



A study on the guaranteed sugar price in Taiwan
by Chwei-lin Fan

A THESIS Submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree
of Master of Science in Agricultural Economics
Montana State University
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Abstract:

This report reveals farm survey research applying to the guaranteed sugar price in Taiwan. The minimum guaranteed sugar price is determined on the basis of survey data furnished by the Taiwan Sugar Corporation and is announced by the government prior to the period of planting of each cane crop year. Since 1957 the sugar support price in Taiwan has served as a reliable method for the government's sugar-price policy making and has also been broadly welcomed by most cane growers as a guidance for their farm planning.

Part I presents some basic facts about Taiwan's agriculture. Part II reviews the history of fluctuating income and rice-sugar cane competition in Taiwan. Part III describes the research problem from standpoints of the government, the Taiwan Sugar Corporation, and the cane producers. Part IV points out the objectives and procedures of the study. The aims of the guaranteed sugar price survey are to stabilize the local sugar industry. Part V shows the hypotheses used by the Taiwan Sugar Corporation in the study which was used as the basis for the government's announced guaranteed sugar price. The hypotheses are that as the result of the guaranteed sugar price are: (1) farmers will prefer to plant sugar cane, (2) the Taiwan Sugar Corporation might obtain enough raw cane material to operate the sugar factories, and (3) the government can maintain at least the past, level of foreign exchange earned by sugar export.

Part VI contains the presentation of data and analysis of the effect of the price program. This is the heart of the paper. This part includes the model used for computing the guaranteed, sugar price analysis of the number of sampled farm families and the acreage of planted cane, and the three years' results of the study of guaranteed sugar price for different head sugar factory areas and fields. Part VII is a summary and conclusion of the study. The guaranteed sugar price can be used to insure a level of sugar cane production which will at least maintain the present level of sugar export. However, because one guaranteed sugar price is announced for all areas and all field types, some re-location of sugar cane production on Taiwan can be expected.

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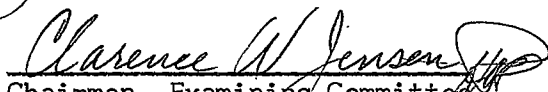
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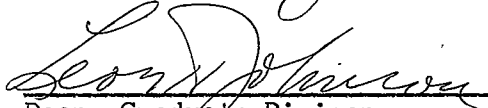
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Any errors or omissions in this study are the responsibility of the author.

ABSTRACT

This report reveals farm survey research applying to the guaranteed sugar price in Taiwan. The minimum guaranteed sugar price is determined on the basis of survey data furnished by the Taiwan Sugar Corporation and is announced by the government prior to the period of planting of each cane crop year. Since 1957 the sugar support price in Taiwan has served as a reliable method for the government's sugar-price policy making and has also been broadly welcomed by most cane growers as a guidance for their farm planning.

Part I presents some basic facts about Taiwan's agriculture. Part II reviews the history of fluctuating income and rice-sugar cane competition in Taiwan. Part III describes the research problem from standpoints of the government, the Taiwan Sugar Corporation, and the cane producers. Part IV points out the objectives and procedures of the study. The aims of the guaranteed sugar price survey are to stabilize the local sugar industry. Part V shows the hypotheses used by the Taiwan Sugar Corporation in the study which was used as the basis for the government's announced guaranteed sugar price. The hypotheses are that as the result of the guaranteed sugar price are:

- (1) farmers will prefer to plant sugar cane,
- (2) the Taiwan Sugar Corporation might obtain enough raw cane material to operate the sugar factories, and
- (3) the government can maintain at least the past level of foreign exchange earned by sugar export.

Part VI contains the presentation of data and analysis of the effect of the price program. This is the heart of the paper. This part includes the model used for computing the guaranteed sugar price analysis of the number of sampled farm families and the acreage of planted cane, and the three years' results of the study of guaranteed sugar price for different head sugar factory areas and fields. Part VII is a summary and conclusion of the study. The guaranteed sugar price can be used to insure a level of sugar cane production which will at least maintain the present level of sugar export. However, because one guaranteed sugar price is announced for all areas and all field types, some re-location of sugar cane production on Taiwan can be expected.

FORWARD

The Taiwan Sugar Corporation, under government support and in cooperation with the Chinese Rural Economics Association, has sponsored a long-run farm survey program since the 1955-56 crop year. The objective of this survey program is to collect farm data for sugar cane and its competitive crops. This data provides information needed to design an adequate support-price policy for sugar.

This writer was employed as a farm economic researcher by the Taiwan Sugar Corporation and the Taiwan Sugar Experiment Station for many years, and was assigned as one of the representatives of the Corporation participating in the study of the guaranteed sugar price for Taiwan. I visited all the sugar cane farms in every corner of the wide island, and got in touch directly with many contract farmers and each data collector to discuss farm management problems and survey techniques.

My study in the United States has been sponsored since July, 1959, by the Institute of International Education under a grant from the Council on Economic and Cultural Affairs, Inc. I believe that I am well equipped with the training I received from Louisiana State University, the University of Minnesota, and Montana State College.

This paper is a preliminary report of the largest scale farm survey in Taiwan's history. Although our research has been fruitful for our sugar price problem solving, further study in the rural economics of Taiwan should be improved and strengthened in the future by obtaining reliable knowledge through proper research methodology.

GLOSSARY OF ABBREVIATIONS AND TERMS

CREA	Chinese Rural Economics Association
ESB	Economic Stabilization Board
GSP	Guaranteed Sugar Price
ICA	International Cooperation Administration
JCRR	Sino-American Joint Commission on Rural Reconstruction
MEA	Ministry of Economic Affairs
MT	Metric Tons
NT \$	New Taiwan Currency
NTU	National Taiwan University
TPCA	Taiwan Provincial College of Agriculture
TPFB	Taiwan Provincial Food Bureau
TPG	Taiwan Provincial Government
TSC	Taiwan Sugar Corporation

"Area" As used here, it means the same as district and region. Each area indicates a head sugar factory area within which are included three to six sugar factories. There are five head sugar factory areas in Taiwan from the central to the southern part--namely, Taichung area, Huwei area, Hsingying area, Tsungyeh area, and Pingtung area.

"Competitive crops" Generally, it means that sugar cane and rice are competing on the same land and at the same time; but the broad meaning is competition between sugar cane and a few kinds of crops such as sweet potatoes, soybeans, jute, cassava, peanuts, wheat, vegetables, etc., during the same period of time. However, tobacco, pineapples, bananas and other garden fruits are not included since tobacco is a monopoly with special high income and fruit crops need many years in their growth.

"Contract farmers" It means cane producers, cane planters, and/or cane growers. Their raw sugar cane material must be sent to the closest sugar factory for sugar extraction according to the contract signed between TSC and contract farmers.

"Fields" There are five kinds of fields in each area: two-crop field - double rice paddy field for producing rice twice a year; single-crop field - single rice paddy field for producing rice once a year; rotation field - crop rotation field partly irrigated; dry-plain field - plain field non-irrigated; upland field - hilly dry land.

"Guaranteed Sugar Price" There are two kinds of guaranteed sugar price: One is the suggested guaranteed sugar price which is computed by the Chinese Rural Economics Association using actual farm survey data; another is the announced guaranteed sugar price which is the minimum purchase price announced by the government prior to the sugar cane planting. The government announces one minimum price for all areas and all field types. The announced price is based principally on the suggested sugar price calculated by the Chinese Rural Economics Association. Usually the announced guaranteed sugar price is a little lower than the suggested guaranteed sugar price. If the world sugar price is less than the announced guaranteed sugar price, the farmer received the announced guaranteed sugar price.

"Intercropping" It is a special kind of crop system in which certain crops such as sweet potatoes, peanuts and beans are planted in the sugar cane field when the sugar cane is in the young stage.

"Investigator" He is the data collector, interviewer, and enumerator.

"Mud seedling" It means that sugar cane is planted in the rice field when the rice is not yet harvested.

"Period of growing" There are three different growing periods: autumn planting, around 16-18 months; spring planting, around 12 months; ratooned planting, around 12 months.

"Planting period" There are three different planting periods: autumn planting, also called fall planting or early planting, which means sugar cane is planted from July to December; spring planting, also called late planting, which means sugar cane is planted from January to March; ratooned planting means sugar cane is reproduced by its own stubble without using a new seedling after harvesting.

"Sugar sharing" It means the sugar division between the Taiwan Sugar Corporation and contract farmers. The present ratio between contract farmers and Taiwan Sugar Corporation is 54:46.

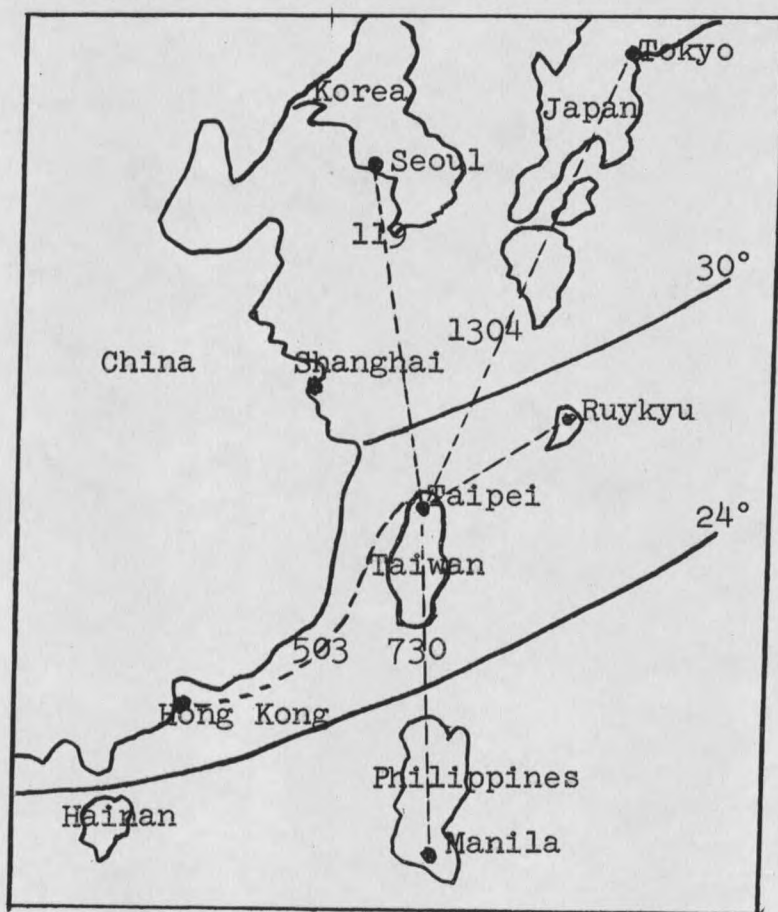
"Tai-chin" It is a unit of weight; roughly 1,000 Tai-chin equal 600 kilograms.

PART I

INTRODUCTION

Location

Taiwan, sitting astride the Tropic of Cancer at the Western edge of the Pacific Ocean, is called Formosa (meaning "beautiful island"), and is separated from Fukien province of the Chinese mainland by a 100-mile strait.



Map I. Location of Taiwan^{a/} with Mileages to Major Points in the Far East.

^{a/} International Cooperation Administration, Economic Progress of Free China, Published in Taipei, Taiwan, 1958, p. 2.

Tobacco-leaf-shaped Taiwan is 240 miles long, north to south, and 85 miles at its greatest width. Its area of 13,885 square miles is about equal to that of Massachusetts, Connecticut, and Rhode Island combined. More than two-thirds of the Island consists of rugged foothills and mountain ranges with some peaks 12,000 feet above sea level. The arable lands scattered along the western coast are planted with sugar cane, rice, sweet potatoes, and other miscellaneous crops. Steep, high cliffs plunge directly into the Pacific from the eastern coast.

Taiwan is about the same distance from Hong Kong to the southwest and Shanghai to the northwest. Four hundred miles northeast the Ryukyu Islands, of which Okinawa is the largest, lead to the Japanese archipelago, while Luzon, of the Philippines, lies 225 miles to the south.

Today Taiwan's population is estimated at ten million, including eight million Taiwan-born people and two million Chinese who have migrated from the mainland since the Communists swept over the whole China mainland in 1949.

Importance of Agriculture

The importance of agriculture in Taiwan's economy is indicated by the figures shown in Table I.

TABLE I. TAIWAN'S AGRICULTURAL BACKGROUND.*

Total land area (hectare)	3,480,000
Cultivated land (hectare)	870,000
As percent of total area	25 percent
Number of farms	770,000
Average size of farm (hectare)	1.3
Size of farm family	7 persons
Number of workers per farm	3
Total population	10,000,000
Percentage of population in agriculture	50 percent
Major agricultural products	rice, sweet potatoes sugar cane, pineapples and bananas
Percentage of agricultural income in national income	approx. 35 percent

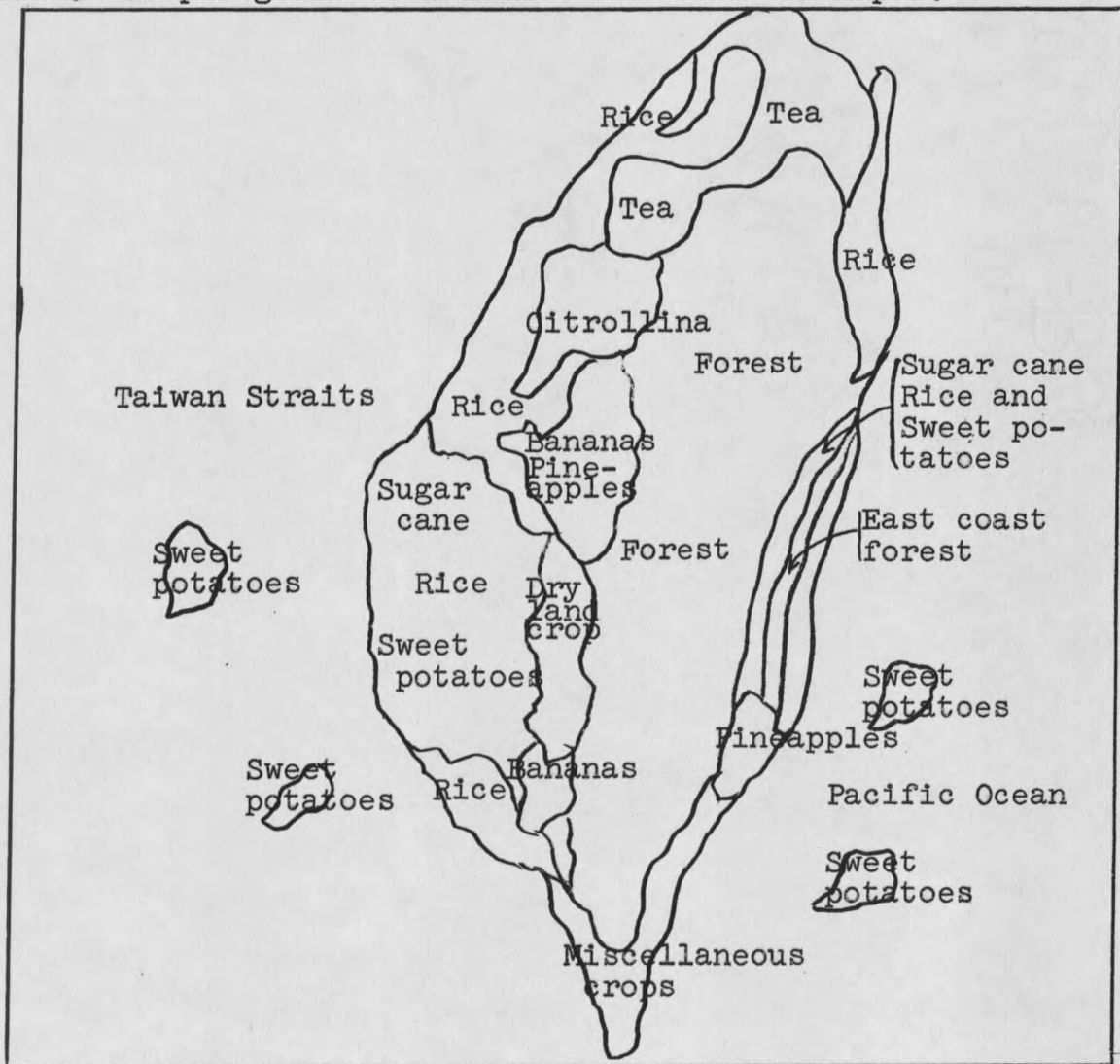
* Source: Sam-Chung Hsieh, Chief of Rural Economic Division, Sino-American Joint Commission on Rural Reconstruction, "Report to the Council on Economic and Cultural Affairs, Inc.", Mimeograph 1957, p. 5.

Commercial Crops

The principal crops of Taiwan are rice, sugar cane, sweet potatoes, pineapples, bananas, tea, and citrollina. Farm income presently accounts for about 35 percent of the net national income. Agricultural products comprise more than 90 percent of all export commodities by value. Since Taiwan is a small island with limited arable land and is facing a very serious population pressure, the major part of the rice crop must be used for domestic consumption. The island's economic growth depends heavily on foreign trade, so it is very easy to understand that the foreign agricultural trade is extremely

important to Taiwan. The sugar export amounted to between 60 and 70 percent of the foreign exchange obtained from all export commodities.

Rice and sugar cane are the two principal crops of Taiwan. Crop regions of Taiwan^{1/} are shown in Map 2.



Map 2. The Principal Crop Regions of Taiwan

^{1/} International Cooperation Administration, Economic Progress of Free China, Published in Taipei, Taiwan, 1958, p. 24.

Climatic Conditions^{2/}

Since Taiwan is located between the gap of the tropic and sub-tropic areas, and the high central mountain range is scattered from the north to the south, its soil type, temperature, rainfall, and sunshine are greatly varied in the different areas.

Soil types--In the north there is primarily old leached alluvils and diluvials and some are residual. In the southwest, most of the usable soils are red and yellow laterites derived from gravel and sandy alluvil fan material. Upland soils are in most cases thin, immature, and relatively less fertile.

Temperature--The yearly average temperature is only 21.7°C in Taipei (northern part) and 24.3°C in Kaoshuing (southern part). At the same time, the temperature in the northern part during December and January is usually below 20°C.

Sunshine--The yearly sunshine total averages 1,603.6 hours in the Taipei area and 2,508.0 hours in the Kaoshuing area. The difference is 904.4 hours.

Rainfall--From April to June the total rainfall was 829.8 mm in the Taipei area, while only 689.3 mm in the Kaoshuing area. It was 149.8 mm more in the former area than

^{2/} Taiwan Bank, A Comparative Study on Sugar-Rice Price Ratio in Taiwan, Taipei, Taiwan Bank Press, 1953, p. 78.

in the latter area. However, from July to September, the condition was just opposite, namely, the rainfall was roughly twice as much in the Kaoshuing area as in the Taipei area. Local climatic conditions are caused by strong northeast winds in winter and milder southwest winds in summer. Typhoons always occur between June and October; heavy rainfall also visits this island in summer.

PART II

FLUCTUATING INCOME FROM SUGAR CANE AND RICE-SUGAR CANE COMPETITION IN TAIWAN

Purchasing Price of Sugar Cane
During Japanese Rule

Taiwan was occupied by the Japanese for over fifty years before the Second World War. During the Japanese rule the sugar company obtained raw sugar cane material partly from its own cane plantation but mostly by purchasing from contract cane farmers.

TABLE II. PURCHASING PRICE OF SUGAR CANE UNDER JAPANESE RULE.*
(Price Unit: Per 1,000 Tai-chin Japanese dollars)

Year	Raw Material	Subsidies	Encouraged Fund	Purchasing Price
1916	-----	-----	-----	\$3.80
1917	-----	-----	-----	5.65
1918	-----	-----	-----	5.65
1919	-----	-----	-----	8.50
1920	-----	-----	-----	6.00
1921	-----	-----	-----	5.00
1922	-----	-----	-----	5.50
1923	-----	-----	-----	6.50
1924	-----	-----	-----	7.00
1925	-----	-----	-----	6.70
1926	4.00	2.70	-----	6.70
1927	4.00	1.60	-----	5.60
1928	4.00	2.05	-----	6.05
1929	4.00	1.86	-----	5.80
1930	4.00	0.90	0.70	5.60

* See asterisk on next page.

TABLE II. PURCHASING PRICE OF SUGAR CANE UNDER JAPANESE RULE.*
(Continued.)

Year	Raw Material	Subsidies	Encouraged Fund	Purchasing Price
1931	4.00	0.90	0.70	5.60
1932	2.70	1.60	0.30	4.60
1933	2.70	2.00	0.80	5.50
1934	2.70	2.00	0.80	5.50
1935	2.70	3.05	0.80	6.55
1936	3.00	3.00	0.80	6.80
1937	3.00	3.00	0.70	6.70
1938	3.50	2.50	1.00	7.00
1939	4.00	2.90	3.70	10.60
1940	4.50	2.20	2.30	9.00
1941	4.50	2.80	2.10	9.40

*Source: Southern Agricultural Problem, Japanese published, 1941. Data of 1916-1925 and 1932-1941 in this table was obtained by correspondence from Mr. Keng-Yun Huang, Agricultural Economics Division, Taiwan Sugar Corporation.

The purchasing price of sugar cane during the Japanese rule was determined by three factors: The first factor was the raw material fee-namely the cost of cane production. Until 1932 this was the major part to the total purchasing price. Second were the subsidies which were paid to cane producers for three kinds of loss: loss due to too early and too late a period of planting and harvesting; loss due to the highest cost of production in different cane fields; loss due to the income difference caused by higher price of rice during sugar cane harvesting. Third was the encouraging fund which classified of four kinds of

encouragement; Collective cane plantation-mass production for sugar cane; new cane variety and field technical improvement; earlier period of cane planting between July and August; and high sugar content, high brix and more sugar extraction.

Farmers were forced to plant sugar cane by the Japanese during their occupation. The purchase price of sugar cane went up especially after 1937. Because of the inflation from 1938 to 1941, it is not certain that real farm income increased.

Purchasing Price of Sugar After V-J Day

Since Taiwan returned to her mother country, the Republic of China, in 1945, the sugar company reorganized and became government-owned and operated. The government developed a new policy of sharing actual sugar production between the Taiwan Sugar Corporation and contract farmers. This policy replaced the policy of purchasing on a cane-raw-material basis which was used during the earlier Japanese period. The ratio of sugar sharing between the Taiwan Sugar Corporation and the farmers in 1946-47 was 52:48; later it changed to 50:50 sharing between producers and the Sugar Corporation in 1947-48; and currently it is 54:46 between contract farmers and the sugar corporation. The changes in the government sugar price policy are outlined below.

1946-47 Purchasing sugar price was the average wholesale

price in domestic market between December 1946 to April, 1947.

1947-48 Purchasing sugar price was the average wholesale price in domestic market during the grinding season.

1948-49 The purchasing sugar price was calculated by the following formula:

$$P_0 = \frac{P_1 Q_1 + P_2 Q_2 + \dots + P_n Q_n}{Q_0}$$

P_0 = Purchasing sugar price.

P_1, P_2, \dots, P_n = Selling price of Taiwan sugar in foreign markets which purchased Taiwan sugar.

Q_1, Q_2, \dots, Q_n = Quantity of Taiwan sugar sold in different foreign markets.

Q_0 = Total quantity of sugar sold in idfferent foreign markets which equals $Q_1 + Q_2 + \dots + Q_n$.

If the P_0 /per kg was less than the price of two kgs of rice, the government should pay the difference.

1949-50 During the grinding period, the purchasing sugar price was determined by world sugar price less domestic transportation fees from sugar factory to sea port.

1950-51 The purchasing sugar price was the world sugar price but provided that the sugar price per kg should not be less than the price of rice per kg otherwise, the government would pay the difference. The relative

profitability of rice had increased greatly since the 1948-49 period.

1951-52 Same as the 1950-51 period.

1952-53 The purchasing sugar price was the foreign sugar price for Taiwan sugar for previous six months' average, but provided that the purchasing sugar price per kg should at least equal to the price of rice of per kg; otherwise, the government guarantees to pay the difference.

1953-54 The purchasing sugar price was the foreign sugar price for Taiwan sugar for the previous three months' average, but provided that the sugar price per ton should not be less than \$NT 1,400; otherwise, the government would pay the difference.

1954-55 If the purchasing sugar price per ton was less than \$NT 1,800, the government would pay the difference.

1955-56 If the purchasing sugar price per ton was less than \$NT 2,000 the government would pay the difference.

From the above information^{3/4} it can be seen that the sugar price policy between 1946-47 to 1955-56 changed from

3/ Ying-Piao Yu, Chief of Agricultural Economics Division, TSC, A Review of Sugar-sharing Regulation in Taiwan, Taiwan, TSC Press, Mimeograph, 1959, p. 1-6.

year to year. The sugar price was determined by three principle factors: First, average price of sugar sold in different foreign markets; second, the ratio of foreign exchange between Taiwan currency and foreign dollar; third, transportation fee from sugar factory to domestic sea port.

Sugar prices fluctuated and were affected very much as any one of the three factors changed so that the farmer's income from sugar was unstable. These sugar price policies did not consider the production cost of sugar cane and neglected the comparison of sugar cane with its competitive crops. The sugar price policies before 1957 were not completely satisfactory. Sugar sharing has been highly welcomed because cane producers reversed their position from sugar tenants to sugar owners.

Since the price of sugar is determined by the international sugar market, farmers shifted their production from sugar cane to rice when the world sugar price moved down. The government therefore started to announce a guaranteed sugar price in order to stabilize sugar cane production. There is one announced guaranteed sugar price for all of Taiwan. After the grinding season, 65 percent of the farmers' sugar share had to be sold to the government for export. Before 1957, the government paid the farmers the world sugar price plus an

adjustment if required, based on the local market price of rice. The complete price paid by the government to the farmers was announced once each month. In 1957 and afterwards, the government announced one guaranteed sugar price for the entire year. This price was announced in June, before planting. If, at time of sale, the world sugar price is above the guaranteed sugar price, the farmers receive the world sugar price. The government paid the difference to cane producers according to the level of the announced guaranteed sugar price. The subsidies and purchasing price of sugar after V-J Day are seen in Appendix I. The guaranteed sugar price policy was actually started in Taiwan with the 1957 crop year.

Sugar-Rice Price Ratio

The idea of a sugar-rice price ratio has long been rooted in most of Taiwan's people's minds. The ratio serves as a rough indicator of the relative profitableness of sugar and rice production.

From Table III, we can see the sugar-rice price ratio has gradually decreased. Rice has become relatively more profitable to produce. The ratio fell to 0.61 and 0.82 in 1949 and 1953 respectively. It was a very serious situation. Most farmers shifted from sugar cane to rice production at that time. The guaranteed sugar price policy was started in 1957

and since then the sugar-rice price ratio seems to have been slightly more stable than in previous years of 1953-55.

TABLE III. SUGAR-RICE PRICE RATIO IN TAIWAN (1914-1958).*

Year	Sugar (Price per 100 kg)	Rice (Price per 100 kg)	Price Ratio (Sugar/rice)
1914	\$24.17	\$ 9.50	2.54
1915	27.72	7.38	3.75
1916	31.50	8.25	3.82
1917	31.67	11.88	2.67
1918	32.50	17.25	1.88
1919	63.55	22.50	2.82
1920	63.67	20.13	3.16
1921	41.62	15.25	2.73
1922	32.33	16.00	2.02
1923	39.70	15.13	2.62
1924	35.73	18.38	1.94
1925	32.70	20.38	1.60
1926	30.67	19.64	1.56
1927	33.28	17.13	1.94
1928	27.83	17.00	1.64
1929	29.37	19.60	1.50
1930	26.02	17.50	1.49
1931	22.97	11.88	1.93
1932	25.48	13.63	1.87
1933	28.82	13.73	2.10
1934	27.35	15.50	1.76
1935	28.02	19.00	1.47
1936	29.35	20.00	1.47
1937	32.18	20.13	1.60
1938	33.67	20.63	1.63
1939	34.80	23.25	1.54
1940	37.42	23.50	1.59

*See asterisk on next page.

TABLE III. SUGAR-RICE PRICE RATIO IN TAIWAN (1914-1958).*
(Continued)

Year	Sugar (Price per 100kg)	Rice (Price per 100 kg)	Price Ratio (Sugar/rice)
1941	38.17	25.13	1.52
1942	42.00	18.75	2.24
1943	46.60	22.53	2.07
1944	414.40	239.00	1.75
1945	748.80	686.70	1.09
1946	3,877.82a/	2,316.26	1.67
1947	19,886.58a/	6,958.65	2.72
1948	84,412.04a/	34,726.05	2.43
1949	26.15b/	34.05	0.61
1950	128.14	117.40	1.10
1951	366.90	127.05	2.89
1952	308.90	201.70	1.53
1953	261.90	318.00	0.82
1954	289.25	293.68	1.04
1955	395.43	302.23	1.31
1956	410.15	325.64	1.26
1957	497.42	347.45	1.43
1958	336.64	352.23	1.27

* Source: Agricultural Economics Division, TSC, original data unpublished.

a/ During the Civil War, from 1945 to 1949, between the Nationalist government and the Chinese Communists, a very serious currency inflation occurred. It was the worst that had ever happened in China.

b/ The Nationalist government authorized a monetary reform in Taiwan on June 15, 1949, changing from the old into the new Taiwan dollar.

