holding some 32 tons each) for 4-6 weeks before carrying out feeding trials. These involved feeding of the silage and corresponding silage made from untreated bagasse, plus additional cracked corn, to cattle. The treatment increased palatability of the silage and gave higher daily gains.

Digestibility and ruminal volatile fatty acid production of sugar cane tops silage by goats. J. Deville and Y. Wong You Cheong. *Rev. Agric. Sucr. Maurice*, 1978, **57**, 45-49. – In a digestibility trial with goats, cane tops silage prepared with the addition of molasses at 5% and ammonia at 0.2% N had the same dry matter digestibility (66-69%) as fresh cane tops. The ruminal volatile fatty acid patterns were also similar for the two diets.

Alcoholic fermentation. C.J. Franco. *Saccharum* (STAB), 1978, **1**, (3), 31-36 *(Portuguese)*. – Notes are prepared on aspects of alcohol, including yeast multiplication (initiation of fermentation, preparation of diluted must, mineral nutrition, precautions against infection and preparation of the yeast suspension), factors which affect the fermentation (proportion of yeast, infection, mineral nutrition, temperature, alcohol content), control of fermentation (practical, yield control and operational control analyses), practical conclusions, determination of fermented sugars and of alcohol produced and analysis of the results.

Production of bacterial protein from sugar cane bagasse pith. I. Isolation and selection of strains. O. E. Molina and D. A. Callieri. *Rev. Ind. Agríc. Tucumán*, 1978, **55**, (1), 13-25 *(Spanish)*. – From rotting sugar cane stalks and bagasse, 87 cultures showing cellulolytic activity (CA) were isolated and further selection yielded seven non-pathogenic strains capable of decomposing bagasse pith. The strains were grown under different environmental conditions, and results showed that pith decomposition increased when it was treated with alkali. The % CA decreased with pith concentration, although the total absolute amount of pith decomposed was higher. CA was also influenced by the pith:nitrogen ratio which was optimum at 1:0.042. Further, the nature of the nitrogen source affected CA and biomass yield. The isolates are to be studied to determine their morphological and cultural characteristics.

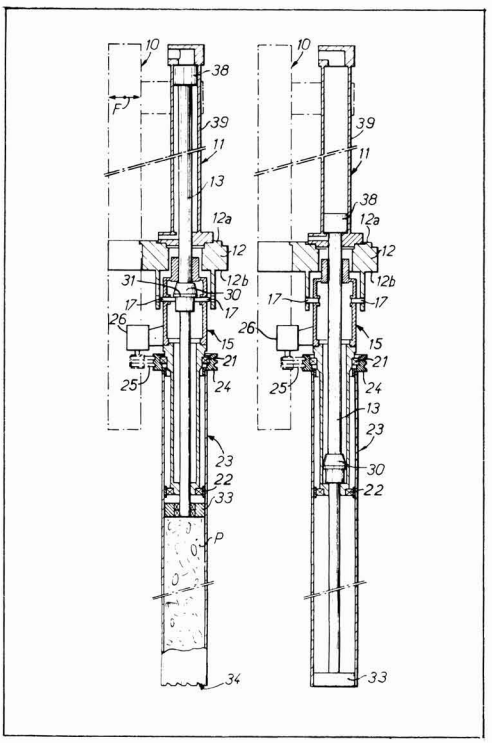
Torula yeast developed in final molasses and dried for broiler fattening. IV. In wheat diets. M. Valdivié and A. Elías. *Cuban J. Agric. Sci.*, 1978, **12**, 151-159. The inclusion of 10% or more torula yeast in wheat diets fed to chicks provoked feed incrustation in the beaks and mouth mucous, crossed beaks, reduced consumption, growth delay and increased mortality.

Bagasse quality study. M. L. Rodríguez and R. Gutiérrez. *ATAC*, 1978, **37**, (1), 20-26 *(Spanish)*. – Prospects for industrial utilization of bagasse will be conditioned by the consistency and uniformity of the quality of raw material, and a study was made by collecting samples from the final bagasse from Central FNTA and analysing them for pith, fibre, fines and soluble contents, fraction retained by a No. 5 screen, moisture content and pol, the extremes for the 1974 and 1975 seasons being indicated in bar diagrams with tables of 10-day averages. According to the Student t-test, differences were not significant up to the 5% level, but moisture contents were higher in 1975 than in 1974 and corresponded to a reduced pol content.

PATENTS

UNITED STATES

Sampler for extracting core samples (of cane). P.P. Avot, of Outreau, France, *assr.* F.A.P.M.O. **3,978,733.** March 8, 1974; September 7, 1976.



The sampler comprises a jack 11 with a piston 33 moving within a cylindrical tube 23 having a serrated end 34 and driven by a motor 26 through belt drive 25. The sampler is mounted on support 10 such that when cylinder 23 is rotated and moved towards the supply of cane a sample P is taken into it. The sample is then expressed, after removal from the load, by hydraulic pressure at the rear of the jack which causes the piston 38 and so shaft 13 and piston 33 to move along the axis of the sampler.

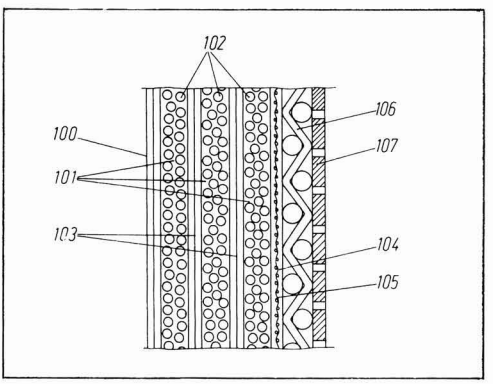
Increasing the sucrose content of cane. E.G. Jaworski, of Olivette, MO, USA, *assr.* Monsanto Co. **3,981,718.** December 20, 1974; September 21, 1976. – The sucrose content of cane is increased by the application, 2-8 (3-7) weeks before harvest, of an effective amount (0.11-5.6 $kg.ha^{-1}$) of a N-methyl or N-dimethyl glycine or a salt.

UNITED KINGDOM

Liquid animal feed. N. V. Hens'voeders – Les Aliments Hens S.A., of Schoten, Belgium. **1,473,623.** April 1, 1975; May 18, 1977. – A liquid animal fodder is obtained by mixing (10-20%) urea, (70-80%) molasses and (4-8%) acid (of which at least 51 mole % is HCl) and heating the mixture (of pH 2-3) (at 80-85°C until at least 4% of the urea has reacted with the molasses).

Beet harvesters. Machinefabriek J. de Jonge B.V., of s'-Heerenhoek, Holland. **1,473,711; 1,473,712.** August 30, 1974; May 18, 1977.

Centrifugal drum. Braunschweigische Maschinenbauanstalt, of Braunschweig, Germany. **1,474,003.** February 25, 1975; May 18, 1977.



In order to reduce the flywheel mass of a batch-type centrifugal basket, it is constructed of, *e.g.*, epoxy resin reinforced with glass fibre and stainless steel. The basket is built with a smooth outside surface 100 and fibres 102, 103 wound circumferentially and laid axially, respectively, in alternate layers to impart strength to the basket. A stainless steel mesh layer 105, embedded in resin acts as a protective wall 104 between the drum wall and the backing screen 106 and surface screen 107. The drum is not drilled but is provided with discharge apertures in the form of hollow rivets inserted in removable cores, while it is attached to the top and bottom annular drum frames by means of radially aligned drilled screws also located in cores; this allows passage of liquid and prevents its accumulation and penetration of the drum material.

Cane harvesters. (A) P. C. Bell and G. W. Bell, of Empangeni Rail, Zululand, South Africa. **1,474,507.** October 7, 1975; May 25, 1977. (B) Ministerio de la Industria Sidero-Mecanica, of Havana, Cuba. **1,475,673.** August 27, 1975; June 1, 1977.

Copies of specifications of United Kingdom patents can be obtained on application to The Patent Office Sale Branch, Block C, Station Square House, St. Mary Cray, Orpington, Kent, England (price £1.25 each). United States patent specification are obtainable from: The Commissioner of Patents, Washington, D.C., USA 20231 (price 50 cents each).

TRADE NOTICES

The COPA magnetic flowmeter. Fischer & Porter GmbH, D-3400 Goettingen, Postf. 701, Germany.

The Fischer & Porter D10D1455 magnetic flowmeter is a compact volumetric flow rate detector which operates on the principle that a conductive fluid generates an induced voltage when flowing through a magnetic field, and that the amplitude of this voltage is directly proportional to the flow rate. The flowmeter's magnet coils are powered by an integrally mounted magnet drive unit using the steady-state magnetic field principle to provide total zero point stability; the drive unit is controlled by a signal originating in the MAG-X flow converter mounted on top of the primary meter. The flowmeter is of high accuracy and uses very little power; it handles fluids having conductivities as low as 5 μS. cm^{-1} and is thus of application with most liquids. The measured value is independent of fluid viscosity, density and temperature. Full details are available in Specification Sheet 10D1455, Pub.1 - 5/79N.

Mirrlees pumps. Plenty Mirrlees Pumps Ltd., Floway House, Newbury, Berks. RG14 5TH, England.

A brochure lists typical applications and a reference list of customers for Mirrlees screw and Plenty vane pumps. Within the sugar industry, Magmo pumps are designed to handle massecuite at capacities from 820 to 8750 $gal.hr^{-1}$ (4-40 $m^3.hr^{-1}$), while Plenpak fixed-capacity low-speed pumps with outputs of up to 550 $gal.min^{-1}$ are suitable for molasses.

Zanini equipment for sugar and alcohol manufacture. Zanini S. A. Equipamentos Pesados, Avenida Paulista 460/18° andar, Sao Paulo, S.P., Brazil 01310.

A brochure in Spanish and English outlines the equipment manufactured by Zanini for the sugar industry, while details are also provided of licence agreements with a number of companies, and of alcohol distilleries supplied by Zanini over the past three years.

Karun sugar factory. Stork-Werkspoor Sugar B.V., P.O. Box 147, 7550 AC Hengelo (0), Holland.

A brochure, containing many colour photographs and diagrams, describes the cane sugar factory constructed by SWS as part of the Karun Project in the Daimcheh region of Khuzestan in Iran. The crushing rate is 20,000 tcd (giving 300,000 tonnes of raw sugar per year), while the refinery section will produce 840 tonnes of refined sugar per day, 200 tonnes as cubes.

APE. Amalgamated Power Engineering Ltd., 115 Colmore Row, Birmingham B3 3SA, England.

A colourful brochure from APE describes the activities of the six manufacturing companies in the group. The products include steam turbines, diesel engines, pumps, compressors, gearing and automatic control valves.

Chemicals. Mazer Chemicals Inc., 3938 Porett Drive, Gurnee, IL 60031, USA.

A recent brochure from Mazer Chemicals outlines the company's activities in the field of speciality chemicals; products manufactured for the sugar industry include surfactants and flocculants, scale inhibitors, fungicide and bactericide, descalant, caustic accelerator, and molasses fluidity improver and foam inhibitor.

Refined sugar sachet filler/sealer. — Tirlemont refinery in Belgium is the first refinery in Europe to install a Sugar Pouch King, which is a high-speed, continuous-web, horizontal form-fill-seal machine operating at speeds of up to 900 sachets per min. Supplied by R. A. Jones International (the European marketing subsidiary of R. A. Jones & Co. Inc., of Cincinnati, Ohio, USA), the machine incorporates an integral flexigraphic printer and uses heat-sealing paper as packing material. Pouch dimensions are 51 x 63 mm, and the pouches are fin-sealed on three sides.

Kamalia sugar factory. — Construction of a cane sugar factory near Kamalia, in the province of Punjab, Pakistan, is under way. To be commissioned this year, the factory is designed for a crushing rate of 2000 tcd with provision for expansion to 3000 tcd. Amongst equipment supplied by Smith/Mirrlees is a Tongaat heavy-duty shredder, milling plant, clarifier, filters and centrifugals. The factory will use a 3-massecuite, double-einwurf boiling scheme, and the raw sugar will immediately pass to a continuous melter after which the melt liquor will be carbonatated and sulphited to provide a fine liquor for production of direct consumption white sugar. Design and construction of the buildings and construction of tankage and other steel fabrications (to Tate & Lyle drawings) is being undertaken locally.

Conveyor contract from Cuba. — A contract worth more than £500,000 for the supply of steel cane carrier chains and conveyor running gear to the Cuban sugar industry has been completed ahead of schedule by Ewart Chainbelt Co. Ltd. The COBRA conveyors, of the overlapping apron type, are the first to operate in Cuba.

Boiler for an Irish sugar factory. — The illustration shows the fully-assembled shipment of the pressure parts of a new water tube steam boiler from the Gothenburg works of Generator Industri AB for installation at the Thurles factory of the Irish Sugar Co. Ltd. The boiler is an HLA 14 corner-tube design rated at 3,89 $kg.sec^{-1}$ at 23 bar gauge and 360°C from feed water at 118°C. It will be fired initially with heavy fuel oil using a Petrokraft low-pressure air-atomizing burner, but its configuration makes it suitable for later conversion to solid fuel firing, with some downrating, if required.

A compound economizer was also supplied, and site work consisted of positioning and connecting the two units, applying insulation and cladding, and installing the burner. The boiler has a fully drainable desuperheater and was selected after visits by Irish Sugar Co. executives to plants in Sweden where Generator boilers have been in use for many years. The boiler was supplied through D. J. Neil Ltd. of Macclesfield, England.

Cooperation on alcohol plant manufacture. — H. Putsch & Comp., West German manufacturers of beet slicers and filters, have signed a contract with Vogelbusch GmbH, of Austria, whereby the two companies will collaborate in the construction of plant, mainly for ethanol production. Under the agreement, Putsch technology will be combined with the considerable know-how of Vogelbusch in the design and construction of plant for alcohol manufacture from biomass. Some large projects are already being designed by the two companies.

Statements published in this section are based on information supplied by the firm or individual concerned. Literature can generally be obtained on request from the address given.

Brazil sugar exports [1]

	1979	1978
	—— *tonnes, raw value* ——	
Algeria	0	14,880
Angola	13,235	0
Canada	0	5,250
Chile	22,067	40,219
China	41,788	142,185
Ecuador	0	15,157
Egypt	84,950	146,268
Finland	0	27,250
France	34,500	90,574
Ghana	10,826	10,826
Indonesia	23,601	88,587
Iran	132,576	170,105
Iraq	121,809	127,092
Japan	0	21,400
Jordan	0	19,920
Korea, South	0	15,320
Malaysia	0	11,192
Morocco	21,909	0
Nigeria	35,726	45,240
Pakistan	13,641	0
Portugal	36,000	97,020
Senegal	41,475	24,375
Somalia	0	13,130
Sri Lanka	0	10,826
Sudan	35,130	11,345
Syria	0	9,743
Tanzania	0	24,413
Tunisia	12,500	0
UK	21,652	0
USA	1,053,237	579,541
USSR	99,441	83,270
Venezuela	0	15,157
	1,941,589	1,924,591

Yugoslavia sugar export plans. — In 1977 Yugoslavia exported 1100 tonnes of sugar but imported 84,532 tonnes in the same year[2]. Since then no more sugar has been imported and the country has become an exporter. Exports were expected to reach 70,000 tonnes in 1979 and the planned level for 1980 is 100-120,000 tonnes. With sugar production estimated to reach 782,000 tonnes and local consumption at 741,000 tonnes, white value, the export target will be difficult to reach[3].

Paraguay cane alcohol plants[4]. — It is expected that the first of three plants being built to produce absolute alcohol from sugar cane will begin operation in August. It will be located at Mauricio J. Troche (Department of Guairá) and will have an initial output of 120,000 litres a day, from 1770 tonnes of cane.

Symposium on alcohol fuels technology. — A call for papers has been made for the 4th International Symposium on Alcohol Fuels Technology, to be held during October 5-8 at Guarujá, near São Paulo, Brazil. Selected papers will be presented by authors in technical sessions and small groups will have the opportunity for discussion in "workshops". The symposium will cover the production and distribution of alcohol and biomass fuels, their utilization, and the impacts of these functions. An international committee is organizing the symposium and the official languages will be Portuguese and English. Registration will cost $200 up to July 1 and $240 thereafter. Detailed information may be obtained from the IPT IV Alcohol Symposium, Caixa Postal 7141, 01000 São Paulo, Brazil (Attention: Nedo Eston de Eston).

ISO sugar economy studies. — The latest in the series of studies on the sugar economies of individual countries, prepared by the International Sugar Organization, covers Argentina, Barbados and Jamaica. It reviews developments in production, consumption and trade of these countries since 1960. It is available in English and a translation into Spanish is in preparation. The cost is £1.50 plus postage and it is available as Volume 6 of "The World Sugar Economy: Structure and Policies" from the I.S.O. at 28 Haymarket, London, England SW1Y 4SP.

Mauritius sugar exports [5]

	1979	1978
	—— *tonnes, tel quel* ——	
Canada	13,750	39,576
Comoro Islands	1,200	1,850
France	39,900	6,350
Germany, West	1,020	0
Italy	0	18
Jordan	0	42
Sri Lanka	30	0
UK	430,317	439,603
USA	118,118	91,193
	604,335	578,632

Fuel alcohol study in New Zealand. — Beet Sugar Developments Ltd., a subsidiary of the British Sugar Corporation, has been commissioned to make a feasibility study into the commercial production of fuel alcohol from sugar and fodder beet in New Zealand. A 3-man study team comprising an agronomist, a process specialist and biochemist, was to be sent to New Zealand in March for a four month study. The other main consultant is CSR Ltd., the Australian sugar company who will cover the distillation and fermentation side of the study.

Fuel alcohol study in Honduras. — International Planning Services Inc. of Baton Rouge, Louisiana, has been awarded a contract by the Honduras Ministry of Economy to perform a prefeasibility study on the production from sugar cane of anhydrous alcohol to be used as fuel. This study is the first of its kind to be undertaken at a national level by a Central American country.

ICUMSA 18th Session. — The 18th Session of the International Commission for Uniform Methods of Sugar Analysis is to be held in Dublin during June 13 - 18, 1982. Any organization with an interest in sugar, and especially sugar analysis, is asked to make due note of the above dates when arranging other meetings, symposia, seminars, etc., so as to avoid any clash with the ICUMSA Session.

Sugar factory training courses. — The Sugar Industry Research Institute, of Jamaica, is offering a full-time course for sugar factory engineers. It involves 39 weeks and the next course will start early in October 1980. Other courses offered by the Institute are a post-graduate diploma course in sugar cane processing, a diploma course in sugar technology, skill up-grading courses conducted in the Jamaican factories, full-time courses in electrical and mechanical engineering, and residential and correspondence courses for laboratory technicians. Details of curricula, entry qualifications, costs, etc., may be obtained by writing to the Technical Training Director, P.O. Box 87, Kingston 7.

Polish sugar expansion programme[6]. — Per caput consumption of sugar, 42.7 kg per year in 1978, is to be increased to between 45 and 49 kg by the year 2000. Ten new sugar factories are to be built and existing facilities reconstructed so that the average campaign length is reduced from 90 to 80 days.

US sugar duty[7]. — The import duty on raw sugar was reduced by 2.1875 cents per pound 96° basis to the statutory minimum of 0.625 cents with effect from February 1. Domestic spot price for sugar on January 31 was 23.01 cents per pound and, if the full reduction in duty were passed on to the consumer, this would reduce the domestic price to 20.8 cents which is still well above the domestic market price objective of 15.8 cents.

Brazil sugar statistics[8]. — Sugar production in Brazil in 1979 totalled 7,361,659 tonnes, raw value, of which 1,630,188 tonnes was raw sugar and the balance of 5,731,471 tonnes in the form of whites. This compares with a total of 7,912,508 tonnes in 1978 of which 1,469,115 tonnes was raw sugar and 6,443,393 tonnes, raw value, was white sugar. During the year, Brazil exported 1.942 million tonnes, raw value, thus fulfilling its export quota under the International Sugar Agreement of 1.941 million tonnes.

1 F.O. Licht, *International Sugar Rpt.*, 1980, **112**, S43.
2 *World Sugar J.*, 1980, **2**, (7), 30.
3 F.O. Licht, *International Sugar Rpt.*, 1980, **112**, 12.
4 *Bank of London & S. America Review*, 1980, **14**, 79.
5 Mauritius Sugar News Bull., 1979, (12).
6 F.O. Licht, *International Sugar Rpt.*, 1980, **112**, 36.
7 *Lamborn*, 1980, **58**, 24.
8 F.O. Licht, *International Sugar Rpt.*, 1980, **112**, S43, 78.

South African sugar exports[1]

	1979	1978
	— *tonnes, raw value* —	
Canada	229,790	229,275
Japan	445,126	424,570
Korea, South	0	25,330
USA	48,964	38,957
Other countries	400	724
	724,280	718,856
Non-quota sugar for animal feed	159,659	0
	883,939	718,856

Mauritius sugar crop 1979[2]. — The 1979 sugar cane harvest began on May 30, 1979 and ended on December 28, 1979. The 21 sugar factories crushed a total of 6,213,684 tonnes of cane, 87,770 tonnes less than the record crop of 1976. Average cane yield was 79.1 tonnes per hectare, the same as the 1976 figure while the average sugar extraction rate was 10.88% and the sugar yield 8.62 tonnes per hectare. The provisional figure for sugar production in 1979 is 687,195 tonnes, tel quel, or 728,908 tonnes, raw value, against 665,219 tonnes, tel quel, or 705,398 tonnes, raw value, in 1978.

Hungary sugar production, 1979/80[3]. — According to reports from Budapest, the twelve Hungarian sugar factories have produced 470,000 tonnes of sugar, white value (510,000 tonnes, raw value) during the 1979/80 campaign. The target was reportedly exceeded by 30,000 tonnes. The sugar beet crop was 3.9 million tonnes, and the average yield per hectare 35.3 tonnes (34.1 tonnes in 1978/79).

New Haiti sugar factory[4]. — The Italian company EFIM said that its subsidiary, Reggiani O.M.I. S.p.A., has signed a $40 million contract with the Haiti Ministry of Agriculture for the construction of a sugar refinery in Haiti. They said the plant will have a production capacity of 300 tonnes of sugar per day and it will be completed in 22 months.

New Yugoslavian sugar factories[5]. — Construction of the first sugar factory in Slovenia has been completed at Ormoz, near Ptuj. The annual processing capacity is said to be 350,000 tonnes. In 1981 some 7000 hectares in the Ptuj area is to be sown to sugar beet. About 87% of the factory equipment is home-produced and the remaining 13% has been supplied by BMA. Investment is estimated at some 2.5 million dinars. Another new plant with a total annual production capacity of 45,000 tonnes of sugar will be completed shortly at Bijeljina in Bosnia-Herzogovina. Some 9000 growers are to grow 400,000 tonnes of beet a year to supply the factory.

Alcohol plant for Zambia[6]. — Indeco are planning to establish an alcohol distillery and yeast plant in Zambia using molasses as raw material. When in full operation the plant is expected to produce 1,500,000 litres of alcohol each year, enough to meet local requirements. Fodder yeast production is projected at 7500 tonnes per annum. The plant will save Zambia about £2½ million a year in foreign exchange. Construction is expected to start soon and will take two years to complete.

Pakistan sugar situation[7]. — Charsadda sugar factory in the North West Frontier Province of Pakistan was forced to close on December 16 while the four other factories of the Province were receiving hardly enough cane to continue crushing. Normally the factories work until the end of April or beginning of May. This cane shortage is due to diversion to gur manufacture[8] since the farmer makes $150 per acre when he sells his cane to the factory but can make $600 if he uses the cane to make gur. The Government has restricted movement of gur from one province to another and has decreed a maximum price of 4.76 rupees per kg. Despite such measures, the prices of gur are much higher than the controlled price for white sugar. With large-scale diversion of cane, the factories in Central and North Pakistan are working at only 50% capacity.

Barbados 1979 sugar crop[9]. — In 1979 sugar production in Barbados reached 116,553 tonnes, raw value, including 6,974 tonnes of fancy molasses. The 1980 harvest is expected to yield about 125,000 tonnes, following good rainfall. A difficulty is the acute shortage of workers which could delay reaping and upset projections.

Australia sugar exports[10]

	1979	1978	1977
		tonnes, raw value	
Canada	399,325	326,561	656,926
China	119,274	134,195	271,648
Japan	769,743	696,105	846,055
Korea, South	246,161	269,895	298,468
Malaysia	249,423	228,219	125,591
New Zealand	20,013	97,273	144,904
Oceania*	8,695	8,412	9,332
Papua-New Guinea*	22,576	23,323	23,231
Singapore	55,098	50,786	102,448
UK	0	0	29,671
USA	112,519	167,340	456,975
Other countries	26	0	0
	2,002,853	2,002,109	2,965,249

*Exported as refined sugar.

Rumania sugar production[11]. — Sugar production in Rumania from the 6,008,000 tonnes of beet sliced reached 525,000 tonnes, white value, against 555,000 tonnes of sugar produced from the 1978 crop of 5,845,000 tonnes of beet.

French West Indies sugar production[12]. — In 1979, 1,126,712 tonnes of cane were crushed to produce 104,737 tonnes of sugar, tel quel. This was a considerable improvement on 1978 when 1,009,889 tonnes of cane yielded only 80,841 tonnes of sugar. In Martinique, however, the cane crop continued to decline, from 192,015 tonnes in 1978 to 165,650 tonnes in 1979, and sugar production fell from 12,509 tonnes to 9374 tonnes.

Continuing drought in Peru[13]. — The third year of dry weather in Peru is threatening 1980 crops, particularly sugar cane, rice and cotton, and cane production in the principal growing area of La Libertad has been ravaged. Sugar production is forecast at 600,000 tonnes, well below production in previous years. Sugar exports in 1979 are estimated at 50,000 tonnes in 1980 against 180,790 tonnes in 1979 and 265,890 tonnes in 1978[14]. The country's supply problems are underlined by the fact that Peru, a traditional exporter, purchased 21,000 tonnes of raw sugar from the world market on February 13. The Government is to provide $15 million to the sugar cooperatives to finance further imports[15].

Ivory Coast application for an EEC quota[16]. — The Ivory Coast intends to seek access to the EEC sugar market and to apply for a 50,000 tonnes quota under the Lomé convention. The state sugar organization Sodesucre hoped to start deliveries in March and expected to export 40,000 tonnes of raw sugar in 1980 out of a total production of 100-110,000 tonnes. When the country's six sugar complexes reach full capacity in three years' time, output should reach 300,000 tonnes per annum.

PERSONAL NOTES

We regret to report the death last December of **Julio C. González Maíz**, doyen of Cuban sugar technologists. He was 80 and had served with distinction as an educator, research worker and sugar factory technologist during his long career in the industry, receiving diplomas and awards from technologists associations of other lands besides those of his own country.

---

1 F.O. Licht, *International Sugar Rpt.*, 1980, **112**, S44.
2 *Mauritius Sugar News Bull.*, 1979, (12).
3 F.O. Licht, *International Sugar Rpt.*, 1980, **112**, 55.
4 *Westway Newsletter*, 1980, (75), 10.
5 F.O. Licht, *Interntional Sugar Rpt.*, 1980, **112**, 36.
6 *World Sugar J.*, 1980, **2**, (8), 33-34.
7 F.O. Licht, *International Sugar Rpt.*, 1980, **112**, 79.
8 See also *I.S.J.*, 1980, **82**, 69-70.
9 F.O. Licht, *International Sugar Rpt.*, 1980, **112**, 98.
10 *Lamborn*, 1980, **58**, 32.
11 F.O. Licht, *International Sugar Rpt.*, 1980, **112**, 128.
12 *Zuckerind.*, 1980, **105**, 188.
13 F.O. Licht, *International Sugar Rpt.*, 1980, **112**, 114.
14 C. Czarnikow Ltd., *Sugar Review*, 1980, (1480), 37.
15 *Public Ledger*, March 1, 1980.
16 F. O. Licht, *International Sugar Rpt.*, 1980, **112**, 114.

ZANINI ALCOHOL

Distillery plants supplied by Zanini.

Type	Capacity l/day	Client	City/State
Autonomous	360.000	Destilaria Alcidia S/A	Teodoro Sampaio/SP
Autonomous	120.000	Destilaria Guaricanga S/A	Presidente Alves/SP
Autonomous	120.000	Agro Industrial Fazenda Unidas S/A	Itacoatiara/AM
Annexed	120.000	Usina Central Barreiros S/A	Barreiros/PE
Annexed	120.000	Cia. Açucareira Norte de Alagoas - Usina Santana	Maceió/AL
Autonomous	120.000	Destilaria de Álcool Major Infante S/A - Damisa	Santo Antonio da Platina/PR
Autonomous	90.000	Destilaria RS S/A	Sidrolândia/MS
Autonomous	240.000	Destilaria MB Ltda.	Morro Agudo/SP
Autonomous	150.000	Sinop Agro Química S/A	Sinop/MT
Autonomous	240.000	Destilaria Univalem S/A	Valparaiso/SP
Autonomous	120.000	Cia. Agro Industrial Serra da Ibiapaba - Agroserra	Ibiapina/CE
Annexed	120.000	Cia. Agro Industrial Vale do Curu	Paracuru/CE
Autonomous	120.000	Costa Pinto Agro Industrial S/A	Aldeias Altas/MA
Autonomous	120.000	Cooperativa Mista e Agrícola de Araçoiaba	Araçoiaba/CE
Autonomous	120.000	Destilaria Moema Ltda.	Orindiúva/SP
Autonomous	240.000	Destilaria Brasilândia S/A - Debrasa	Brasilândia/MS
Autonomous	240.000	Destilaria Nova Andradina S/A	Nova Andradina/MS
Annexed	120.000	União do Nordeste S/A - Usina Guaxuma	Coruripe/AL
Annexed	120.000	Cia. Açucareira Usina Laginha	Vila dos Palmares/AL
Autonomous	90.000	Destilaria Água Limpa S/A	Monte Aprazível/SP
Autonomous	120.000	Destilaria do Outeiro	Canguaretama/RN
Autonomous	120.000	Agro Industrial Santa Laura S/A	Ibaiti/PR
Autonomous	60.000	Bandeira Agro Industrial S/A	Tupã/SP
Autonomous	90.000	Agro Industrial Grande Vale Ltda.	Neópolis/SE
Autonomous	240.000	Vale Rio Agro Industrial Alcool Química do Rio Grande Ltda.	São Desidério/BA
Annexed	300.000	Usina Santa Elisa S/A	Sertãozinho/SP
Annexed	340.000	Cia. Açucareira Vale do Rosário	Morro Agudo/SP
Annexed	240.000	Irmãos Biagi S/A Açúcar e Álcool - Usina da Pedra	Serrana/SP
Annexed	300.000	Fundação Sinhá Junqueira	Igarapava/SP

1950 · 1980

zanini

Zanini, 100% home capital stock and technology

Please Consult us in Brazil

Zanini SA Equipamentos Pesados
14160 Sertãozinho SP Brazil
Via Armando de Salles Oliveira km 4
Phone 166/42.3111 (PABX)
Telex 166315/166476/166482 ZANIBR
Cable Açúcar

01310 São Paulo SP Brazil
Av Paulista 460 18°
Phone 11/285.5122 (PABX)
Telex 1121550/1122901 ZANIBR

Index to Advertisers

reader inquiry service

If you wish to receive further information on the products and services mentioned in the advertisements please fill in the inquiry section of this card and post it to us.

reader inquiry service

Please arrange for me to receive without obligation further details of the products referred to below which are advertised in your .....19.....issue.

Advertiser	Product	Page

Signature . . . . . .

Block Letters

NAME . . . . . Date . . . . . .

Position . . . . . .

Firm . . . . . .

Address . . . . . .

photocopy service

We are able to supply one photocopy, for research or private study purposes, of most of the original papers abstracted in this journal. It should be noted that these are *not* translations but are in the original language of publication which, if not English, is indicated in italics in each abstract. The charge of 40 cents per page includes air mail postage and payment should be sent with the order.

photocopy service

Please supply one photocopy of each of the following original papers, abstracts of which appeared in your .....19.....issue.

Page	Author(s)	Title

Signature . . . . . .

Block Letters

NAME . . . . . Date . . . . . .

Position . . . . . .

Firm . . . . . .

Address . . . . . .

Payment of $ is enclosed

additional subscriptions

To receive additional copies of *The International Sugar Journal* all you need do is to complete the card with details of the subscription required, and return it with your remittance of U.S. $50.00 for supply by surface mail. The additional cost for air mail will be quoted on application.

additional subscription order

Please send a further copy of your journal each month to the address below starting with the issue of

. . . . . .19 . . . . . .

Block Letters

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

Signature . . . . . .

Date . . . . . .

I enclose cheque/draft/M.O./P.O. for $50.00.

Reader Inquiry Service,
The International Sugar Journal Ltd.,
23a Easton Street,
High Wycombe, Bucks.
England.

Photocopies Dept.,
The International Sugar Journal Ltd.,
23a Easton Street,
High Wycombe, Bucks,
England.

Subscriptions Dept.,
The International Sugar Journal Ltd.,
23a Easton Street,
High Wycombe, Bucks.,
England.

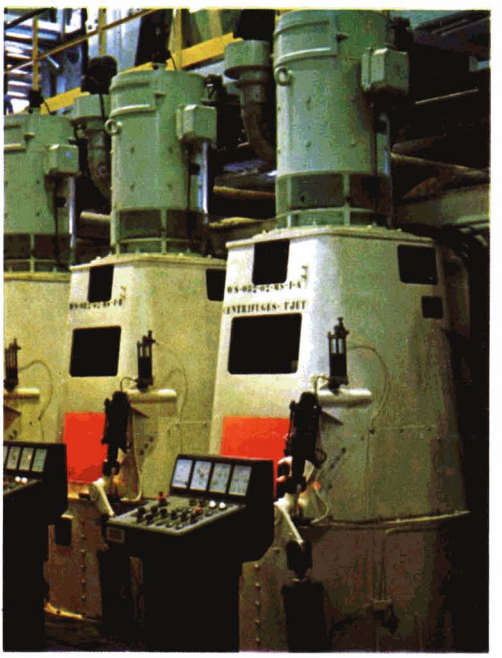
bosco: technology on a world-wide scale

...more than 2000 high capacity, continuous and batch type Bosco centrifugals, all equipped with d.c. and a.c. motors, can now be found in operation all over the world; machines which contribute to the production activities of many of the most important cane and beet sugar-producing countries and to the industrial growth of many up and coming countries. Our success lies in constant modernization, in line with the most modern manufacturing techniques and technological needs, in the high quality of the material used, in precise and accurate workmanship, in the strict internal checkings and inspections, and in the efficiency of our after-sales assistance and spare parts service.

Our activities in the sugar industry include:

— B3 and B7 batch type centrifugals and B5 continuous type machines, which have already made a name for themselves, and our most recent model - the B6 continuous type centrifugal which is about to be launched on the market;
— accessory equipment;
— traditional and fluid bed type plants for sugar drying and cooling;
— centrifugal separators for slurry treatment;
— vacuum pumps and compressors.

A battery of six Bosco B5 continuous centrifugals for low grade affination and second strike massecuites. KSAR EL KEBIR SUGAR FACTORY (MOROCCO) PROCESSING CAPACITY: 4000 TBD



View of a battery of five Bosco B7 fully automatic batch centrifugals, D.C. driving system, for white sugar. KSAR EL KEBIR SUGAR FACTORY (MOROCCO) PROCESSING CAPACITY: 4000 TBD

bosco

an active presence in the sugar industry

Bosco industrie meccaniche s.p.a. - Terni
PIAZZALE A. BOSCO, 3 - 05100 TERNI - ITALY - TELEX 660032 - PHONE (0744) 55341

Printed by the Wrightsons Group of Companies, London; and published by the Proprietors, The International Sugar Journal Ltd., at 23a Easton Street, High Wycombe, Bucks. Entered at the New York Post Office as Second-Class Matter.
PRINTED IN GREAT BRITAIN.