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Agricultural Production Incentives in Taiwan: Some Comparative Advantage Perspectives

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Abstract. This study estimates the respective comparative advantage of the production of five crops in Taiwan and investigates how government policies have influenced their production and trade. Rice, soybeans, and maize cannot be produced economically because their domestic resource costs are higher than their world market prices. However, the Taiwanese farmer does not necessarily conform to the criteria for domestic resource cost coefficients. With government price incentives, the private profitability of rice, maize, and soybeans reveals only positive advantages, which gives farmers an incentive to produce those crops. On the other hand, sugarcane and bananas are subject to relatively high negative effective rates of protection.

Introduction

Since World War II, Taiwan has successfully promoted agricultural development. Three strategies for agricultural development have been adopted over the past 30 years. In the early stage of its agricultural development (being faced with a food shortage problem), Taiwan emphasized increased food production to meet domestic needs. That policy target was realized with the aid of technical innovations that made it possible to increase production. The means employed in this stage was “technological efficiency.” Once agricultural production was able to provide more than enough food for domestic needs, cash crops (including mushrooms, asparagus, and pineapples) were introduced and grown along with the food crops to increase income in the agricultural sector. The means adopted in this period was “price efficiency.” Finally, after technical innovations and cash crops, the development strategy was to search for foreign markets for agricultural exports, which in turn would earn foreign exchange for the economy. The means employed in this last stage was “marketing efficiency” (location efficiency).

Growth in Taiwan’s agricultural output has been achieved mainly through technical innovations that have raised the productivity of the relatively fixed input of land. Labour and capital, in combination with land, are two major factors of agricultural production that mutually interact in substitution for each other in the process of agricultural development. In the early stages of development, abundant labour served as a cheap source of growth. Farming was usually performed by labour-using and land-saving technologies. At that time, unpopular methods were emphasized to accumulate capital, often at the expense of farmers’ living standards. However, as Taiwan progressed in pursuit of development, new efficient techniques were gradually introduced, and government policies on prices, inputs, and credits provided solid economic incentives to farmers. The combination of these factors resulted in increased income for farmers in general and raised the possibility of relying more heavily on the means to achieve more capital investment to substitute for labour.

Problems of labour transference arose as a result of the introduction of more modern farming instruments and techniques and of increased wage rates. Several questions, however, need to be answered concerning crop production and changes in labour employed in agriculture. For example, the decline of farm labour in absolute numbers made it impossible to maintain the labour-intensive farming system; labour-intensive farming is, however, no longer efficient in Taiwan. This leads one to question whether to apply more capital to substitute for labour to maintain high land productivity and whether some crops will be adversely affected by this change by virtue of different economic incentives to farmers. Can new incentives (price or others) be applied to maintain the production of individual crops? Or, can Taiwan, which has modernized the farm sector and achieved high agricultural growth rates, offer farmers substantial economic incentives to institutionalize their production and thus maintain a steadily increasing trend in the production of most crops?

This study attempts to measure the comparative advantage of the production of five crops—maize, soybeans, bananas, sugarcane, and rice—and to estimate the effects of various government policies on their production and trade. Maize and soybeans account for the bulk of Taiwan’s agricultural imports; bananas and sugar are its main agricultural exports; and rice is its main food crop, produced for self-sufficiency but still with a high level of commercialization in the world market. In view of the impact of the energy and food crises on world grain production, data on crop

production in 1970, 1972, 1974, and 1976 were studied to compare the 1970-72 and 1974-76 periods (immediately before and after the energy crisis).

Comparative Advantage Indicators

With respect to comparative advantage analysis, economists concerned with future resource allocation have recently applied themselves to measuring trade advantage in terms of foreign exchange earnings. Pearson, Akrasanee, and Nelson (1976) constructed three measures for this purpose: net social profitability, domestic resource costs of foreign exchange earned or saved, and the effective rate of protection on value added. All three measures are theoretically sound but differ in analytical concepts and conditions. Net social profitability measures the adjustment of economic rents and shadow prices and external effects on the local economy; domestic resource costs of foreign exchange earned or saved measure the social costs of earning a net marginal unit of foreign exchange; and effective rate of protection on value added measures the percentage increase (resulting from protection) in the domestic value added over the value added in a free trade situation. As noted by Pearson, Akrasanee, and Nelson, the three measures have been applied or suggested for application in two uses: the *ex post* measurement of the costs of trade-distorting policies and the *ex ante* evaluation of resource allocation.

The three measures of comparative advantage, however, have their own basic hypotheses for the analysis of each product. These hypotheses have a direct bearing on the results of the actual analysis. Moreover, for analysis of comparative advantage, the data selected (whether suitable or not) will have great influence on the validity of the conclusions reached. Generally speaking, the methods for measuring comparative advantage are usually theoretically sound but empirically weak, owing to a lack of complete data for analysis. The similarity of the basic hypotheses of the three measures is that: products selected for comparative analysis must be tradeable; the foreign price elasticity of demand (or supply) must be unlimited; and a fixed input-output relationship is required.

Theoretically speaking, if a commodity has a comparative advantage in production, its production can be promoted and sold in the world market to earn foreign exchange or save domestic resource costs. However, the premise for this production is that the product must have a high commercialization level in the world market. As to import or export price elasticities, some products are suitable for measuring comparative advantage of trade, but others are not. The volume of any product produced in Taiwan, whether for final consumption or for export, amounts to so small a percentage of the world's total tradeable volume of the same product that, with respect to price change, Taiwan could increase imports or exports of that product infinitely without affecting the world price.

Government Incentives

Rice

The government rice policy aims fully to satisfy demand for rice through domestic production. It requires that optimum incentives and support be provided so that growth of rice production may always surpass population growth. With this in view, the government has (over the years) adopted the following guidelines to boost rice production in response to increasing demand:

- reduce the costs of production by setting reasonable ceilings on the prices of fertilizers, pesticides, and farm machinery to keep farm prices relatively stable and leave an equitable margin of profit for the farmer;
- strengthen farmers' organizations and their services; and
- improve the agricultural financing system, including the provision of an adequate supply of long-term loans.

In 1974, for the purpose of stabilizing rice prices and increasing farmers' income, the government set up a stabilization fund to provide guaranteed prices for rice. The minimum prices were fixed at approximately the average cost of production plus a 20 percent profit. The minimum paddy price was set at NT\$5.20 per kg for the first crop of 1973 and it was raised to NT\$6.00 for the second crop. The price was further raised to NT\$10.00 for both the first and second crops of 1974. Since 1975, the government purchase price has remained at NT\$11.50 for both rice crops, the highest the farmers

have ever received. This guaranteed price gives rice farmers a very strong incentive, and record production was achieved in 1976.

Sugar and Bananas

For sugar and bananas, government incentives for production were set up relative to world market demand. The annual sugar production averages about 850,000 t, of which about 400,000 t is exported and the balance retained for domestic consumption. Sugar exports are handled by the Taiwan Sugar Corporation (TSC). While the domestic sugar market is open to cane farmers and sugar dealers in free competition, the TSC may intervene in domestic sugar marketing to protect the interests of both producers and consumers by adjusting the quantity of sugar traded in the local market. Generally, the TSC tries to maintain the domestic sugar price at a high level as an incentive to encourage farmers to plant more sugarcane. Sugar for domestic marketing comes from two sources: contract cane farmers and the TSC. According to the contract, the farmers' share of sugar may be resold to the TSC for export at a certain percentage or sold to local sugar dealers for domestic consumption.

Generally speaking, an increase in price received from exports would stimulate both banana production and exports, because farmers can easily expand banana acreage or export bananas originally reserved for domestic consumption. But the actual situation is that the government enforces the retirement of banana plantings on steep slopes for the sake of soil conservation, and bananas are currently exported only to Japan, which maintains a strict banana import quota. The problem in banana exports is not one of price, but of markets. As efforts have been made in recent years by the government to reduce banana acreage and production, an increase in foreign market price is not likely to increase total production. A price increase in the foreign market will possibly drive up the price of bananas in the producing areas and drive up exporters' profits, but it can hardly affect the volume of banana exports as those exports are limited by the markets and import quotas of importing countries.

Maize and Soyabeans

The government has no intention of fully satisfying the demand for maize and soyabeans with domestic production. However, the farmers are still encouraged to produce them to improve the land utilization rate and reduce dependence on foreign feed for the domestic animal industry. At present, Taiwan still has some idle land that can be exploited for growing maize and soyabeans: about 250,000 ha of rotational rice fields and winter rice fields. However, as the c.i.f. prices of imported maize and soyabeans are lower than their domestic production costs, the market prices do not constitute any incentive to increase their production.

To boost maize and soyabean production, the government has offered guaranteed prices to assure a reasonable income to the growers. In 1972, the Taiwan Grains and Feeds Development Foundation was established with initial funds of NT\$1 million, and an additional tax of NT\$40 was levied on each ton of imported grains as a contribution to the fund. The fund has been used to purchase maize and soyabeans at guaranteed prices. The guaranteed prices are equal to the production costs plus a 20 percent profit. Price supports that guarantee reasonable profits give farmers a strong incentive to produce these two crops.

In recent years, the government has emphasized the necessity of reducing the costs of production and of boosting farmers' incomes. The general agricultural policy adopted by the government has as its chief goal holding down the prices of farm requisites and guaranteeing reasonable prices for farm products. Under this policy, farmers are given a real incentive to increase crop production.

Estimates of Comparative Advantages

Rice

The costs and rates of return for the first and second rice crops are used for calculation purposes. For both crops, calculations are based on *Ponlai* rice, which is the most popular variety among the farmers in Taiwan. The domestic resource cost coefficient for both the first and the second crop was less than one in 1970 and 1974, but greater than one in 1972 and 1976. By definition, if an activity is

socially profitable, then its domestic resource cost coefficient is less than one; when it is not socially profitable, its domestic resource cost coefficient is greater than one. Generally speaking, with the keen competition in today's economic society, rice production would not be so desirable so far as resource use is concerned. As economic development progresses, the domestic resource cost coefficients can be expected to grow. However, the domestic resource cost coefficients are lowest for both rice crops in 1974, which therefore had a higher comparative advantage than either the previous years or the following year. This resulted mainly from the energy and food crises in 1973 and 1974, which increased the world market price of rice from US\$227 per ton in 1973 to US\$373 in 1974. After the food crisis, the price in the world market dropped to US\$225 per ton in 1976 and the domestic resource cost coefficient rose to 1.054 and 1.121 for the first and second crops, respectively, which showed that (with decreased world market prices) domestic rice production was at a comparative disadvantage in 1976.

Comparative advantage in rice production, as indicated by the domestic resource cost coefficients, was positive in 1970 and 1974 but negative in 1972 and 1976. When judged by net social profitability at shadow prices of foreign exchange, the situation was similar. However, the Taiwanese farmer does not necessarily conform to criteria for social efficiency. With government price incentives, private profitability showed only positive advantages. Even with negative net social profitability coefficients in 1972 and 1976, the farmers thus still continued rice farming because of private profitability. And the effective rate of protection coefficients indicated positive advantages in 1972 and 1976, which meant that, even when production efficiency is lower domestically than in foreign countries, rice can still be produced by Taiwanese farmers under government protection.

Rice production in Taiwan has been actively supported by government policy and many public investment programmes. Profits accrued to farmers and society in recent years have proved the fruitfulness of the efforts to increase rice production.

Sugar and Bananas

These two products, both traditional agricultural exports, have low levels of costs, and their domestic resource cost coefficients range from 0.323 to 0.721 for sugar and from 0.325 to 0.398 for bananas. All domestic resource cost coefficients are below one, which indicates that sugar and bananas had comparative advantages in production in the years studied.

Sugar and bananas are subject to relatively high negative effective rates of protection primarily because of the contract for the government to purchase from cane farmers the needed raw materials at a low price to reduce sugar production costs. This has greatly boosted Taiwan's position in the world sugar market. Taiwan also reduced banana acreage and production to expand the production of principal food crops. Although fluctuations in the prices of sugar and bananas are frequent in the world market, farmers are still attracted by world market prices. Sometimes, they benefit immensely from very high world market prices, which result in increased contract prices.

In recent years, however, sugar and banana exports have been subjected to strict quotas imposed by importing countries and enjoy no preferential treatment. This has generated serious problems in foreign trade. Production must be geared to world market demand. Too much production usually results in lower domestic prices. High world market prices may thus not give farmers a comparative advantage in production of these two crops.

Maize and Soybeans

Comparative advantages in maize and soybean production, as measured by the domestic resource cost coefficient, were good in 1970 for maize and good in 1972 for soybeans only. The other years covered by this study witnessed only comparative disadvantages for the production of both, which have worsened in recent years. However, the supply response of the grain farmer does not necessarily conform to criteria for measuring social efficiency with domestic resource cost coefficients. With government-guaranteed prices, private profitability has a positive advantage every year. The production profit has ranged from NT\$0.71 to NT\$1.10 per kg for maize and from NT\$1.72 to NT\$2.71 per kg for soybeans in recent years. All effective rate of protection coefficients are positive, which explains government protection for domestic production in the form of an additional tax of NT\$40 per ton on imported grains. The government policy of guaranteed prices and protection may do harm to resource allocation but will give farmers an additional incentive to

continue producing maize and soyabeans to realize the goal of reducing dependence on foreign supplies.

Summary and Conclusions

The results of this study show that banana and sugarcane production have a comparative advantage because their domestic resource cost coefficients are below one. Rice, soyabeans, and maize cannot be produced economically because they have a domestic resource cost coefficient greater than one. However, the Taiwanese farmer does not necessarily conform to criteria for domestic resource cost coefficients. With government price incentives, the private profitability of rice, soyabeans, and maize reveals only positive advantages, which gives farmers an incentive to produce those crops. On the other hand, sugarcane and bananas are subject to relatively high negative effective rates of protection. The contract between the government and the sugarcane farmers allows the former to purchase from the latter the needed raw materials at a low price so as to reduce sugar production costs. The government also has a policy to reduce banana acreage and production in order to expand the production of principal food crops.

With respect to the energy and food crises, rice, sugar, and bananas had lower domestic resource cost coefficients after the crises, but maize and soyabeans had higher domestic resource cost coefficients in the post-crises period. The crises raised the domestic resource cost coefficients for imported goods but decreased them for exports. The government was thus hard pressed to maintain domestic production of maize and soyabeans in competition with imports, but the farmers were encouraged to expand rice, sugarcane, and banana production for export.

Judging from the increasing trend of the domestic resource cost coefficients, agriculture will be a high-cost industry in the future. In particular, since grain production has the highest domestic resource cost coefficient and a positive protection rate, the government has to make heavy budget allocations to subsidize grain production. This increasing burden on the government will create a serious problem for future agricultural development. The critical choice to be faced in the future is whether to maintain domestic grain production with a high domestic resource cost to achieve self-sufficiency in food or to import more grain from abroad and set aside some agricultural resources to produce cash crops, which will make agriculture more profitable. Comparative advantage analysis produces a set of useful indicators of reference value but cannot serve as the sole basis for policy making. The final decision, as always, rests with policy makers.

Note

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Reference

Pearson, S.R., Akrasanee, N., and Nelson, G., "Comparative Advantage in Rice Production: Methodological Introduction," *Food Research Institute Studies*, Vol. XV, No. 2, 1976.