

# THE CHANGING ROLE OF SUGAR IN THE TAIWAN ECONOMY

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In 1498 a Portuguese sailor named Vasco de Gama completed a two-year voyage of some 23,800 miles and landed in the Indian port of Calcutta. Being the first Portuguese to set foot on Indian soil, he was asked just what brought him there. His answer was simple and direct, "Christianity and spices.....," the two influences that, at the turn of the 16th century, turned the eyes of Europe seaward and initiated patterns of trade and colonial establishment that have guided, or misguided, much of man's development for the past four centuries.

The spice trade had for some time been a very lucrative trade in Mediterranean Europe, but it had been restricted to overland passage and had become an Indian monopoly on the one hand and a sea-bound Italian monopoly on the other. With the trip of de Gama this was completely changed. The homeground of the spice lands was at last within the reach of the sailing nations of Europe in general and the Iberian Peninsula in particular. The floodgates of the highly competitive and profitable international spice trade were thrown open. And few were the legal or moral restrictions on such trade.

One of the spices that was used sometimes in place of golden gifts in king-to-king exchanges was a product made from the processing of the juice from a giant perennial grass that grew wild in the tropical and subtropical lands of east Asia. Its name came from an Arabic word meaning "gritty" and this well described the flavorful, crudely processed, crystalline substance called "sugar" by the English speaking Europeans. Its sweetness was a boon to the bland diet of the temperate, starch-abundant lands of western Europe. Although it was not one of the most prized spices at the time of de Gama's trip it soon came to be considered a major product in the scramble for productive colonial lands whose exports were to meet the dietary requirements of the affluent, import-oriented Europeans.

Sugar cane was probably first cultivated in the river valleys of India but was not included in any quantity in the overland caravans because the preservative techniques then employed were inadequate to prepare it for the long, hot journey. After trade became prominent between India and marine Europe, plants were taken to the Mediterranean lowlands but the sugarcane did not flourish because of climatic differences. Portugal, realizing the potential in this crop, took samples to Brazil, its newly acquired South American colony, and by 1581 there was an aristocracy and tens of thousands of African slaves being supported by this crop. In that same year almost 4,900,000 lbs. of raw sugar were delivered to Lisbon from Brazil. This was

the genesis of the economic pattern that had tropical, sugar-surplus-producing countries pouring almost all of their resources into the development of a mono-crop export economy that would feed the more affluent non-producing temperate countries. In varying degrees Taiwan has been entangled in this pattern for more than 350 years.

### Sugar In Taiwan

The cultivation and processing of sugarcane has long been an important agricultural and economic activity in Taiwan. To understand the reasons for this it is first essential to know what conditions foster a sugarcane culture and then see how adequately Taiwan meets these.

Presently there are many countries that are able to grow sugar cane, but the number that can grow it in a quantity sufficient to satisfy domestic demand and to supply appreciable surplus amounts for the export market are limited to those that meet certain geographical and economic requirements. The most significant geographical influences are climate, topography and soil. One of the major economic factors is the availability of a highly seasonal labor force of considerable size. Secondary factors are population density and proximity to market. Taiwan is generally favored in all of these considerations.

### Climate

A productive field of sugarcane will absorb a little more than eight acre feet of water in a year of growth. However, not only must the water supply be abundant for the cultivation of high yielding cane but it must be properly distributed. The ideal water sequence for cane is a moisture-abundant growing season but a moisture-free ripening period. This necessitates a short climatic dry season as soon as the cane is mature and a well-drained field if irrigation is used. Should the cane absorb appreciable moisture after maturation the sucrose (the fluid from which sugar is made) content decreases as the cane juices are diluted. In a typical situation a good field of cane will have a sucrose content of about 15% at the time of harvest but if there is a heavy unseasonable rain the content may go as low as 9%, making a considerable difference in the yield of sugar. Usually precipitation amounting to more than 50 inches distributed over a long wet season of some 8 or 9 months is sufficient for moderately high-yield cane production. For maximum production irrigation is employed to bring the total water absorption to about 100 inches per growing year. Sucrose content diminishes proportionally with the decrease in water available during the growing season.

A secondary factor to be considered in the event of rain during the harvest season is that most of the cane is transported for some distance by animal drawn carts. With a high clay content in much of the cane-growing soils this becomes a real problem for the rain may slow down considerably the process of harvesting. This increases the possibility of the cane souring in the period between cutting and juice extraction.

Because of the dual detrimental effect of precipitation during the harvest period, the wet tropics are eliminated from consideration as major sugar producing regions.

Coupled with the need for adequate precipitation is the necessity of having enough sunlight and heat. The mean annual average of the best cane-growing lands is about 24°C. or 75°F. It is essential that there be no danger of frost and not more than one or two months should have an average temperature below 19°C. (66°F.) The south-west quarter of Taiwan meets these demands generally with the exception that the crop lands in Taichung and Changhua Hsien have a longer "cold spell" than optimum conditions would prescribe. The heat is best suited to cane growth if it occurs with a high percentage of humidity, thereby preventing excessive evaporation. This enables the cane to use a greater amount of the moisture available. The Taiwan cane area also meets this requirement.

Since the job of harvesting cane (in non-mechanized production) requires a sizable amount of manpower working under crowded and strenuous conditions, the relief provided by the relative coolness of the winter season is of considerable importance. Hence the island is benefitted doubly because the cool, dry season both increases the sucrose content and improves the harvesting conditions. Taiwan is further aided by the steady invigorating winds of the winter season that blow across the Taiwan Strait from the continental interior of the Mainland.

**Table 1 Climatic Data for Representative Sugar Cane Area Stations (1)**

	Taichung												Annual
	J	F	M	A	M	J	J	A	S	O	N	D	
Prec. *	1.55	2.67	4.26	5.13	9.40	14.7	11.6	14.0	5.36	.89	.66	1.14	71.52
Temp. #	15.8	15.8	18.4	22.1	25.3	26.9	27.8	27.5	26.7	23.9	20.7	17.4	22.4
	Tainan												Annual
Prec.	.74	1.42	1.90	2.80	7.40	15.6	17.5	16.9	6.56	1.42	.69	.75	73.71
Temp.	17.1	17.2	19.9	23.4	26.4	27.4	27.9	27.6	27.2	24.9	21.8	18.5	23.3
	Kaohsiung												Annual
Prec.	.34	.78	1.44	2.12	6.52	19.0	22.7	14.4	5.30	1.57	.79	.76	75.76
Temp.	18.9	19.3	21.8	24.6	27.2	27.7	27.9	27.7	27.6	23.8	23.4	20.2	24.3

\* Precipitation is a yearly total in inches.

# Temperature is Normal Air Temperature and is an average in °C.

(1) Data adapted from Taiwan Weather Bureau

Another factor that is important in the consideration of climate is that the summer typhoon tracks are non-westerly. If Taiwan were so structured that the open, low-lying crop lands were fully exposed to the late summer and fall storms, the cane would suffer from considerable breakage and would sour before the salvaged stalks could be processed. Cuba, the world's largest exporter of raw sugar, is frequently plagued with wind problems because of the lack of wind-moderating mountain barriers of any

consequence.

Taiwan's favorable climatic conditions are summed up in the following precipitation and temperature statistics for stations in the major Taiwan sugarcane growing areas.

### Topography

A second important consideration in the cultivation of Sugar cane is the topography of the area in question. The growing of cane involves a great deal of bulk transportation which must be both rapid and far reaching. Therefore the best land for cane production is a lowland that is level to gently rolling and affords a good bed for a narrow guage railway network. This network is especially important because sucrose is temperamental in its reaction to air after the cutting of the cane. Therefore it is necessary to extract it within 24 to 48 hours. Any longer period, generally, between cutting and crushing results in a souring of the cane and a loss of sucrose content. The structure of the western third of Taiwan is ideally suited for such a transportation system and the Taiwan Sugar Corporation (T. S. C.) now has a total of over 3000 kilometers of narrowguage railway line that feeds the cane from 95,000 harvested hectares to the 26 scattered crushing mills.

This level land is also significant in view of the fact that eventually the cane production might be mechanized. Presently in Louisiana over 90% of all the cane tending is machanized, including the cutting, thereby reducing the dependence on seasonal man power. In Taiwan, however, the labor surplus definitely limits the possibility of early mechanization of the production and results in a high man hour per unit of production ratio.

### Soil

Because of the increased use of commercial and organic fertilizers the importance of soils in the production of sugarcane is decreasing. In Taiwan, however, the yields are still not influenced by fertilizer to any great extent so that the underlying soils are locally important. The ideal soil for a sugarcane field is a friable, well-drained limestone soil. In Indonesia high yields come from rich basic, fertile volcanic soils. Since the western third of Taiwan was beneath a shallow sea prior to the Pleistocene Era there are isolated areas of marine deposition which are high in clays and calcereous materials. These have been both denuded by subsequent erosion in some places and covered over with detrital material carried by the expansive westward flowing river system in others. The dozen or so rivers that have deposited the majority of this alluvial soil head up in the mixed metamorphics and sedimentary rocks found on the western flank of the central mountain range. Because of the varied composition of the source area the alluvial soils are heterogeneous and their profiles and constituents differ considerably from place to place. Generally these alluvial soils are the most productive in Taiwan because of their workability and localized nutrient-rich contents.

These are the soils that support most of the cane land on the western side of Taiwan.

Two groups of soils that have the same favorable level, lowland topographic advantages are less productive than the alluvial soils because of particular composition. One is the Planosols group that is made up primarily of marine deposits. Although the top layer of the soil is often workable and light textured, the clay pan in the immediate sub-layer is so dense and non-porous that it discourages all but the most vigorous root growth. One of the recent innovations in the campaign to make this land productive is the planting of sugarcane in between the rows of wet paddyrice. The moisture content of the soil enables sugarcane roots to develop a satisfactory hold and when the ricepaddy is drained and the soil hardens the rice is harvested. During the dry season, however, the cane continues to grow (although with a low yield) and gives the farmer some return on his land. Prior to this program (which is not yet extensive) the land lay in disuse during the dry season and produced only a poor rice yield in the wet season. It is too firm in the low-rainfall season to even permit the growth of a green manure crop. The cane not only makes the soil more productive but it adds necessary organic matter to the A-horizon and increases the overall friability of the land. The main distribution of these planosols is on the inland side of the Chiayi-Tainan-Kaohsiung Hsiens. Total acreage is estimated at 30,000 hectares.(1)

Another problem soil in the climatically favorable cane area is the "Solonchak." This is a saline soil. This is a larger band of land that is on the sea side of the planosols region and its width averages 3-12 miles and it usually edges on the sea. There is a total of almost 50,000 hectares. These soils are influenced by the high water table in the coastal area, basic parent rock, and salt water action in the tidal flat region. (2) The result is that the soils become too alkaline and require considerable use of fertilizer or thorough drainage. The lands now on the very edge of the coast are used either for salt flats and the production of salt or for fish culture. When these soils are treated so that they are no longer too saline, they become productive and can host the same variety of crops as the lowland alluvial soils.

### Labor Requirements

This brings into focus another major factor in the successful production of cane. Historically cane has been a crop produced with a minimum of labor except for the cutting season. When demand was not as high as it is presently, or competition was not as keen, high yield per acre was not sought for as much and weeding was the major occupation of the cane grower during the growing season. With the emergence of increasing competition and the need to develop quick-maturing crops, there has been much manpower added to the production of cane in highly developed cane-producing

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1. *Natural Environment and Crop Distribution in Taiwan*. H. T. Chang, Chinese-American Joint Commission on Rural Reconstruction, Taipei, 1957. Pg. 15.
  2. *Ibid*, pg. 17

economies. Use of fertilizer, irrigation, insect control and more thorough weeding are but a few of the demands on the most modern sugar-producing farms. In Taiwan, however, this intensive cultivation is still not wide spread and the majority of the sugar farms still need only about 1/4 of their cutting force during the growing year.

Therefore one of the prerequisites of successful sugarcane production is a labor surplus that can fill this seasonal demand for manual labor. The cutting season for cane workers is usually between 90 and 100 days long. In economies where these workers are squatters on the fringes of urban centers or men who are not owners of their own land, there evolves a considerable social problem with the support of this segment of the population in the non-cutting season. Cuba will ever be the classic example of the sugar economy that failed to provide a means of support for almost 25% of its labor force in the non-cutting season. In Taiwan, however, this problem is not as drastic.

Much of the sugar land is on T. S. C. contract to individual family farmers who utilize large family units for labor. Many sugar growers also have other crops and have not invested all of their resources of land and capital in cane. This micro-diversification enables the farmer to remain solvent during bad cane years or during the long period of growth when there is no cash return on cane.

There remains, nevertheless, the dual problem of extending credit to those marginal farmers who are completely reliant on cane (those who therefore need cash during the growth period) and of providing job opportunities for the semi-itinerant or marginal labor force that does not have a private plot of productive land to fall back on. The latter problem is alleviated by the high labor demands of wheat and rice that follow cane harvesting and the historical unity and largeness of the Chinese family that seems to manage always to keep some members in productive sectors of the economy.

### Market

As in the production of all goods for export it is highly important to have a stable market for the product in question. With sugar it becomes even more necessary because of the increasingly political nature of the market and diminishing reliance on purely economic factors. The fact that quotas can be shifted, disregarded, and inaugurated with only token heed paid to bare economic factors is highly important. Although the marginal propensity to consume refined sugar in its primary form is low, in its secondary form as foodstuffs it is quite susceptible to recessions and economic dislocations in the country of purchase. This fact can also work positively. Added to the uncertainty of sugar exports is the problem that many of the major producing countries of cane sugar have evolved into one-crop economies, or at least one-crop exporters, with secondary exports seldom amounting to 50% of the value of the raw sugar exported.

The obvious reaction to a situation of this sort is dual diversification: both in domestic products exported and in market countries. Taiwan is now attempting to do

both.

### Outline of the Role of Sugar in the History of Taiwan

When the Dutch came to Taiwan in the early 1620's they found a flourishing trade going between the island, the Mainland and Japan. Taiwan was supplying most of the sugar for North China and Japan. In 1624 the Dutch, attempting to consolidate their power in the southern part of the island and establish a hegemony in the highly remunerative trade between Europe and the Orient, put a tax on the exportable sugar in the hope of weakening the position of the Japanese, who were then the main traders. Even in view of this tax 4836 metric tons of raw sugar were exported in 1625 to Japan.<sup>(1)</sup>

Even if the Dutch had formulated their mid-19th century "culture system" (which was so productive in Java after 1830) it is doubtful that Taiwan sugar would have entered the market scene in Europe to any great degree. It might, however, have produced sugar at a price that would have stimulated the Chinese and the Japanese to a higher per capita sugar consumption, the former having always had one of the lowest consumption rates in the world.

With the removal of the Dutch in 1662 by the aggressive, anti-Manchu, Koxinga and the subsequent immigration from Fukien province of new cultivators and strains of cane, the sugar industry improved still more. Most of the population that dealt with sedentary agriculture was situated in the southern part of the island, the area most favorably suited to the growth of sugarcane. Through the combined efforts of Koxinga and his eldest son, Chêng Ching (who immediately followed him on the throne) sugar production was increased and was to a degree, modernized. However, because of the political estrangement between the Mainland and the government of the first two Chêngs on Taiwan, trade decreased with North China and this tended to diminish the value of the work done by the local government in cane sugar production. Trade with Japan was also increasingly difficult with her movement toward isolation and trading restricted to Nagasaki.

With the improved relations between the Manchus and Taiwan after the death of Chêng Ching in 1683 trade again increased and by the early part of the 18th Century production was doubled.<sup>(2)</sup> By the middle of the 18th century there was a steady trade between North China and Taiwan that utilized more than 400 vessels in the transport of raw sugar to the Mainland.

The trade took on a more varied aspect in the dozen years between 1872 and 1884 as export destinations included England, Australia and the United States. After 1884 various legislation in the United States and market changes in England and Australia returned the Taiwan sugar production to Japan and to the recently opened market in

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1. *The Island of Formosa*, J. W. Davidson, Bock World Company, Taipei Reprint from 1903 edition, Pg. 15

1. *Ibid.* Pg. 445.

Hong Kong.

Note the instability in the pattern of production between 1625 and 1899.

**Table 2 Raw Sugar Produced in Taiwan for Export for Selected Years**

**Between 1625 and 1899 ( 1 )**

<i>Year</i>	<i>Metric Tons</i>
1625	4836*
1725	7100
1856	9672
1870	36,270
1874	41,488
1876	53,233
1878	25,000
1880	64,332
1884	58,483
1886	23,580
1896	43,632
1899	31,154

\* Partial total—this is the amount exported only to Japan.

(1) Adapted from Davidson

### **Sugar Production under Japanese Rule**

When the Japanese took possession of Taiwan in 1895 after the Treaty of Shimonoseki, they found a land well suited to the production of a product that they were unable to grow in any quantity on their home islands. Sugar had long been one of the major imports of the Japanese and although their per capita consumption of sugar was low (about 11 lbs. per person per year in 1900) it was more than six times that of the Chinese. Therefore the interest in the Taiwan sugar industry was considerable and much money was invested in a thorough examination of the suitability of the land and climate, the methods of cultivation, and the production of the raw sugar. It was found that, by replacing the crude stone and wooden grinding mills with modern electrically driven steel cane crushers, production could be increased as much as 40% with the same cane output. If, in addition to this, cropland planted in cane was increased and improved types of cane were introduced the sugar production of the island could be doubled without a restrictive capital outlay. In view of this the Japanese had seven American crushing mills operating on the island by 1903 and, by 1909 Taiwan was producing more than 3% of the world's total export cane sugar(1). This amounted to 241,263 metric tons of raw sugar. Following this there was a steady expansion of the

1. *A Commercial Geography*, D. Stamp, London School of Economics, 1958, Pg. 59



Taiwan sugar industry. From 1931 to 1935 Taiwan produced an average of 1,209,016 metric tons of sugar for export per year or 8% of the world's total production. In 1938 1,379,000 metric tons were produced but the majority of the production stayed in the Japanese colonial empire. (See footnote) It is interesting to see the pattern that evolved from the relationship between the Japanese per capita sugar consumption and their political control over Taiwan.

**Table 3 Relation between Taiwan Sugar Production and Japanese Consumption for Selected Years ( 1 )**

<i>Year</i>	<i>Production</i>	<i>Year</i>	<i>Consumption</i>
1900	35,000*	1900	11 lbs./person/year
1909	241,236	1909	13 " " "
1918	650,000*	1918	15 " " "
1934	1,209,016	1934	31 " " "
1948	290,028	1947-48	1.6 " " "

\* Values estimated from known production totals before and after

Note: Production is metric tons of canesugar

(1) Compiled from Cressy (a) and Woytinsky (b) and Davidson

(a) *Asia's Land and People*, Geo. B. Cressy Mc Graw Hill Book Co, New York, 1944

(b) *World Population and Production*, W. S. Woytinsky & E. S. Woytinsky, The Twentieth Century Fund, New York, 1953

The increase, under the Japanese, in land planted in cane was also considerable. By 1938 167,394 hectares were being used to grow sugar cane. By 1945 this total had dropped to 107,676 hectares and in the confused postwar period the cropped land went down to 29,905 hectares (2) Production decreased accordingly and even as late as 1951 the total cane sugar produced amounted to only 350,716 metric tons.

Footnote: The seeds of this colonial empire were in part laid in the 17th Century when the Japanese introduced a more vigorous sugar cane production program. The fact that cane could not, like rice, be grown, processed and consumed by the basic agricultural society, but demanded the presence of a middle man that could process and export it might be construed as more than just the satisfying of an economic need. It put the Chinese farmers in a position of dependence on the Japanese. The Japanese hegemony in the sugar trade is partially shown by the fact the Chinese did not balk at the tax the Dutch imposed in 1625 while the Japanese became very irate,

2. Free China Industry, vol. XVII No. 2, Feb. 1962, Pg. 69

It is interesting to note the change also in average crop yields per acre of sugar-cane land for selected years.

**Table 4 Sugar Cane Crop Yields Per acre for Selected Years ( 1 )**

<i>Year</i>	<i>Hawaii</i>	<i>Indonesia</i>	<i>Taiwan</i>
1903	30	34	12
1938	61.1	51.5	25.8
1948	68.0	51.5	20.6

Note: Yield is metric ton of cane per acre.

(1) Compiled from Davidson, and Woytinsky and Taiwan Sugar Statistics, 1960

### **PostWar Sugar Production**

By 1953 the Taiwan yield had been raised to 29.4 metric tons per acre. With the increasing yield per unit Taiwan also has been changing the planting pattern. In some locales the conditions are so favorable for cane that after the first planting and harvest there is no need to plant cane again for the next crop develops from the same root system. The second growth is called a "ratoon." Cuba for example is able to get as many as 8 ratoons from one planting of cane but the average yield is only 15-17 metric tons per acre for the ratoons. In Indonesia because of the great demand for arable land a crop is harvested and then the field is put into some more rapidly maturing cash crop; but the yield per acre is over 50 tons of cane. (This high yield is due to a combination of factors including rich, volcanic soils, fertilizer, and strains of very productive cane). This ratoon system is particularly important since the initial planting takes almost 15% of the harvested crop as sugar cane is not planted by seed but rather by section of stalk. This planting is the most expensive item in the cultivation of sugar cane.

Because of the introduction of increasingly hearty and productive types of cane, Taiwan sugar farmers have been leaving an increasing amount of land in ratoon growth without restrictive loss in yield per acre. (Generally the yield decreases a certain amount with each successive ratoon harvest.) The crop in Taiwan is usually only extended for one ratoon and then the field is plowed and replanted. In addition to this the length of the growing season for cane has been decreasing steadily through improvement in the types of cane planted. In 1948 the average crop length time was 18 months and 20 days. In 1960 it was just a little less than 14 months in the most favorable areas.<sup>(1)</sup> In the northern croplands (Taichung Hsien and parts of Changhua Hsien) the cycle is still about three years long with the first harvest coming 18 months after the initial planting and the ratoon being harvested 12 months after this.

### **Role of Sugar in Taiwan Post War Economy**

What, then, has been the effect of this improvement in the growing methods emp-

1. *T.S.C.Today* Taiwan Sugar Corporation, 1961

loyed in Taiwan? What role has sugar played since the post-war change of hands and concentration of resources in Taiwan? If we study the decade between 1950 and 1960 we see that sugar has continued to play a very important role in the export economy of Taiwan. Not only has the absolute value been great but the proportional value has been particularly high. There has not been a year that sugar has amounted to less than 40% of the total value of exports and it has usually been over 50% of the total. The second most important export item, rice, has been dwarfed by the predominance of sugar. In addition, the export picture of rice is considerably altered by the fact that recently there has been a net import of rice and the majority of the rice exports are not surpluses at all but sale of a superior commodity which is subsequently replaced by a suitable, but inferior, commodity. Note the charts below that show the relative positions occupied by the items in the Taiwan export market from 1950-1960

**Table 5 Percentage Value of Exports of Sugar, Rice and Pineapple  
in Relation to Total Taiwan Exports (1)**

<i>Year</i>	<i>Sugar</i>	<i>Rice</i>	<i>Canned Pineapple</i>
1950	79.7%	3.0%	0.12%
1951	53.5	16.2	1.70
1952	58.8	15.2	1.90
1953	67.2	10.5	1.92
1954	58.3	7.7	4.23
1955	49.8	23.3	4.24
1956	52.2	14.0	4.96
1957	62.3	12.0	2.77
1958	51.8	16.9	4.39
1959	40.6	14.9	4.97
1960	44.1	3.0	4.79

(1) Compiled from Taiwan Sugar Statistics, 1960

*Free China Industry* February, 1962

In correlation with this it is important to see the world market price of sugar during these same years and observe the trend that is inferred by these prices. Since almost 80% of the sugar in world trade is controlled by various international agreements and only a fifth is really on the free market the price becomes not so much a guide to actual sale price (which is unrealistically adjusted to various agreements, both domestic and international) as it does a harbinger of surplus or deficiency in world production.

As was clear in 1958 and 1959 and even more so in 1960 there is, in relative terms, a decreasing demand for sugar. There is little possibility that this immediate trend will grow brighter in the near future because of the increased production in many Latin American countries that have been given part of the previously Cuban quota in the United States sugar market. In addition to this, Cuba, the world's largest sugar producer

for the export market, has still by and large a mono-crop economy and has already contracted to export some 6.2 million metric tons of raw sugar in 1962. This can only continue to depress the markets. Cuban cane production has increased and by November of 1961 Cuba had already exported 5,260,226 metric tons of cane sugar.<sup>(1)</sup> This is an increase of almost 600,000 metric tons over the total 1960 sugar exports. The very magnitude of Cuba's crop was the indirect cause of the break up of the U.N. Sugar Conference in Geneva last December. With the collapse of market controls (which are established periodically by the U.N.) the price of sugar dropped even lower and in February of 1962 the world price was 2.26 U.S. cents per pound. This is the lowest price on the world market since 1941.

**Table 6 World Sugar Prices from 1949-1960 (2)**

<i>Year</i>	<i>Price per pound U.S.\$ cents</i>	<i>Year</i>	<i>Price per pound U.S.\$ cents</i>
1949	4.16	1955	3.24
1950	4.98	1956	3.48
1951	5.67	1957	5.16
1952	4.17	1958	3.50
1953	3.41	1959	2.97
1954	3.26	1960	2.71

(2) From F. O. Ficht's World Sugar Statistics, 1960

These facts have dual significance for Taiwan because not only will increased world production further depress the market and make it even harder to sell the island's main export commodity at a good price, but, and almost more ominous, Japan (after the USSR and Communist China) was the largest buyer of Cuban sugar.

### **Taiwan Sugar in United States Market**

One of the most common reactions to the preceding lugubrious view of the world sugar market and its immediate future in Taiwan is that the United States will buy increasing amounts of Taiwan sugar, thereby alleviating the local situation. However, if one looks at the U.S. sugar situation with care, it will soon be seen that there is not that much room for either Taiwan sugar or optimism.

The United States is producing more sugar now than ever before and last year, for the first time in 8 years, there were no restrictions placed on beet sugar production or cane production in the continental U.S. In 1961 the United States territorial and domestic producers fulfilled 53% of the needs of the nation. Presently in Congress there is a powerful lobby demanding 62% of this vast market for domestic and territorial producers in 1962. To better understand the picture it is necessary to see the changing face of

1. Hispanic American Report, Feb, 1962 Pg. 1091

the U.S. sugar quota and non-quota purchases for the past two years.

**Table 7 Continental United States Sugar Supply Supplied from  
Selected Countries (1)**

<i>Place of origin</i>	<b>1960</b>		<b>1961</b>		<b>1962 (first half)</b>	
	<i>Quota</i>	<i>Non-Q.</i>	<i>Quota</i>	<i>Non-Q.</i>	<i>Quota</i>	<i>Non-Quota</i>
Domestic Beet	2,164,692		2,608,000		1,032,931	
Mainland Cane	619,047		750,000		317,843	
Puerto Rico	895,784		980,148		602,780	
Philippines	979,783	175,062	962,651	392,513	490,000	175,655
Peru	140,012	135,000	122,692	503,737	49,928	280,070
TAIWAN	4,173	6,267	3,980	166,046	1,842	23,158

Note: Quantities are in short tons of raw sugar. Non-Quota means allotments above and beyond Quota.

(1) From personal correspondence with the U.S. Department of Agriculture March, 1962

Hence we see that although demand has gone up for sugar to fill the gap left by the discontinance of an annual import of almost 3 million metric tons from Cuba there is little chance that Taiwan will find a place in the U.S. market that will warrant an expansion in her sugar industry. Her handicaps are both geographic and political. The United States Congress finds the elasticity of the present sugar arrangement has great political potential in highly changeable Latin American politics and is disinclined to free too big a sector to any Far Eastern producer except the Philippines, and this again is a political consideration in many ways.

### Taiwan Sugar in Other Markets

A study of the pattern of the other Taiwan sugar markets is equally as interesting. Studying the destination of the exported sugar for the three years from 1957 to 1959 shows a wide geographical spread which can be seen below.

**Table 8 Taiwan Sugar Exports by Destination: Selected Countries (1)**

<i>Country</i>	<b>1957</b>	<b>1958</b>	<b>1959</b>
Japan	329,643	282,735	352,597
Malaya	82,550	54,550	10,580
Ceylon	33,250	20,110	----
Iran	111,694	184,535	138,550
Hong Kong	46,121	21,161	21,215

Note: Amounts in metric tons of raw sugar

(1) Compiled from Taiwan Sugar Statistics, 1960

The one pattern that can be discerned here is that the market is far from stable. Besides Japan, the only really constant purchaser of consequence was Iran and its

demand decreased almost 50,000 metric tons in one year. That is almost twice the amount allotted to Taiwan by the United States for the first half of 1962.

A second major consideration is that Taiwan is the world's second largest raw sugar exporter in the free market. This means that instead of getting an agreement-bound preferential rate ( the U.S. rate is now 6.40 cents per lb.) for much of its sugar, it must accept the going world price (between 2.26-2.48 cents per lb.) Various secondary factors bring the price disparity to about U.S.\$55.00 per metric ton. Therefore, with a decreasing free market price and an increasing surplus of sugar on the world market and an air of uncertainty as to where several million tons of Cuban sugar will go each year, there is need for real consideration before planning sizable expansion of the Taiwan sugar industry.

It is seen there are three possible programs for the sugar industry in Taiwan. One would be an expansion of both production and land planted. Because of the market situation and the pressing need for agricultural land in Taiwan this plan is discouraged. The second program would be one of reduction of lands and production. The success of such a plan would depend on the replacement program for the land and the employees. Also to be considered is the value of the crops that would replace sugarcane. Possible replacements will be considered below under the third program.

The third alternative is to cut back on land utilized in cane production but, using the many and effective resources of T.S.C., maintain or even slightly increase production through higher yields per acre of planted cane. This program, if instituted effectively, would have the dual benefit of freeing more land for other necessary and desirable crops while continuing to meet present demands for raw sugar and allowing for a minor increase in demand. It is this program of changing land usage patterns that will be discussed.

### **Proposed Changes in Land Usage Patterns**

It is evident that there is a need for non-sugar agricultural land to be increased. This will have to come, in part, at the expense of present sugar lands. A decrease in the amount of land planted in sugarcane will necessitate intelligent use of the additional land to avoid any loss of income and or social maladjustment. How can this transition come about? First, the uplands in the cooler marginal regions of north central Taiwan should be taken out of cane and put into good local cash crops such as cassava and sweet potato. These crops find ready, local markets and have a good future because of the feed requirements in the growing meat industry on Taiwan, and, in the case of cassava, growing export demands. With the growing population this usage pattern looks as though it will be more profitable than marginal cane production, i e. cane from low yield per acre lands, and has the additional attraction of being both a good feed market crop and also fit for human consumption. It is also to be noted that new strains of cassava have been recently imported from Brazil by the Nationalist government and

turned over to T. S. C. to stimulate increased production.

With uplands on the eastern side of the island that are warm and well-watered the logical replacement would seem to be another export crop, namely, pineapple. There has been a growing export market in the past 18 months particularly and the past 4 years in general (see Table 5) and with the network of transportation already established and the T.S.C. cannery at Taitung, this replacement should prosper.

The last, but major, replacement suggested here is rice. The major geographical characteristics that are favorable to sugarcane production are also beneficial to the growth of paddy rice. Rice does not do well in the uplands, where cane will grow with moderate success, but in the lowlands there is constant competition between these two products for well-watered, warm, level lands. Therefore rice should be given priority in the mutually productive areas and sugar should be grown more intensively on secondary fertilized lands. In response to this there has been a shifting land pattern south of Taichung Hsien in the planosols region (see above) and cane has taken over in places where the rice yield is prohibitively low. In response to other land demand saline soils north of Tainan have been pulled out of cane production and used for other crops (not necessarily rice) and salt flats.

In these mutually suitable areas the final decision on whether to grow rice or cane, however, will rest on the marketability of each. Presently there is more incentive to cultivate rice in view of the increasing demand for domestic and export rice and the declining demand for raw sugar. The government, through the Taiwan Sugar Corporation, is faced with the problem of attempting to maintain present production rates with decreasing acreage. This need for higher yield is the second part of the suggested program for future Taiwan sugar production.

### Future Government Plans for Sugar Production

#### A. Projected Production

The Nationalist Government has recently released a program dealing with the various agricultural aspects of the next four years. Note the projected production schedules for three of the crops that have come into discussion in the present paper.

**Table 9**      **Targets for Three Selected Crops under the Third  
Four-Year Plan (1)**

<i>Crop</i>	<i>1956*</i>	<i>1960</i>	<i>1961</i>	<i>1962</i>	<i>1963</i>	<i>1964</i>
Rice	1,789,829	2,000,000	2,050,000	2,110,000	2,170,000	2,260,000
Sugar	767,328	857,000	857,000	860,000	865,000	870,000
Canned	83,056	136,000	137,000	140,800	155,600	166,400

Pineapple

Note: Amounts are in metric tons.

(1) From A Summary of Draft Third Four-Year Agricultural Development Plan

\* 1956 figures are production figures. All the rest (incl. 1960 and 1961) are targets.

B. *Fertilizer*

This production increase in sugar cane is to come with a slight decrease in land planted, hence requiring an increase in yield per acre. One of the major factors in this improvement will be the increased use of fertilizer, which in turn will demand an increase in the imported and locally produced chemical and organic fertilizers. However, when the projected targets for chemically produced fertilizer (most commonly used with sugarcane) are studied there seems to be an insufficient amount scheduled for supply. Note the following table.

**Table 10** Projected Fertilizer Utilization (1) for Sugarcane

<i>Fertilizer</i>	<b>1960</b>	<b>1961</b>	<b>1962</b>	<b>1963</b>	<b>1964</b>
Nitrogen (N)	19,655	21,000	21,000	21,000	21,000
Superphosphate (P <sub>2</sub> O <sub>5</sub> )	2,520	3,100	3,100	3,100	3,100
Potash (K <sub>2</sub> O)	5,400	6,000	6,000	6,000	6,000

Note: The unit is the metric ton. All figures are targets.

(1) From *A Summary of Draft Third Four-Year Agriculture Development Plan*

The further uncertainty of this increase is seen when we note the fact that the Development Plan assumes the 1960 targets have been reached in both total production and in yield per acre of cane land. The magnitude of the error becomes evident when we see that present yield per hectare averages 8,883 kg. instead of the planned 9,528 kg. which was the target production for 1960. Therefore the gap to surmount in the third four year plan is not from the assumed yield of 9,528 kg. per acre to the projected 9,729 kg. (an increase of 198 kg./hectare) but rather from the present yield of 8,883 kg. (or up 846kg./hectare.) This makes the necessary increase 4 times the projected increase. (See Footnote)

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Footnote: The average yield per hectare for the for the four years preceeding 1960 was above the assumed 9,528 kg. / hectare. Should the 1961 crop yield come back to the 1956-59 averages the projected targets will be more easily realized and this entire observation may be invalidated. However, the effects of the floods and droughts that lowered the 1960 crop yield will not be easily eradicated. According to early TSC reports (personal correspondence, April 1962) the 1961 yield is not favorably high. Therefore, in addition to using fertilizer to build up marginal cane lands for more intensive cultivation, there will be a demand for it to replenish previously devastated croplands. Hence, the basic thesis that future fertilizer demands may exceed projected supply stands.



### Further Government Plans for Improvement of Sugar Industry

#### C. *Government Aid*

The Development Program goes on to discuss other means of improving the sugar industry with the "strengthening (of) the management of the TSC owned farms --- enforcing supervision over contracted sugarcane farms and offering technical assistance--" There is a considerable research program going on under the auspices of T.S.C. and, if the fruits of such work can be applied to the contract farms (which amount to almost 70% of total production) as well as to the company farms there will be definite progress. Some of specific programs to be promoted by T.S.C. are paraphrased below.

#### D. *Intercropping*

Stimulation of intercropping and marginal use of cane land for secondary products is being promoted to give income to the small farmer who does not have the resources to wait the 14-16 months necessary for his cane to mature. Some of the crops that are being considered for this intercropping are soybeans, peanuts, and cotton.

#### E. *Improved Cane Varieties*

Introduction of quicker-maturing varieties of cane that will produce more often but will not go down restrictively in yield per unit planted is planned.

#### F. *Soil Improvement*

The liming of acidic soils and the addition of sand to soils that have too high a clay content would add previously non-productive land to the total available for production of various crops.

#### G. *Pineapple Increase*

The promotion of more extensive pineapple growing. There was a very pronounced increase in the export of canned pineapple in 1961 and the outlook for the future market is positive. Since T.S.C. is the major influence in the pineapple industry it should be possible to shift some lands from the production of sugar to pineapple. Pineapple will grow on much more rugged terrain and might also increase the demand for domestic sugar if a market for canned, sweetened pineapple were found.

Therefore the sugar phase of the Development Plan has both strong and weak points. With a total annual projected increase of over 250,000 metric tons in total production in four years with no increase in land planted there will have to be a much more efficient use of the present land and reliance on fertilizers and new types of cane. At the same time there is an awareness for the need of reducing the role of sugar in the export economy of Taiwan.

### Conclusion

It is seen that Taiwan geographically is well-suited to the production of sugar cane and this crop deserves to occupy a place of definite importance in the economy of the

island. The growth of the industry shows clearly that a combination of favorable factors exists on Taiwan.

However, breaking away from dependency on one particular export product for foreign exchange is a sine qua non for the establishment of a stable and advancing economy. Therefore, in the present situation it has become increasingly advisable to alter the economic pattern that permits the domination of the export market by one crop. It is this position that sugar has had historically and that the government, through its sugar monopoly, the Taiwan Sugar Corporation, is trying to modify. While attempting to maintain production of sugar sufficient to meet both foreign and domestic demands, moves are being made to consolidate the cane-growing lands and put more well-watered, fertile lands into other crops, some of which are cassava, sweet potato, rice and pineapple.

Hopefully, by progress in the direction of diversification, a stable economy can be attained that will rely not primarily on one product and one market, but on many products finding buyers in many markets.

## 糖在臺灣經濟中的地位與目前的問題

蔗糖在遠東國家自來就是重要農產物之一。當殖民地在遠東一些地區成型後，蔗糖的地位益形重要。它甚且開始發展一特殊經濟型態，影響一些熱帶與亞熱帶國家的經濟。臺灣的蔗糖就是有這種影響力的。

臺灣在地理上很適於甘蔗的生產。無論氣候與土壤都甚合要求。因為產物需要大規模的運輸，地形的條件也很重要，而收穫季節也需要大量低廉人工。臺灣的情況都能符合這些要求。

糖業出口經濟一個必要的條件，就是固定的市場。以前，臺灣的糖供給中國的北部與日本。在日據時代，日本極力使生產現代化，所以到一九三一時，臺灣出口的原料糖曾佔世界的百分之八。這種情況到二次大戰時停止，現在正逐漸恢復。

今天限制臺灣糖產量的兩大因素是：較大固定市場的缺乏與其他作物對良好耕地的日漸需要。美國在目前似尚無向臺灣購買大量糖的可能，而原是臺灣最大市場的日本，正逐漸增加向古巴的購買量。在目前自由市場糖價走下坡時，固定市場是非常需要的。

現在政府正施行的削減基地面積而同時維持糖產量的政策有其優劣點。總之，政府在決定增加基地或糖量前對一些問題必須慎重加以考慮。本文的目的即在說明這種考慮的必要性與提出解決問題的一些可能途徑。