

## Australian Sugar Industry

by

C. L. SUNDARARAJAN, B. sc. (Ag.)

Sugarcane was first grown in Australia in the year 1817 though the first commercial plantation commenced only in 1865 in New South Wales. As soil and climatic conditions in Queensland were more favourable for the successful cultivation of cane, the industry gradually extended northwards till at the present time 80% of the entire cane is produced in the tropical regions of Queensland. In 1953 - '54 the total area under cane in Australia was 481,602 acres. There are 34 mills, 14 of which are co-operatively owned by the growers and the rest proprietary. The following table gives the various sugar districts with their rainfall and the number of mills in each of them :

Districts	No. of mills	Rainfall
1. Mossman to Ingham	10	80 to 180"
2. Lower Burdekin	4	43"
3. Mackay - Proserpine	8	65 to 70"
4. Bundaberg - Maryborough	7	44"
5. Nambour - Beenleigh	2	48 to 63"
6. Narwood in N. S. W.	3	"

Mossman and Mackay are in the high rainfall tropics, while the Lower Burdekin is in dry tropical belt and is essentially an irrigated area. The others are sub-tropical and most of the crops are grown with rainfall only, though irrigation is being used on considerable acreage in Bundaberg.

Cultivation of cane is confined to the narrow eastern coastal strip, about 30 miles wide, of Queensland and New South Wales, and it extends to a length of about 1,300 miles from Mossman ( $16\frac{1}{2}$  Latitude S) to Clarence river in N. S. W. ( $29\cdot5$  Latitude S). Climatic and soil conditions vary. The areas receive their heavy rains during summer (December to February) though fair to heavy rains are received in the other seasons also. The soils are of volcanic origin in many of the areas except in Lower Burdekin Delta and extensive irrigation is practised with the aid of pumps working in shallow bores.

## AUSTRALIAN BANANA INDUSTRY



The New South Wales banana industry is valued at between £A 4,000,000 and £A 5,000,000 annually, producing 1,750,000 cases a year. Average production to the acre in New South Wales is calculated at 72 cases on non-irrigated land, 300 cases under irrigation. A case weighs about 80 lbs.

Experts regard the use of plastic bags to cover young fruit as the most important innovation in the banana-growing industry. Used to protect growing bananas in winter and spring months and intensify sunlight, they produced a larger and more mature banana.

As with the sugar industry obtainable in all parts of the world, Australian Sugar Industry also was formerly organised on Plantation basis, with 166 inefficient plantation mills. Indentured labour from South Sea islands was extensively employed. But with the coming in of federation in 1901, employment of coloured labour in all the industries, specially in sugar industry was prohibited, the coloured labour repatriated and various inducements given to encourage European settlement in the area. The result is that at present the entire sugarcane cultivation is based on the typical Australian pattern of one man ownership and operation. In place of 166 inefficient mills there are only 34 mills which mill 7 million tons of cane per annum. The entire work is carried on with white labour. All the operations are highly mechanised. The labour employed even in factories is surprisingly small. A factory with a crushing capacity of 2,400 tons per day employs about 30 persons per shift on the manufacturing side with 12 persons in the Loco section.

Australian Sugar Industry is a protected industry. Import of foreign sugar is not allowed and the industry itself, through the Queensland Government, has taken up on itself the responsibility of supplying the entire Australian requirements of refined sugar at a fixed price (the present price is 10 pence per lb. in retail) and providing the Australian manufacturers of jams and other preserved food stuffs with enough sugar at such prices as would be obtained in the free world market. This sugar industry supports directly or indirectly 200,000 persons in Queensland alone — almost one-fifths of that State's population. Apart from the need to make the country self-sufficient in sugar and earn a substantial exchange by exports (valued at £ 21.7 millions in 1952 - '53), it is considered as of paramount importance to the Nation to develop the northern areas of the country and habitate them with white population in the interests of security and military strategy. The need for this development has been felt specially since the World War II.

Possibilities of expansion of sugar industry in the country are great. Given sufficient export markets at attractive prices for sugar, the industry can increase its production manyfold, as enormous stretches of land suitable for cane cultivation are available. But since the export quota of Australia as per the International Sugar Agreement and the Empire Sugar Agreement is restricted to 600,000 tons of sugar per annum, a number of restrictions have been placed on the industry to balance the production against anticipated demand at economic price level. Each mill is allotted a maximum

quota of sugar (Peak) it can produce each year and this quota is distributed among the registered suppliers of cane on the basis of supply in a specified year.

The average size of the farm is about 60 acres with an average production of 1100 tons of cane per year, though there are farmers owning very large blocks under cane. Each farm is self-contained with dwellings and all machineries and quarters for cane cutters. Each farm is allotted a net assigned area, the maximum area of cane in any one year and a peak (the maximum tons of cane that it can supply to the mill in any one year). Usually three-fourths of the gross area of a farm is the net area, and it is this area which is to be under cane every year, the rest being fallowed and/or green manured. In the case of a farm of 60 acres gross, 15 acres under first ratoon, 15 acres under second ratoon and the rest fallowed. Steps are taken to see that a farmer does not plant an area in excess of the farm's net area and the millers are prohibited from accepting cane from any area other than that allotted. This system of gross and net assignment allows the fields to rest once in four years and enables the farmer to enrich the soil by growing a green manure crop. In general, cane farmers specialise only in cane and do not have any other crop. The allotment and revision, whenever necessary, of the peaks and the net assigned areas are determined by the Central Cane Prices Board and local Cane Prices Board constituted under an Act of the Queensland Parliament.

**Priliminary Cultivation :** The stubbles of the preceding crops are uprooted in June and the crop residues cut into pieces and incorporated into the soil by working disc harrows, rotary hoes, disc plough or their implements drawn by tractors of different sizes. The land is further worked by grubbers or disc harrows to prepare a suitable seed bed for sowing legumes in September. The type of green manure chosen depends upon the locality and the time available between now and the time of planting cane. Velvet beans (*Stizolobium* Sp.) have a long growth period, are drought resistance, wilt resistant and produce heavy mulch of dead leaves on the soil surface while the vine is still growing. Cow peas are preferred where a short duration crop is required. The seeds are usually grown in lines 4' 6" apart to reduce the seed rate and facilitate intercultivation when the vines are yet to cover the entire field. These green manure crops make rapid growth with the onset of summer in November and give a final yield of 10 to 16 tons of green matter per acre, when they are

ploughed in January. The land is disced with harrows to disintegrate the green matter and the soil is compacted well with rollers. The green matter decomposes entirely in about 2 weeks' time. Further working is done with grubbers (rigid tyne cultivators) until a good seed bed to a depth of one foot free from clods is obtained.

**Planting:** Time of planting varies with latitude to allow of sufficient soil moisture and high soil temperature during germination of setts. In North Queensland planting is usually done during April — May after the heavy summer showers. In South Queensland and N. S. W. planting is done either during autumn (February — March) or during spring (August — November). Since all after-cultivation is carried out with tractors, it is found essential to have a spacing of 4' 9" to 5' 3" between rows of cane. Planting is done by planting machines which cut the cane into setts of suitable size, dip them in or spray them with a solution of Aretan (organo-mercurial compound) and plant them in furrows opened by the machine, cover the setts with soil and compact the soil above the setts. In certain localities where application of fertilizers is done at the planting time a fertilizer box is attached to the machine. A single row planter requires one man to feed the canes to the chute and a double row planter requires two men to feed the cane. In either case, there is, in addition, a driver to drive the tractor. A single row planter worked by a 22 H. P. tractor will plant 4 to 6 acres per day and a double row planter worked a 40 H. P. tractor will cover an area of 12 acres per day of 8 hours. A single row cutter-planter will cost £ 133 while a planter with a dipper or spray attachment for Aretan will cost £ 250/-

Only whole canes of 10 to 12 months old are used for seed purposes. Great care is taken to discard diseased and unthrifty canes and canes with prominent eyes. Each sett is of 3 buds, 14" long and are planted singly end to end 4" apart at a depth of 9". Two tons of cane or 10,000 setts are required to plant an acre. There are 6 to 8 buds for each yard-length of furrow. Use of 'Aretan' to prevent the onset of pineapple disease, protect the canes against adverse conditions of soil and to hasten germination of buds is universally practised. The cost of the treatment is 10 to 15 shillings per acre.

**Varieties:** Considering the total area of cane, the number of varieties of cane one comes across in any one area is remarkable. Each mill area uses a couple of varieties and each individual farmer has more than two to three varieties growing in his farm. Having

more than one variety is a sort of insurance against total loss due to possible damage to a variety by disease or by adverse climatic conditions. They also aid in spreading over the harvest programme over a longer season without any deterioration to cane. A few farmers who placed all their reliance on only one variety Pinder, suffered heavily this year in Queensland on account of the tops breaking off at the time of heavy cyclones this January. Trojan and Badisla varieties of cane in the nearby fields were entirely unaffected by the cyclone.

Each mill area has a list of approved varieties prescribed every year by the Bureau of Sugar Experiment Stations, a quasi—government body in charge of sugarcane work. It is an offence to grow any variety other than those approved.

At one time Co. 290 and P. O. J. 2878 reigned supreme in the area, but on account of their susceptibility to many of the diseases, they have been discarded in favour of other superior varieties. Farmers have a wide choice of suitable varieties to choose from and they do not hesitate to take up to new ones.

At the present time 35% of the entire cane area is covered by varieties bred by the Bureau of Sugar Experiment stations, 42.6% by varieties from the Creeping Stations of the Colonial Sugar Refining Company and 22.4% of the area is covered by canes imported from foreign countries. The performance of a few varieties is outstanding and there is no doubt that the higher efficiency and higher sugar recovery of the Australian industry are, to a very great extent, due to these varieties. Some of these varieties can be imported and their performance tested in typical sugarcane farms in India.

**Aftercultivation:** During adverse seasonal conditions when tractor cannot gain entrance to the fields pre-emergence sprays of 2—4D are used in certain localities to prevent germination of weeds and for giving the seedlings a good start. But in the majority of the areas weeding is done with the help of a "cotton king" with spring tyne attachments. The implement consists of two sets of 3 reversible discs of 16" diameter on either side with 5 or 6 spring tynes in the centre. The disc cultivates the interspaces between the rows of cane and the spring tynes weed and stir the soil right in the row of cane without damaging the germinating buds or the shoots. A single row "cotton king" is worked by a light tractor (20 H. P.) and covers an area of 10 acres

in 8 hours. In irrigated areas (12½% of the entire area) cultivation is done as and when necessary and in times of extreme dry weather, the soil is thrown a bit inside the rows with the use of 'cotton king' to conserve the available moisture. In all cases soil is thrown into the rows of crop bit by bit as the crop grows till the entire furrow is closed and a small ridge is formed along the rows of cane. Final weeding and earthing up is done by a tractor drawn implements. No cultivation is done once the crop has grown out of hand. Hand weeding or chipping as is done in India, is unknown. Even in a 70 ton crop (with canes 6 ft. long) in the irrigated farms, the ridges formed along the rows of cane are not more than 6 to 9" high from the bottom of the adjacent furrow and the canes do not seem to lodge on account of the low ridges.

The ratoon crops, usually two or more, are treated the same way except that at the beginning the stubble is 'shaved' or cut to the ground level by disc harrows or stubble shavers to allow new shoots to come up from the ground level and not from the crown of the ridge.

In Burdekin area, irrigation is given at three-weekly intervals, the maximum number of irrigations being 10 to 12 per year. The cost of lift irrigation varies from £ 12 to £ 15 per acre per annum.

Sugarcane arrows in almost all the tracts in April - May, the intensity depending upon the variety and the locality of the farm.

**Fertilizers:** Payment for cane in Australia is based on the quality of cane and every endeavour is made to obtain a crop of high sugar value. The farmer is interested in the tons of sugar produced rather than in the tonnage of cane alone. Since exorbitant rates are to be paid for the harvest of lodged canes and since the sugar content goes low in a lodged crop of cane, farmers always prefer to have a crop of erect cane of normal tonnage and of high sugar content to a heavy lodged crop of luxuriant growth but of low sugar value. All fertilizer practices have this in view. The bureau has an elaborate advisory service which enables every farmer to have his soils analysed every fourth year free of cost. Nitrogen is always assumed to be deficient and hence determinations for phosphorous and potash status of the soil alone are made. Based on the results of analysis proper fertilizer recommendations are made to the farmers.

As already stated, a majority of the farmers grow a green manure crop which is estimated to add 200 to 300 pounds of nitrogen per acre. In addition, many farmers have begun applying molasses at the rate of 4 to 8 tons per acre and/or filter press mud at the rate of 10 tons per acre as a basal dressing. In fact as much as 28% of the production of molasses is utilised as fertilizers to cane field. These mill waste products are made available to farmers either free (mostly by co-operative mills) or at a nominal rate (£ 2 to 3 per ton of molasses) by proprietary mills. These products are reputed to improve the texture of the soils besides being of some manurial value. In certain mills a mixture is made of molasses and press mud in the proportion 2 parts of molasses and one part of mud and supplied to the farmers at £ 2 per ton. This mixture is easy to handle.

In irrigated Burdekin area, where no green manuring is practised, a suitable planting mixture (17%  $P_2O_5$ , and 7.5%  $K_2O$  or 8%  $P_2O_5$  and 25%  $K_2O$  according as the soil is deficient in P or K) is drilled into the soil at 3 cwts. per acre during planting time. In addition, a top dressing of 2 to 3 cwts. of ammonium sulphate is applied close to the crop rows when the crop is about 7 months old. In dry areas a suitable of mixture (12 — 5.5 — 7.5) is drilled in at the time of planting at the rate 3 to 6 cwts. per acre and no further fertilizer is applied. Experiments carried out by the Bureau indicate that all the fertilizer requirements of the crop can be applied in a single dose and that no advantage is gained by applying the fertilizers in two instalments.

**Harvest:** Cane is harvested when the crop is 12 to 14 months old. In certain areas of Southern Queensland and in New South Wales where stand - over crops are found, cane is harvested only when they are 22 to 24 months old. The universal practice in the country is to burn the crop prior to harvest. This involves the burning of all dry leaves before cutters enter the yield. The quality of cane does not suffer appreciably by the pre-harvest burning, provided the canes are delivered within 48 hrs. Harvesting is usually done by manual labour by gangs who are specialists in this work, and they are paid for at the awarded rate of 13 to 15 shillings per ton. A gang consists of 3 to 4 cutters and a cook who also shares their wages. An average cutters will cut 6 to 8 tons of cane per day of 8 hours. Cane cutters have a 40 hour week and labour laws regulating hours of work, rates and methods of payment, provision of quarters and of equipment to be provided in the house and settlement of disputes are elaborate and are strictly observed. All cane



cutters, in fact all labourers, should be members of the Australian Workers' Union.

The canes are loaded in trucks of 2 to 2½ tons capacity on temporary tram lines of 2 feet gauge laid on the farm and the loaded trucks handed over to the mills at fixed delivery points near the farm. The Australian mills maintain 2000 miles of tram lines and it is the responsibility of the mills to have the loaded trucks hauled up to the mill. A very small percentage of the crop is delivered to the mills by other means of transport like motor truck, railway and boats.

There are a few sugarcane harvesting machines in operation in some of the larger plantations. These machines cut the canes, top them, and throw them in convenient bundles to be loaded into trucks by front-end loaders worked by light tractors of 22 H. P. A two-row machine harvests about 60 tons of cane per hour and a one-row harvests about 25 tons of cane per hour. The cost of machine varies from £ 3000 to £ 5000. Attempts are being made to perfect the machine and make them available to all the farmers at a reasonable cost, as the manual harvesting of cane is cumbersome and costly; and accounts for the major portion of the costs of production.

Handling of cane, while cane is transferred from one truck to another or from trucks to railway wagons, is mechanised with the aid of "derricks". The yield of cane varies from 25 to 30 tons per acre in dry areas and 50 to 60 tons per acre in the irrigated districts. The cost of production of a ton of cane is about £ 2—6—0 in irrigated districts and slightly less in dry areas. The average C. C. S. (Commercial Cane Sugar) content of cane varies favour 12% to 16%.

**Payment:** Payment of cane supplied to a factory is made not only on the basis of tonnage of cane supplied but also on the basis of commercial cane sugar contained in it. Arrangements exist in all mills to take either a continuous sampling of the first expressed juice as a particular consignment of cane is being crushed or to mark out every fourth wagon in a consignment and take samples from the first expressed juice from those canes. In either case the juice is analysed and with reference to the figures of analysis and the fibre content of the particular variety of cane, the commercial cane sugar content (C. C. S. %) is determined. This CCS figure is not identical with the actual sugar content but is a measure of the recoverable sugar at a certain prescribed standard of factory efficiency. The grower is paid as per scale which provides a premium for high CCS%. Qualified

cane testers are appointed by the Central Cane Prices Board, in each mill to ensure that rules and regulations governing the weighment of cane and taking of samples, are strictly adhered to and the procedure adopted in the laboratories for analysis of juice is in conformity with standard methods. Canes with a CCS percentage less than seven is return to the grower.

One unique feature is that the price of cane paid to the grower is linked to the price of sugar realised by mills. All sugar produced within the peak is termed as *Pool 1* and this includes sugar meant for domestic consumption and for export to the United Kingdom as per agreed prices. All sugar produced in excess of the peak is termed as *Pool 2* and is sold in the free world market at the owners' risk often at a price lower than *Pool 1*. The price realised by a particular mill in 1954 is as follows and is given as an example :

Pool	Destination	% of the total production	Price realised per ton.	
1	Domestic consumption	44.6	£ 47-16-0	} Pool 1 average price £ 42-16-0
	Export under agreed prices	55.4	£ 38-16-0	
2	Export to the free world market. (Production in excess of the peak	1124 tons	£ 31- 1-0	

The price thus realised per ton of raw sugar is divided among the growers and the miller in a definite proportion. The price obtained by the grower can be calculated from the formula

$$x = 0.009y (z - 4) \pm \text{adjustment}$$

where  $x$  is the price to be paid to the grower per ton of cane supplied  $y$  is the price per ton of sugar obtained in the relative pool and  $z$  is % CCs of the cane. Adjustment is the adjustment to be made in case the price of sugar goes above or below the price £ 3.35/- per ton (at which figure this formula is held to be true). The figures of adjustment is given in a table. In practice the division of the raw sugar money between the grower and the mill is done in the proportion of 7% (to the grower) and 30% (to the miller). The amount thus realised is distributed among the growers according to the total tonnage and the CCS of the cane. As the whole calculation is based on a certain specified efficiency of the mill, the grower does not suffer on account of the inefficiency of the mill.

Though final payments are made and accounts settled only at the close of the season, interim payments are made to the farmers immediately cane is delivered to the mill as per proclamation (announcing the anticipated price of raw sugar for the season and interim payments to be made to the grower) issued by the Queensland Government at the beginning of each season. The marketing of all sugar whether for refining and home consumption or for export is controlled by the Queensland Sugarcane Board under the Sugar Association Act. A ton of cane analysing 13% CCS is paid at the rate of £ 3-13-0 when the average pool price of raw sugar is £ 42-16-0 per ton. Sugar refining is carried on in separate refineries located in the big metropolitan cities. The sugar mills confine their activities to the production of raw sugar. Except for one refinery in Bundaberg all other refineries are owned by the Colonial Sugar Refining Company, who act as agents to the Queensland Govt. in all matters pertaining to the control and marketing of sugar.

It is evident, therefore, that the farmer stands to gain by supply of quality canes to the mill and the farmer always tries to produce canes with high CCS by the adopting proper manurial and cultural practices. He is always on the lookout for better varieties of cane and demands of the Bureau for supply of suitable varieties to his farm.

**Pests and Diseases :** Australia is now singularly free from many of the major pests and diseases, due mainly to a system of strict quarantine and regulatory measures adopted over the course of many years. Red rot has been controlled by the use of resistant varieties. A few of the major diseases like the Fiji disease and Mosaic have been almost completely eradicated. Sugarcane grubs, once the major pest, have been controlled by the extensive use of B. H. C. preparations. Movements of cane from one district to another cannot be done except under the authority of the Pest Control Officers, and import of cane materials from abroad by persons other than the Bureau is not allowed. A few minor diseases like ratoon stunting disease, chlorotic streak (both believed to be virus diseases) and sun leaf scald (a bacterial infection) are present and they are kept under control by proper preventive and curative measures. Hot water treatment plants for the treatment of sets against ratoon stunting disease are present in all the mills.

**Organisations :** The Bureau of Sugar Experiment Stations, a quasi government body responsible for research into all spheres of

sugarcane development in Queensland was constituted under the Bureau of Sugar Experiment Stations Act of Queensland Parliament. The Bureau maintains a number of breeding and experiment stations in typical areas of the state. The activities are financed by a levy of 3 pence each on the grower and miller for every ton of sugarcane crushed. The growers and millers have effective voice in the formulation of the policies and drawing up programmes of research.

The Queensland Cane Growers' Council is purely a growers' association. All cane farmers are *ipso facto* members of the council and contribute to its finance by a levy of three quarter penny per ton of cane supplied to the factory. The council is the watchdog of the interests of the growers vis-a-vis the millers. It has on its staff qualified personnel who can speak authoritatively on matters pertaining to the culture of cane and technology of manufacture. The official organ of the council is *The Producers' Review*; a monthly journal of great interest to farmers.

The Australian Sugar producers' Council is an association of the growers and millers and is the mouthpiece of the entire industry. In addition, each mill area has its own district executive and pest control board to attend to local affairs. With better varieties of cane, better cultural practices, control of pests and diseases and the effective organisation of the industry, the yield of sugar per acre has risen from 1.81 tons in 1901 to 3.39 tons in 1952—53. 6.8 tons of cane are required to produce one ton of sugar in the Burdein area, the over - all average in Australia being 7.34 tons of cane to a ton of sugar. The Australian cane is the sweetest cane in the world and the yield of sugar per acre compares well with any other sugar producing country.

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