

A Glimpse Into World Sugar Industry

by

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Introduction: India is planning to expand its sugar industry. The ninth session of International Society of Sugarcane Technologists was therefore appropriately held at Delhi in January this year. This gave opportunity for many scientists and farmers of this country to come into contact with the International authorities visiting this country on this occasion. A review of the salient features of the industry of different countries as could be gathered from this conference may therefore be of interest to the farmers at large.

Sugarcane cultivation in India is ancient in origin while the introduction of Sugarcane in many countries like Australia or Cuba is comparatively recent. But these have advanced considerably in the modern white sugar industry. Some important dates on the global spread of cane are mentioned below :

- 766 B. C. Probable date of introduction of cane into China from India by Buddhist monks.
- 327 B. C. Alexander, the Great took cane to Europe from India.
- 600 A. D. Chinese Mission sent to Bihar to study gur making.
- 641 A. D. Arabs introduced cane into Egypt.
- 1420 A. D. Dan Henry the navigator introduced cane into Madeira from where subsequently it reached West Africa.
- 1493 A. D. Columbus in his second voyage took canes to Hispaniola.
- 1520 A. D. Cane reached Mexico.
- 1532 A. D. „ „ Brazil.
- 1535 A. D. „ „ Peru.
- 1547 A. D. „ „ Cuba.
- 1548 A. D. „ „ Puerto Rico.
- 1615 A. D. Sugars first made in Japan.
- 1637 A. D. Sugars first exported from Java.
- 1660 A. D. Sugarcane first planted in Jamaica
- 1670 A. D. Cane introduced in Argentina.
- 1751 A. D. Cane introduced in Louisiana.
- 1817 A. D. Thomas Scott carried cane to Australia.
- 1835 A. D. Sugar first manufactured in Hawaii.

From 13th to 19th Century India was an important exporting country for sugar. Marco Polo (1290) refers to the sugar trade of Bengal; Vasco da Gama (1498) records flourishing sugar trade at Calicut; the Italian traveller Ludovico di Varthema (1503—1508) records trade in Indian sugar in Arabia. India's export of sugar reached 1,05,000 tons in 1876 and from about 1884 India became an importing country and the indigenous sugar industry declined. After tariff protection was granted in 1932, the industry again expanded and the country now is almost self sufficient in this commodity. India, particularly the tropical belt, is eminently suited for the industry and has potentialities for exporting sugar at competitive prices.

Land Preparation and Planting: Cane cultivation in most countries is in the hands of small farmers. All the sugar factories in Hawaii and some in Java own estates in which the full requirement of sugarcane is cultivated by the factories themselves. The size of farm varies widely and it may be as much as 5000 acres in Louisiana. In Queensland the average area per farmer is 60 acres. In Cuba nearly two third of the cane supply is from farmers whose average holding under the crop is about 100 acres.

Preparation of land for planting is naturally variable. In Cuba, the field is ploughed 2 to 3 times and harrówed. Three budded setts are planted generally in rows 5 feet apart and setts in the rows are also planted at 5 feet from each other. Thus the cane clumps are five feet square in spacing. In Hawaii, the cane crop stands in the field for 8-10 years and each crop is approximately of two years duration. The preparation of land is done by heavy machines like Disc plough, disc harrows, sub-soiler and rooters. In Hawaii the cane crop is cultivated on elevations ranging from sea level to 3400 feet above sea level and the rainfall varies widely even in the same island from 40 to 200 inches. Nearly 40% of the cane lies in the area of low rainfall (area). But the climate is mild throughout the year with the rain precipitating almost every month. Therefore in heavy rainfall areas, land preparation is done deep, taking into consideration the contour and the position of drains and flumes and in dry areas shallow ploughing being common. The distance between rows is 4 feet in low rainfall areas and may go upto 5½ feet in high rainfall zones. Three budded setts cut from 9-10 months old crop are planted at 3 tons of seed per acre. Planting is done by machines but in humid areas it is done by hand. In Queensland the cultural practices are mechanised, tractors being exclusively used for

preparation of land, planting, weeding, manuring and ratooning. The setts are planted in furrows 5' apart and at 6" in the furrow. When the crop fully covers the ground the land is levelled off and no banking up is done. In Louisiana, the field is ploughed with tractor and ridges are laid 6' apart. Full length canes of 6 months age and not cut bits are planted and the planting is on ridge tops and not furrow bottoms. This is necessitated to prevent rotting of the cane during the prolonged spell of cold. In Java cane is planted by Rey-no-so system and all the operations are by manual labour. The soils are heavy and hence great attention is paid to laying the drains. The furrows are nearly $4\frac{1}{2}$ ' apart and 30' long. Two budded cuttings or sprouted (rayangans) are planted adopting a seed rate of roughly 25000 two budded setts or 7000 rayangans per acre. In the Phillipines land preparation is by work animals and in recent years tractors are coming into wide use. After the war, cane is planted immediately after ratoons and fallowing, which was the prewar practice, is not generally done. In Jamaica there are three systems of planting; (i) the bed system (ii) the furrow system (iii) and the cambered system. Under rainfed conditions canes are planted in shallow furrows 4' apart. Later by interculture the banks are broken and flats are formed. In heavy rainfall areas and on heavy clay soil, the cambered bed system is adopted. Drains at 22' spacings are opened. Furrows are opened along the bed at $4\frac{1}{2}$ ' spacings and cane planted in shallow furrows which are gradually filled by interculture or in a few cases are banked up. Greatest attention is paid to drains in this system. In Barbados where cane cultivation is more or less continuous without rotation, cane setts are planted in pits 2' square and placed 5' apart. After harvest of cane the field is ploughed and trash is raked up and heaped or bundled in every third row. Fresh pits 2' square and 6" deep are dug up between the old rows. The trash bundles are placed on old stubbles and covered with soil. As the new crop comes up the old bank is dug up. Drains are opened at frequent intervals. To ward off heat and drought and to conserve soil moisture, trash, grass and bagasse are spread on the ground between cane rows.

Season: The planting and harvesting seasons are variable. In Cuba, there are two planting seasons, the fall planting being September to November and the spring planting from March to May. The crop is harvested at 16-18 months age and the fall planting is considered safer. In Mexico, the largest planting is August to December but planting in May to June is done in certain regions.

Harvesting is from December to May. In Louisiana, planting is done before winter and the sprouts are killed by the low winter temperature. In spring the field is off barred to expose the stubble to warm air and sun to stimulate sprouting. In Hawaii planting is done almost round the year but is mainly done from March to August. The crop is generally 22-24 months age at harvest. The first plant crop in some cases, may be harvested at 14 months age on account of tasseling and in high elevation it may be of even three year duration. Spraying the crop with chemical like Maleic hydrazide or applying heavy nitrogenous fertiliser prior to flowering are practised to suppress flowering. In some cases planting time is altered for the same purpose. The planting season in Java is from April to July and harvesting from May to September. In the tropical belt of Australia cane is planted from April to June and in sub-tropical belt from January - March and August - September. All harvest are from June to December. In the Phillipines planting generally synchronises with harvest and top portion of canes are utilised for seed. Planting is done before the cessation of rains in January and the young crops suffer in the dry months January - May when many plants die down. The farmers adopt a very high seed rate to compensate for this. The harvesting period is from November to June. In Barbadas planting is in November and the crop is harvested after 16-18 months.

In Jamaica the spring planting (March to May) or Autumn planting (August to October) are practised depending upon rainfall distribution and irrigation. The harvest is from January to June. The harvest period and approximate age of the crop at harvest are summarised below :—

Country	Harvest Season	Approximate age of crop at Harvest.
Argentina	June - October	12 months
Cuba	December - June	18 months
Hawaii	January - December	22-24 months
Indonesia	May - November	12 months
India	December - May	12-14 months
		18 ,, (Adsali crop)
Louisiana	October - January	12 months
Mauritius	August - January	18-24 months
Mexico	December - May	16-18 months

Country	Harvest Season	Approximate age of crop at Harvest
Natal	May—April	14 months
Phillipines	Novembr—June	11-14 months
Peru	January—December	20-24 months
Puertorico	January—June	14-18 months
Java	November—June	12 months
West Indies	December—June	12-14 months

Irrigation & Manuring : In Cuba, 73% of the cane area is without irrigation and manuring. Only 5% of the area irrigated and manured. New plantings are not generally fertilised. The average rainfall is 50-60" and 85% of the precipitation is from April—October. The ratoon crops that are manured receive about 350 lbs of Chilean nitrate per acre. The average yield is 14 tons per acre. In Hawaii the cane crop is raised both under rainfed and irrigated conditions. The average yield of the crop is 62 tons cane per acre. In Lousiana the crop is fertilised with anhydrous ammonia and irrigation is not common. Rainfall is normally sufficient for the requirement of the crop.

In Mexico nearly half the area is rainfed and the crop suffers in the dry season. The mean yield is about 20 tons cane per acre. In Barbados the plant crop is fertilised with 4 cwts of ammonium Sulphate (90 lb. Nitrogen) and 1½ cwt of muriate of potash per acre while the ratoons receive a little larger dose. In low rainfall areas the dose of nitrogen is reduced to 3 cwts of ammonium sulphate per acre. The cane crop does not appear to be irrigated particularly in the long spell of dry season from December to May and the soil moisture is conserved by heavy organic mulch of trash, grass and bagasse. The cane is harvested at the age of 16 - 18 months and the average yield is 33 tons of cane per acre. In Jamaica, sugarcane is raised both under irrigation and under natural rainfall conditions. The average yield is 33 tons of cane per acre. In Australia, 2 cwts of ammonium sulphate for plant cane and 4 - 6 - cwts to ratoon cane applied. The duration of the crop is 22 - 24 months and the crop is raised both under irrigation and under rainfed conditions. The average yield under irrigation is 46 tons of cane per acre and under rainfed conditions it is 18 tons of cane per acre. In Java cane is cultivated under irrigation. The crop is normally fertilised with about 4 cwts of ammonium sulphate per acre and about 1 cwt of

double super phosphate. The crop is harvested at the age of 12-14 months with an average yield of about 45 tons cane per acre. In Phillipines too the crop suffers from drought in the dry season when many plants die down. Ammonium Sulphate is the commonest fertiliser though in recent years complete fertiliser mixtures are coming into popular use. Average yield is 20 tons cane per acre.

In harvesting the crop, in a few countries like Australia and Lousiana the cane crop is burnt to facilitate cutting.

Pest and Disease: In Cuba, there are no serious diseases. Mosaic is under effective control. Of the insect pests, the borer is important, and is controlled by the natural parasite the Cuban fly. In Lousiana, mosaic is important and immune varieties are developed. At present ratoon stunting is of considerable importance. Of the pests, borer is the principal one and because of severe winter no parasite could be established. It is mainly controlled by dusting cryolite or ryania by tractor units or air plane. Trichogramma parasites are commercially sold to the cultivators.

In Mexico mosaic is the important disease. Of the pests the five strains of diatroea and the spittle bug are of importance. Rats are also important here. In Barbodas, ratoon stunting disease is the only disease of importance. The stalk borer, the root borer and root infesting mealy bugs are the important pests. For the stalk borer the department of Agriculture rears and distributes at timed intervals, masses of Trichogramma parasite.

In Jamaica, mosaic is wide spread. The resistant varieties of Barbados sometimes prove susceptible here. Hence, Jamaica, imports fluff from Barbados for complete local selection. Chlorotic streak is next in importance as also ratoon stunting disease. These are controlled by heat treatment of planted setts. Leaf spot disease attains importance in potash deficient soils. The pests are of occasional importance and of these white grub, brown weevil borer and moth borer are importpnt. The moth borer is checked by natural parasite and the other pests are warded off by increased standard of cultivation.

In Australia the major diseases have been eradicated and the Fiji disease exists only in small areas. Ratoon stunting is wide spread and this is effectively controlled by hot water treatment. Of the pests the grey back beetle and wire worm are now under complete control by extensive use of B. H. C.

In Java, mosaic, leaf scald and *Fusarium pokka bong* are common. The top borer and the stem borer are the pests.

Cane Payment: In most countries the cane supply to the sugar factory is by farmers whose holdings vary in size. In Cuba the farmer is paid on "Sugar percent cane basis". He is given 5.5, or 6.0 or 6.5 tons of sugar per 100 tons of cane delivered to the factory. He is also given 49% to 50% of the value of molasses. In Louisiana the individual shipment of cane is sampled, the juice analysed in small mill and the value reduced to commercial units by appropriate formula. For normal cane yielding 160 lb. of 96% sugar the farmer is paid the value of 106 lb. of sugar i. e., he gets 66.25% of the value of sugar. In addition he is paid bonus for molasses. The transport of cane from loading centre to the factory is at the cost of the factory. In Mexico the cane is supplied by farmers whose average holding is about 7 acres. The farmer is paid on the basis of quality of cane.

Less than 9% recovery	50% of the price of sugar
8—10%	Additional 48% for surplus over 8%
10—11%	45% for surplus over 10% recovery
11—12%	40% for surplus over 11% recovery
More than 12%	35% for surplus over 12% recovery.

Besides the farmer shares 50% of the value of molasses.

In Jamaica the industry produces nearly two third the cane required in its own estate. The cane that yields 1 ton of sugar for 9 tons of cane is taken as of basic quality and it is paid 66% of the value of sugar. This percentage share may vary with the different factories. For increase or decrease in quality the percentage share is varied. In addition to this the farmers receive 50% of the value of by-product of the factory. The approximate price of cane in 1952 was equivalent of Rs. 37/- per ton of cane. The farmer is paid a basic price, a second bonus and the third final price at the close of the season.

In Australia, cane growing is by farmers whose average holding is 60 acres. The farmer is paid on the basis of analysis of his cane. The award is made by the Central Prices Board which is a statutory judicial body.

In Java, the cane is drawn from factory's own estates as well as from farmers. The latter is paid on the basis of Kasimo formula.

$$a = \frac{R \times H}{1000} \times 5.50 \text{ where}$$

a = Price per 100 kg. of cane

R = Rendement (kilos of crystal per quintal - 100 kg. of cane)

H = Sugar price fixed by Government

Research: In Cuba the mill research is by the university and the field experiment by the Ministry of Agriculture. The levy on sugar at half a cent per bag though intended by law for sugar experiment station, is not spent for the purpose. In Louisiana the agricultural experiment station is run by the state university.

The department of Agriculture runs an experiment station at Houma and at Cannal point, Florida. The American sugarcane League of New Orleans publishes sugar bulletin and acts as a liason agency between the industry and research institutions.

In Mexico there are two organisations engaged in research - the National Union of sugar producers and the Bureau of Agriculture. The bank of Mexico and the National union of sugar producers grant scholarships to young scientists for study in foreign institutions. In Jamaica the sugar manufacturers association maintains a research department controlled by a committee appointed by the association, the department of agriculture, the farmers and sugar estates. The work of the department is mostly decentralised over the entire industry and over 200 field experiments are laid every year and this is augmented by field sample survey method.

In Australia, the research is by the Bureau of sugar experiment station created by an act in 1900. It conducts experiments on all aspects of the industry. In 1949 Sugar Research Limited was formed by the factories and it conducts research on Mill Technology and Engineering. The colonial sugar refining company has its own breeding nursery and field chemists for investigation work.

In Phillipines the 'Phillipine Sugar Association' created in the early twenties conducted research upto early thirties. When sugar production was limited the research activities were suspended.

After the war research was revived and the Phillipine sugar institute was created by law in 1951 to serve the needs of research. This institute is financed exclusively by planters and millers.

Government Control: In most of the countries the Government have enacted laws which regulate the production prices and wages of labourers. In Cuba the sugar coordination law of 1937 is the most important single law which deals with protection for small cane growers, payment for cane, rent for cane farm, wages for cutting and hauling cane and minimum wage for agricultural and industrial labourers. In this country, the raw sugar, the mill owned sugarcane, the farmers cane, the domestic consumption sugar, molasses and syrup are taxed under law. In addition there are municipal and provincial taxes on lands and properties devoted to cane cultivation, tax on operating capital, income tax, profit tax etc., The commission for sugar arbitration (1937) is meant for solving the differences between the mills and the farmers. Since 1946 under the law the farmers can appoint chemist to inspect the factories, the scales, the laboratories, warehouses and molasses tanks. There are two prominent companies which do the inspection on behalf of farmers.

In Louisiana, since 1934, the industry is under close control by Government through the sugar act. This act limits production of sugar, fixes price and bonus for the cane. The sampling and analysis of cane is by factory staff but subject to inspection by the department of agriculture. The minimum wages for factories and labourers are fixed by the Government. There is a great dearth for labourers and effort is made both in the factory and field to reduce the labour requirements. In Mexico the industry is controlled by the Bureau of National Economy. Sugar is taxed in Mexico and part of it is reverted to the producer for developing the industry.

The minimum wage for the labourers is fixed under the law. In Jamaica, the delivery of cane, its price, price of sugar and fixing of local export quotas are fixed under statute. Excise duty on sugar and cess on cane are levied. The latter is intended for the maintenance of all island Jamaical Cane Farmers Association.

In Australia, the Government assign quotas for production, fix cane price, acquire and market sugar. Each cane grower is assigned an area on which he is to raise cane and supply to the specified factory. Under sugar acquisition Act, the State Government enters into agreement with Federal Government for production and

marketing of sugar. The Government purchases all the raw sugar and accept the responsibility for losses arising from export of surplus sugar, The Sugar Experiment Station Act; empowers the Bureau of Sugar Experiment Station to levy cess on cane and finance research in field and mill. This station controls cane varieties, diseases and pests by legislation. There are no direct levies by Government and the levies are by the Board. The Queensland cane grower's association levies the cane growers for organisational work. There is no excise duty on sugar. In Java, the land rent decree (1918) assigned area for each factory from which it can rent land for sugarcane. The levels of land rent are also fixed by Government. During the war the sugar industry, was almost non-existent and now the industry is fast reviving. In Phillipines the Government determine the local consumption and export quota and also assign production for each factory through quota administration. The sugar industry decided not to depend too much on Government technical help and levied upon itself certain contributions and constituted sugar Research and stablisation fund. This is mainly utilised for research. The sugar quota administration is Government bureau for allocation of production and marketing quotas among the mills and marketers. For the benefit of the labour the Government instituted various laws.

OBITUARY

We regret to announce the sudden demise of Sri G. K. Chidambaram, Assistant Agricultural Chemist, Coimbatore on 22-5-1959. An Honours Graduate in Chemistry of the Presidency College, he joined the Department of Agriculture as Assistant in Chemistry in 1927. He was gazetted as Assistant Agricultural Chemist in 1946. Unostentatious, handworking and conscientious, he won the hearts of many who came in contact with him. He was closely associated with the Tungabhadra and Fruit soil surveys in Ceded Districts. He was a member of the teaching staff for some time of the Agricultural Colleges at Coimbatore and Bapatla. He was a noted bridge player and member of the Agricultural Officers' club for a long time.

We offer our heart felt condolences to the members of the bereaved family.