Agriculture - Econ. aspects - Taiwan

PROCEEDINGS OF
AGRICULTURAL ECONOMICS SEMINAR, Taipei, Taiwan, SEPTEMBER 16—20, 1958

HELD AT THE COLLEGE OF AGRICULTURE
NATIONAL TAIWAN UNIVERSITY

TAIPEI, TAIWAN, CHINA
MARCH 1959

POPULATION AND FOOD SUPPLY IN TAIWAN

Yen-tien Chang

Professor of Agricultural Economics
National Taiwan University

Most people who are interested in population and food problems are sadly aware of the fact that Taiwan with its total cultivated area of 2 million acres has to feed a population of 10 million. The rapid increase of population in recent years has caused grave concern both to economists and policy-makers. Mr. Barclay, after a year's investigation in Taiwan, concludes in his Report that "at the rate adopted above (25 per thousand), it would take the people of Taiwan only a century and a half to produce the reputed 450 million of the whole of China, and less than 250 years to surpass the present population of the entire world."[1] Such an increase is indeed terrifying to contemplate. However, the purpose of this article is not to attempt to focus emphasis on the pessimistic aspect of the problem, but to picture out the interrelationship between population development and food supply on this island.

I.

The 1956 population is 10,060,381, as released lately by Provincial Department of Civil Affairs. The history of increase to the present number is a matter of a few decades. Under 50 years of Japanese rule, the population doubled in size, and the number increased has amounted to roughly 3.6 million. It is an increase of 110 percent of the 1905 population. Table 1 shows that the trends of population growth

Table 1. Population Changes in Taiwan in Prewar Years

Year	Total		Taiwanese[a]	
	Number[b]	Index	Number[b]	Index
1905	3,123,302	100	3,055,461	100
1910	3,299,493	106	3,186,605	104
1915	3,569,842	114	3,414,388	112
1920	3,757,838	120	3,536,381	117
1925	4,147,462	133	3,924,574	128
1930	4,679,666	150	4,400,076	144
1935	5,315,642	170	4,990,131	163
1940	6,077,148	195	5,682,133	186
1943	6,585,841	211	6,133,867	201

a Taiwanese are persons with permanent registry in Taiwan.

b Figures represent registered population as of December 31 of each year. These are larger than the coresponding census figures which are of October 1 of each year.

Source: Taiwan Province: Statistical Summary of the Past 51 Years, Taipei, 1946.

in 1905-43 have been at an accelerated rate, and the increase of total number goes more rapidly than that of Taiwanese which comprises the bulk of the population on the island. This seems to indicate a result of migration, but as a matter of fact, there had never been any extensive immigration in this period. The arrivals exceeded departures only by 5,682 annually from 1910 to 1920, 3,434 from 1921 to 1930, and 3,931 from 1931 to 1940.[2] So we may safely say that population grow mainly through an excess of births over deaths, or natural increase, not by migration.

The natural increase rates were 8.38 in 1906-10, 1.422 in 1911-15, 9.65 in 1916-20, 17.65 in 1921-25, 22.58 in 1926-30, 24.42 in 1931-35, and 24.02 in 1936-40. These rates indicate that the population of Taiwan has grown steadily ever since 1905. Population growth at such a rate was much more rapid compared with that of other countries in the same period. In 1935-39, the population increase rates were 2.7 per thousand in Belgium, 3.00 in England, 6.1 in U. S. A., 7.4 in Germany, and 12.3 in Japan. Those among the highest, such as Union of South Africa and Egypt gained their population at the rates of 15.0 and 15.6 respectively which are still below the rate of Taiwan.

The increase rate of 24 per thousand, though higher than most other countries, is only moderate when compared with the postwar rate. After the restoration of Taiwan to China, no census had ever been taken until 1956. Population statistics entirely come from the household registration. However, data obtained from the registration agencies, imperfect as they are, seem sound enough to warrant the statements that the postwar population growth has jumped up to a higher stage from its prewar level. The preliminary statistics of the latest census which was conducted on September 16, 1956, sixteen years after the last census, verify that the registered data though not strictly accurate, are useful and, to some extent, reliable. Table 2 shows the postwar population development in general. In the short

Table 2. Population Changes in Taiwan, 1946-1956

Year	Total		Taiwanese[a]	
	Number[b]	Index[c]	Number[b]	Index[c]
1946	6,090,860	195	6,059,139	198
1947	6,459,099	208	6,436,444	211
1948	6,806,136	218	6,678,969	219
1949	7,396,931	236	6,980,234	228
1950	7,554,399	242	7,029,459	231
1951	7,859,247	252	7,268,557	238
1952	8,128,374	260	7,478,544	245
1953	8,438,016	270	7,724,000	253
1954	8,749,151	280	7,983,087	261
1955	9,077,643	289	8,224,955	269
1956	9,390,381	301	8,444,965	276

a Same as in Table 1.

b Including aborigines but excluding aliens.

c 1905=100

Source: Bureau of Accounting and Statistics: Taiwan Statistical Abstract, No. 17.

span of 11 years, Taiwan gained as many people as it did in the 50 years of Japanese rule. Since 1945, migration has contributed much to the rapid population growth. Immigrants from the Chinese mainland were not so many during the early postwar years, after 1949, people seeking refuge from Communist rule flowed into the island in large numbers. Consequently, the annual average increase rate of the ten years, 1947-56, reached as high as 33.5 per thousand, an increase of 9.3 people more than the average of the last decade of prewar records. In the past 60 years' continuous growth, there seems a sharp line which divides the period into two stages: the stage before the war, a moderate increasing stage, and the postwar one, a persistently high rate stage, both accelerating. The immediate causes of this tremendous population growth are twofold: excess of births over deaths and improvement of living level. Birth rates change little. During the past 60 years, the range of fluctuation is between 40 and 45. The 1906-10 average, for example, was 40.7, that of 1936-40 was 43.7, and the present birth rate is 45. The chief cause of population growth is the sharp decline of death rate. Rates of 1910's were around 30 per thousand, those of 1930's reduced to 20. As medical services and health practices became more available, mortality rate declined steadily. In the short span of a decade, 1947-56, the death rate dwindled from 19 to 8. This elevates the natural increase and helps to instigate the postwar population upsurge. If we take the population of 1905 as 100, the forty years' development since that year increased by 100 percent, and after the Restoration it gained another 100 percent within only 11 years, the largest decennial increase in our history.

Fertility and mortality are closely related with general living level. No doubt, the national income of Taiwan is very low as most of its Southeast Asian neighbors, and with low income, it is hard for the people to raise their living level. Yet the national diet has been tangibly bettered since the Restoration. The dependence on potato and coarse grain foodstuffs declined unprecedentedly; for a large part of the rice produced on the island which was exported to Japan in prewar days is now entirely used for domestic consumption. Moreover, the dietary composition is also changed. The people of Taiwan eat a more diversified food. This, coupled with the betterment of medical and health conditions, is the chief cause of decline of mortality rates.

II.

Population problems in countries with heavy population pressure differ from those in sparsely or moderately populated countries. Unfortunately, most countries with such pressure are economically weak or underdeveloped. The economy of Taiwan with all its progress and recent development of industry is still predominantly agricultural, and, to some extent, underdeveloped. One of the salient features of underdeveloped conutries is its underemployment. In Taiwan, there is too large a labor force in contrast with its limited land area and employment opportunities. Thus, economists and policy-makers pay less attention to studies of labor force and its relevant topics, such as age composition, sex ratio, and so on, but are chiefly concerned with the growing number of people to feed.

We are not temporarily attempting here to discuss population problems from the point of view of man-power or men as source of wealth, nor do we approach the problem from the standpoint of "economic optimum population", though we

Chinese are well doctrined with the ancient economic philosophy that "Possessing people will possess territory, possessing territory will possess wealth"[3] which coincides with de Tocqueville's old footnote: "The population of a country assuredly constitutes the first element of its wealth."[4]

Economic optimum population of a nation in a given year is the number of people which permits the maximum production of economic goods and services per capita with natural resoures and human ability to use them as they are in that year. In an underdeveloped country with heavy population pressure, it is impossible to plan or control the number of people to a degree that is most desirable for the country, especially when the actual population is larger than the optimum population and natural resources are limited.

The population of Taiwan grows rapidly in the present decade, as stated above, and food production, mainly rice, set a new record in 1950, and thereafter kept increasing incessantly. How is, then, the "race between population and food supply?"

Rice, the most important staple food in Taiwan, is generally used to represent human food on the island. Its production was almost keeping pace with the growth of population during the past 60 years. The increase indices of the total population and Taiwanese, as shown in Table 2, were 301 and 276 respectively in 1956. The total rice production of 1905 was 621,978 metric tons, and that of 1956 was 1,789,829 metric tons, and the index of increase was then 238. This is a little below the index of total population and higher than that of Taiwanese. The 1957 production as released lately by Provincial Food Bureau increased to 1,839,009 metric tons or 295 percent of that of 1905.

If we do not go back so far to the early days of Japanese rule and confine our discussion to the postwar period, the record of the race between population and food supply would give us a different picture. Assuming 1946 as 100, the index of population was 154 and that of rice production was 200 in 1956. Food supply won the race. This is one of important factors that fosters the living level.

The present high record of rice production is a result of long stringent efforts. The Japanese, after forty years' drudgery, reached the peak of 1.4 million metric tons in 1938. Owing to the shortage of fertilizer, labor force, and other facilities in wartime, the production declined steadily so that at the end of World War II, the total production dwindled to only 638,826 metric tons, or less than half of the 1938 record. Postwar recovery was slow in Taiwan as in most other Southeast Asian countries. Not untill 1950 did Taiwan reach the prewar peak. The amount produced in 1950 was 1,421,486 metric tons or 101 percent of the 1938 production, and thereafter, the annual production increased steadily, but per acre yields lagged noticeably. As shown in Table 3, ever since 1950 the total production of rice has increased every year, but the per acre yields did not break the prewar record until 1956. The increase in total production was mainly achieved through the expansion of planted acreage. In 1947, rice acreage was 677,557 hectares or 108 percent of the acreage of 1938, while the total production was only 71 percent of the peak. After ten years, per acre yields exceeded the prewar highest level, and the total production increased by 28 percent over the peak amount with 25 percent more acreage. One of major factors of the "boom" after 1950 was evidently the land reform program enforced in 1949 which gave incentives to farmers. However, per acre yields, as handicapped by the inadequacy of fertilizer, credit, and backward-

Table 3. Rice Production[a] in Taiwan, 1938-1957

Year	Annual Production			Yield per Hectare		
	Metric Ton	Index A	Index B	Kilogram	Index A	Index B
1938	1,402,414	100		2,242	100	
1939	1,307,391	93		2,088	93	
1940	1,128,784	86		1,768	79	
1941	1,199,006	85		1,853	83	
1942	1,171,182	84		1,900	85	
1943	1,125,804	80		1,845	82	
1944	1,068,121	76		1,778	79	
1945	638,828	46		1,273	57	
1946	894,021	64	100	1,585	71	100
1947	999,012	71	112	1,474	66	93
1948	1,068,421	76	120	1,439	66	103
1949	1,214,523	87	136	1,624	72	116
1950	1,421,486	101	159	1,845	82	119
1951	1,484,792	106	166	1,882	84	126
1952	1,570,115	112	176	1,998	89	126
1953	1,641,557	117	184	2,106	94	133
1954	1,695,107	121	190	2,183	97	138
1955	1,614,953	115	181	2,151	96	136
1956	1,789,829	128	200	2,284	102	144
1957	1,839,009	131	206	2,347	105	148

a. In brown rice

Source: Data obtained from Taiwan Provincial Food Bureau.

ness of other practices, were still small.

In early postwar years, a large part of commercial fertilizers was imported from United States, Japan and other countries. Owing to the scarcity of dollar, fertilizers were inadequately supplied during 1945-51. The quantity for per hectare consumption in 1956 barely reached the 1938 level. This might indicate that the production of this most important staple food on the island was slow in progress, and that the possibility to increase its production is still large.

Another staple food next to rice is sweet potato. In recent years, 230,000 hectares or more than 26 percent of total cultivated land have been used to grow it. Its production has exceeded the prewar peak of 1938 (1,726,188 metric tons) since 1947, and the 1957 production was 2.6 million metric tons or 51 percent over the 1938 amount. Unfortunately, per acre yields have never reached the prewar peak of 12,828 kg. per hectare. The postwar highest yield was only 12,100 kg. per hectare.

Wheat is next in importance to sweet potato as human food. With postwar rapid development, the index of acreage has reached 1,517 and that of production 1,679, assuming those of 1938 as 100. However, the home grown wheat is com-

paratively insignificant as its annual production is only around 25,000 metric tons. The major part of wheat consumed on this island is imported. The total wheat supply in 1956, for example, was estimated at 228,460 metric tons of which 210,768 metric tons were imported.

III.

Food consumption level can be used as a tool to assess food supplies in Taiwan. The pattern of food consumption is determined primarily by the availability of food items, food habit and preference, and the composition of national diet is influenced by the per capita national income and relative food prices. In Taiwan, the basic food consists mainly of rice, sweet potato, and wheat flour. Potato, the cheapest starchy staple, was a foodstuff of considerable significance in prewar days but is now chiefly used as animal feed. The quantity of wheat flour consumed is very small compared with those of the other two staples. Leafy green vegetables are abundant as the subtropical weather favors their growing. The ratio of animal protein in national diet of Taiwan is as low as in most Oriental countries. The Foreign Agricultural Service of the Department of Agriculture of the United States published the "Food Balances, Consumption Year 1955-56, for Countries in East Asia South Asia, and Oceania," last October stating that the total of calories consumed per capita per day in Taiwan was only second to Japan and above all the other ten countries. Of the daily per capita consumption of 2,285 calories in Taiwan, 62.9 per cent was obtained from grains, which was higher than Ceylon, Malaya and the Philippines, but lower than all other countries. In Taiwan, the percentage of calories obtained from meat, fish, poultry, and eggs was only 5.0, but calories from roots and tubers accounted for 13 percent of the total.

In the past, there was little information on the actual consumption level of food in Taiwan. The Provincial Food Bureau made an estimate of per capita rice consumption in 1953, but its estimated amount of abount 150 kg per year was generally considered as too conservative. It was not until 1956 that an investigation of per capita consumption level of basic food was initiated by the Joint Commission on Rural Reconstruction in collaboration with the Taiwan Provincial College of Agriculture, which was completed in June 1957. This was the first such investigation ever made in Taiwan. The items for investigation were confined to the basic foodstuffs, i.e. rice, sweet potato and wheat. The main purpose of the investigation was to ascertain the actual per capita daily consumption of these food staples in different seasons, by different groups of households and in different geographic areas to make an economic appraisal of their supply. This investigation has been useful in dealing with population and food problems.

According to findings of this investigation,[5] the average per capita daily consumption of basic food was 526 grams, consisting of 401 grams of polished rice, 119 grams of sweet potato and 6 grams of wheat flour. The consumption levels of rice and sweet potato of farm families reached 443 and 211 grams respectively while those of non-farm families were only 356 and 20 grams. In contrast to rice and potato, the daily consumption of wheat flour of farm families averaged only 1 gram and that of non-farm families went as high as 11 grams. Seasonal changes of consumption of various foodstuffs are noticeable. In January, the averages of per capita consumption were 432 grams of rice, 146 grams of sweet potato and 4 grams of wheat flour, but in July, they were 370 grams, 92 grams and 8 grams respectively.

At such a consumption level, the annual per capita consumtion of rice (in brown rice) for civilians was 155.84 kg, that of sweet potato was 43.44 kg. and that of wheat flour was 2.19 kg. The rations for military personnel were 575 grams of brown rice, 200 grams of sweet potato and 144 grams of flour per person per day. Thus, in 1956 the total civilian consumption of rice accounted for 1,463,397 metric tons, that of sweet potato 407,918 metric tons and that of flour 20,565 metric tons, or 27,420 metric tons of wheat equivalent.

In addition to the civilian consumption of rice in 1956, 140,520 metric tons were used for military ration,[6] 3,000 metric tons for shipment to offshore islands, 12,000 metric tons for making wine, 32,827 metric tons for seeds and 111,366 metric tons for export, 71,593 metric tons for animal feed, and 35,796 metric tons were wasted.[7] Thus, 1,854,799 metric tons of rice were disposed in 1956, 64,970 metric tons or 3.6 per cent over the rice production of the year.

The disposals of sweet potato in 1956 amounted to 2,614,033 metric tons, one half of which was used as animal feed. This was 1.8 percent over the production in the year. In 1956 home grown wheat plus wheat imports totalled 228,460 metric tons or 171,345 metric tons of flour equivalent. Adding some 7,500 metric tons of flour donated by the people of the United States for relief purpose, the total supply of wheat flour in the year was 178,845 metric tons. More than half of this amount was used for snacks and between meals in the form of noodles, cakes, biscuits and the like. Civilian consumption of wheat flour as basic food was only 20,565 metric tons and military ration amounted to 35,215 metric tons.

The amounts of consumption of rice and sweet potato over those of production might be due either to the under-reporting of production or to the errors of estimates of their disposals. However, as a matter of fact, the supply of these basic foods was sufficient to meet the consumption of the total population in Taiwan in 1956, and 165,924 metric tons of rice were exported to Japan in the previous year. The average value of the export of rice for the past 3 years was US$14.5 million which was more than enough to offset that of the import of wheat, flour, soybean and the like. Counting the 95 percent of its sugar and a large part of its fruits exported, Taiwan is assuredly a net food exporter.

IV.

In conclusion, we must concede that the per capita daily intake of some 1,600 calories or three quarters of the minimum calorie requirement from the three starchy staples means nutritionally a low consumption level. There is a relationship between income and composition of diet: "as income rises, the starchy staples fall in importonce as a source of food calories, while conversely all other foods rise in importance."[8] It is also true that a nation under heavy population pressure and with limited natural resources is most likely a nation of low income. From the standpoint of national income and nutrition, we are classfied into the fifth or the lowest group of the 40 nations as Mr. Bennett put it in his "World's Food." But, as stated above, the production of food on this island has kept pace steadily with the growth of population in recent years and will increase continuously in the near future. The second Four-Year Plan for Economic Development[9] has set the goal of rice production at 2,050,000 metric tons in 1960, which is very likely to be reached. Two million tons of rice together with the increase of other foodstuffs will suffice to feed the growing population with a rising consumption level.

One problem we shall have to face: the population of Taiwan shall increase at its present rate and we see no way to check it. The governor of Taiwan Province affirmed to the Provincial Assembly lately that the government would not take any measure for birth control.[10] In other words, there will be possibly no effective preventive check on population growth in the near future. We shall focus our attention upon the increase of food production as we did in the past decade. It is impossible for us to expand the cultivated area to a great extent but it is likely that full use will be made of the land already cultivated. Irrigated land in Taiwan now constitutes about 60 percent of the total cultivated area; another 10 percent or more of the area could be irrigated. The improvement of irrigation system not only would expand the area of paddy field, but also change the single crop field into double crop field. By using more fertilizers, modern agricultural practices and know-how, much more food could be produced in Taiwan. Rapid growth of population increases the demand for food, and increased demands will stimulate intensive cultivation.

Notes

1. Barclay, George W., A Report on Taiwan's Population to the Joint Commission on Rural Reconstruction, Office of Population Research, Princeton University, Princeton, N.J., 1954, p.45.
2. Chen, C. H. and Tuan, C. H., Population of Taiwan, Bank of Taiwan, Taipei, Taiwan, 1951, p.70.
3. Confucius, The Great Learning, chapter 10.
4. Alexis de Tocqueville, Democracy in America, Adline ed., Appleton, N. Y., 1899, II, 465.
5. Sing-min Yeh, Per Capita Consumption Level of Basic Food in Taiwan, Joint Commission on Rural Reconstruction, Taipei, Taiwan, December 1957.
6. The military consumption of rice in 1956 was estimated at 140,524 metric tons based on the daily ration of 575 grams of rice to the military population of 670,000.
7. Data obtained from the Provincial Food Bureau.
8. Bennett, M. K., The World's Food, Harper and Brothers, New York, 1954, p.218.
9. As the First Four-Year Plan had been completed in 1956, the Second Plan was started in 1957 and will be completed in 1960.
10. Speech delivered by Governor Chow to the 3rd Session of the Provincial Assembly on August 5, 1958.