

Sugar Cane Growing in Southeast Asia: Yesterday, Today and Tomorrow

By MORIMASA YAMASAKI* and MASAHARU KURAMITSU**

Professor,* Tokyo University of Agriculture and
Assistant Director and Adviser,** Agricultural Department, Nippon Koei Co.

Preface

In the section "Sugar Cane Growing: Yesterday" description is given of sugar cane growing during the period of about 10 years before World War II while "Cane Growing: Today" explains its growth in the last 10 years.

Lastly in the section "Cane Growing: Tomorrow" studies are conducted on the future trend of sugar cane growing and techniques as well as facilities for future cane growing.

The reason for describing the past and the present situations of sugar cane growing is to facilitate comparison of the present and pre-war situations which we consider to be of utmost interest to the readers of this article because of a great change witnessed in sugar cane growing due to the changes in the political and social situations in sugar cane growing countries during the wartime period of 1941 to 1945.

Cane growing: yesterday

In sugar and cane yields, Indonesia (Java) leads all countries of the world. Taiwan and the Philippines follow Indonesia, and in other cane growing countries production is insignificant. In this article, sugar cane growing in these three major sugar producing countries are reviewed.

1) *Indonesia (Java)*

Java Island, Indonesia, is favored with na-

tural environment suitable for growing sugar cane. Together with the application of the intensive cane growing technique developed by Dutch agronomists, Indonesia acquired the unique position as the foremost cane growing and sugar producing country of the world. Thus, around 1930 the sugar yield in Indonesia amounted to a historical high of about 2,900,000 tons.

The period around 1930 was the golden age for the Indonesian sugar industry. Soon after, however, due to noteworthy development of the sugar industry in some regions of Taiwan and India, Indonesian sugar exports to those countries decreased remarkably, and Indonesia was obliged to reduce the sugar cane acreage. Nevertheless, cane yield per unit area in Indonesia still maintained a high level and in 1934 the average cane yield/ha was as high as 137 tons.

Achievement of such a high cane yield in Indonesia owes, besides the favorable natural environments and the advanced growing techniques, much to the so-called "wonder cane", POJ2878, bred at the Java Experiment Station (Pasuruan). Mr. Dillewijn has highly evaluated the merit of this variety to the effect that the increase in the cane yield per year in Java, caused by the introduction of this new variety, is more than enough to compensate the money expended by the station during 40 years for the breeding of POJ2878.

POJ2878 has not only contributed to increasing the sugar yield in Java but was introduced into the major cane growing coun-

tries to boost sugar yields. Furthermore, the successful breeding of POJ2878 gave incentive to agricultural scientists in various countries of the world and as a successful model case contributed greatly, directly and indirectly, to the advancement of plant breeding techniques of the world.

2) Taiwan

Since Taiwan (Formosa) was annexed by Japan in 1895, the sugar industry has been regarded as an enterprise of prime importance in that region. And thanks to the positive policy of the administration for the development of this industry and as the result of efforts made to improve the techniques, the sugar yield in Taiwan increased from year to year, and in 1930 production reached 800,000 tons making Japan self-sufficient in sugar. The industry's great progress is principally attributed to the introduction from Java of POJ2725, a variety well suited to the climatic and other conditions of Taiwan, as well as the strenuous efforts made to diffuse this variety widely in Taiwan.

Later, POJ2725 was replaced by the F108 (POJ2725 × F46) bred at the Taiwan Experiment Station which rapidly spread over there, resulting in Taiwan's sugar yield to register a record high of 1,370,000 tons in 1939. But from 1941 when Japan entered World War II, sugar output in Taiwan drastically decreased along with other agricultural products.

3) The Philippines

In 1930, sugar production in this country marked 1,450,000 tons. However, with her independence declared in 1946, the Philippines had to adjust her sugar output owing to the new situation with regard to sugar export to the U.S., namely, sugar which had been exported to the U.S. tax-free for the whole amount came to be subject to import duty except for the tax-exempted amount of 850,000 tons.

Before the war the Philippines ranked next to Taiwan in cane yield per unit area. Taiwan recorded 80 tons per hectare while the Philippines chalked up 60 tons because the PSA variety grown in the Philippines did

not show the anticipated high productivity.

Cane growing: today

Although the Philippines and Taiwan are striving hard to increase sugar production as well as to expand their export, the rest of the sugar growing countries are showing a stronger desire to further develop their sugar productivity to meet their own demand.

1) Indonesia

During 1928—1931 of pre-war days about 3,000,000 tons of sugar were annually produced in Indonesia with 200,000 ha of field under cane. As of 1970 there are 55 sugar refineries and according to statistics, 600,000 tons of sugar were produced in 1966 with 76,000 ha of field under sugar cane. There are 5 alcohol breweries now and 12,000 tons of alcohol were imported in 1968.

In the case of bibit planting, canes are harvested in 12 months after planting and in ratoon, 10 months after the shooting of a ratoon. In 1966 cane field per hectare was 87.3 tons which is the highest yield in Southeast Asia at present. Sugar mills, however, are mostly old-fashioned as they have been established 45—55 years ago. In sugar producing technique there is also much room for improvement.

Since the enforcement of the land reform in 1960, leasing of large area of yield has been refused and furthermore the lease term is limited to 1 year so that growing of ratoon became almost impossible. Cane growing is therefore being conducted by the Reynose method (Cuban method.) As to the variety, those of the POJ strain widely grown during the Dutch administration has entirely disappeared these days, and after Indonesia gained its independence, the PS strain varieties bred at the experiment station (Pasuruan) are being developed. Latest variety bred at the station is PS43.

When Kuramitsu, one of the authors, visited the experiment station, the director of the station took him around the blocks of cane growing fields by jeep and explained to him

about the details of cane growing at the station. He was still young, perhaps scarcely 40 years old, but quite an able agricultural expert. He was strongly impressed at the neat cane fields, which were well taken care of without a stalk of weed.

The following data on PS canes are the results obtained at the Arasoe sugar mill in Sulawesi.

PS41 189 quintal (sugar)/ha
(sugar yield = 14%)

PS30 193 quintal (sugar)/ha
(sugar yield = 14%)

Cane yield per unit area is 100~130 tons/ha for almost all the varieties grown around this factory.

The director of the station told him that Indonesia leads the world in cane growing, and that foreign varieties such as Pindar and F160 are not grown there. The PS strain varieties only are grown.

2) *Taiwan*

The sugar industry in Taiwan is operated under the product-sharing system in which the factory gets 45% of the product and farmer growing sugar cane 55 percent.

In 1966 the yield per unit area was 85.7 tons/ha, and sugar production was 623,000 tons in 1967 and 814,000 tons in 1968. Sugar export was 653,000 tons in 1968. Before the outbreak of World War II, there were 45 sugar mills whereas at the present time the number of mills dropped to 25, all of them located in the area south of Taiwan. The number of employees totals 12,000. The largest sugar mill in Taiwan is located at Shan-hua where the production capacity is 3,200 tons/day and during the 1969—70 period, 42,000 tons of sugar were produced at this factory.

Before the war, paddy was the rival crop of sugar cane but at present peanuts and asparagus came also into the limelight as sugar cane competition and asparagus production have increased so much that each country has at least one asparagus canning factory.

Sugar is purchased by the Monopoly Public Corporation at the rate of NT\$1,000 per 100

kg. On this amount of sugar NT\$300 is levied as tax and NT\$100 is expended as sundry expenses so that the farmer gets a net income of NT\$600 for every 100 kg. If another crop is found to be more profitable, cane farming is apt to be converted to that crop.

At present the pattern of cane growing is one cycle of "bibit to ratoon", and the growing pattern of "bibit to ratoon to ratoon to ratoon", which was adopted when the N:CO variety was grown, is no longer embraced. The reason why the ratoon is not repeated in the growing pattern is the pernicious insects that attack the roots of the canes and make further shooting of ratoon impossible. F160 is currently the principal cane variety grown.

3) *The Philippines*

Negros and Luzon are the centers of cane growing and sugar production in the Philippines. In this country, cane growing is more profitable than paddy, because under the Sugar Act, the United States is annually buying 1,000,000 tons of sugar at \$175 per ton, a price about double the international quotation.

According to statistics available, the cane yield per unit area was 46.8 tons/ha in 1966 and about 1,650,000 tons of sugar were produced in 1968.

Japan exported sugar plants with a production capacity of 2,500 tons per day to three sugar mills in the Philippines.

4) *Thailand*

The cane yield per unit area was 31.3 tons/ha in 1966. In Thailand, where the canes grown in soils contain too much water, water is too abundant for the cane during the ripening period and for this reason much glucose is produced resulting in more molasses in the stalks which causes the factory yield to drop as low as 10% or less. If the dry season lasts for 5 months, much glucose is also produced and the factory yield similarly decreases.

Cane growing: tomorrow

This section describes what the principal

sugar growing and producing countries of Vietnam, Indonesia, Taiwan and other regions are doing to realize their vision in the future.

1) *Vietnam*

The sugar mill at Hiep Hoa, the only one in Vietnam, is not operating now. The mill is located in the delta area of the Mekong, and as the site is on the lowland, the ground water could not be drained effectively so that much glucose is contained in the raw canes resulting in the low factory yield which is as low as 6% in average. It has, therefore, been considered moving the factory to the Phan Rang area where the soils and other conditions are better suited for growing and production of sugar. The Vietnam Sugar Company has established a production target of 300,000 tons of sugar in 1975 so it plans to move to the Phan Rang area the Hiep Hoa mill equipment, whose capacity is 300 tons per day with bibit farm of 1,000 hectares. In 5 years, a new sugar mill with a production capacity of 4,000 tons per day is being planned.

2) *Indonesia*

Sulawesi and Lampung are the most promising regions for growing sugar cane in this country.

At Arasse in Bone Province in Sulawesi, a government-operated sugar cane farm of 15,000 ha in area has been set up and efforts are being made to have it ready for operation by 1972, multiplying bibits. A sugar mill with a capacity of 2,500 tons per day has been under construction and is now almost completed. The area has enough water and the growing of sugar cane looks promising. The unit production is presumed to be 100 tons per ha so that output of 1,500,000 tons by 6 months' operation is considered possible. The operation of this farm will contribute much to the attainment of 180,000 tons of sugar production.

The government's plans to produce sugar are as follows:

During the 1973~74 period to develop 87,000 ha and produce 907,000 tons of cane, or 10.5 tons/ha in sugar.

3) *Tinian*

The program calls for the development of 4,000 hectares of farm and construction of a sugar mill with a production capacity of 2,000 tons per day.

4) *Malaysia*

Preparation is in progress to build a sugar mill with the capacity of 4,000 tons per day at Penang. Construction at Sabah of a sugar mill with the capacity of 2,000 tons per day is under contemplation but in order to operate the mill economically 4,000 hectares of farm must be secured. But there is some doubt about the possibility of obtaining such a large area of farms for growing canes.

5) *Taiwan*

In Taiwan, it is planned to construct the sugar mills concentratedly in southern Taiwan and produce 3,000 tons of sugar per day.

For successful sugar cane growing and production, the following are the indispensable conditions:

(1) The sugar mill capacity must at least be 2,000 tons per day.

At least 4,000 hectares of farmland must be secured for providing raw materials to the mills. With simple irrigation facilities the farm must produce at least 100 tons/ha of cane and the factory yield must be 12% or more. Thus, the total sugar output must be around 50,000 tons and the production period of 200 days is considered as being adequate.

(2) Protective measure by the government is necessary.

(3) An annual precipitation of 1,500 mm or more is required, but 100 mm of monthly precipitation will suffice. Canes begin to wilt if rainless days continue for 50-60 days. Canes subjected to wilting contain more glucose. During the manufacture more molasses is produced and the yield is reduced to 10% or less. Canes grown in badly drained area also suffer from the same disadvantage.

(4) The temperature must be 20°C in average and the optimum temperature is in the range of 25°C~27°C. Canes do not begin to absorb fertilizer and extend roots at temperatures below 20°C and at 47°C they stop grow-

ing.

(5) It is vital that the soils are best in physical property. Both clayish and sandy soils are also good for the growing of canes though in the last, the soil is apt to dry up easily.

(6) The level of the ground water is required to be below 80 cm. In the case of the 50 cm ground water level the root grows to a length of 60 cm in six months and the plant reaches 150 cm in height, but it stops growing.

(7) The soil humidity should be more than 80% in average.

(8) The yield as well as ripening are affected under the influence of wind and the monsoon. Damage by typhoon to the cane is 24% when the wind velocity is 20 m per second. At Okinawa and Miyako Island, damage by typhoon was around 20% when the wind velocity was 80 m per second. Even when damage is wrought to the leaves, there appears a slight decrease in the percentage of Brix.

(9) Effect of pH of soil: Canes can thrive at 4-8 of pH, the optimum pH being 5.5-6.5. Canes can be grown in both acid and alkaline soils, but those grown on alkaline soil have less sugar content and canes grown on acid soil are rich in sugar content, although it is difficult to refine it.

(10) Effect of irrigation: Cane yield is 70 tons/ha in farms resorting only to rainwater. But under effective irrigation, the cane yield could be increased to 100 tons/ha or more. The amount of irrigation water required for cane growing is about 1/10 of the paddy.

(11) Effect of the length of solar radiation: About 250 hours of solar radiation are required monthly. At Indonesian Pasuruan, the long-range monthly average of solar radiation is about 250 hours. In north Taiwan the same is only 186 hours, and in south Taiwan (at Tainan) it is 217 hours.

In 1968, sugar cane production amounted

to 8,520,000 tons in Asia while the world output totaled 37,174,000 tons. Thus, Asia accounted for 22.9% of the total output.

Asia imports about 5,125,000 tons of centrifugal sugar and exports about 2,125,000 tons; therefore the shortage of centrifugal sugar in Asia totals 3,000,000 tons.

However, at least 10 years are required to fully develop a sugar growing area.

The average sugar consumption per capita is 6.4 kg in Asia, 38.4 kg in Europe, and 18.5 kg in the world. The growth of average sugar consumption in the developing countries is rapid until it reaches the 20 kg level. And it requires about 40,000,000 tons of sugar when the per head sugar consumption in Asia reaches the world average. To attain this level, it is most important to increase the sugar yield per unit area rather than to augment the cane growing area.

More than half of the achievements noted above could be realized if superior varieties could be bred, if adequate irrigation facilities could be provided (just simple system will suffice) and thereby the yield of about 100 tons/ha could be attained, and if the mill could be operated at least 180 days a year. Even in West Germany 2,000,000 tons of beet sugar are being produced. Under such circumstances, it is considered not so difficult in Southeast Asia to produce sufficient amount of sugar to meet its increasing demand.

References

- 1) Humbert, R. P.: The Growing of Sugar Cane. (1963).
- 2) International Sugar Council: The World Sugar Economy. (1963).
- 3) Institute of Asian Economic Affairs: The Sugar Industry in Indonesia. (1960).
- 4) Japan Sugar Year-Book. (1968).
- 5) FAO Production Year-Book. (1966).
- 6) Agriculture, Asia—No. 110. (1970).