

**TRANSITION AND REFORM OF CHINA'S AGRICULTURAL SYSTEM TOWARD A
MARKET-ORIENTED ECONOMY: LESSONS FROM THE TAIWAN EXPERIENCE**

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Department of Agricultural Economics
Texas Agricultural Experiment Station
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Web Site: <http://AFPC1@TAMU.EDU>

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Agricultural and Food Policy Center
Department of Agricultural Economics
Texas A&M University
College Station, Texas 77843-2124

or call 409-845-5913.

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Paul M. H. Sun
Ronald D. Knutson
Yuan-ho Lee

Agricultural and Food Policy Center
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Paul M. H. Sun^{1/}, Ronald D. Knutson^{2/}, Yuan-ho Lee^{3/}

I. Introduction

Because agricultural development is an important basis of economic development, Taiwan has made a great investment in the agricultural sector since 1945. Beginning in 1953, the government carried out its first four-year Economic Development Plan to strengthen agricultural development and raise national income. As an indicator of the success of this plan, Taiwan doubled its agricultural output index from 22.1 in 1952 to 44.5 in 1966; further to 88.4 in 1985 and 104.4 in 1996 (base 1991=100).

However, as might be expected based on the concept of diminishing returns, the growth rate of agriculture production has decreased from an average annual growth rate of 4.8 percent between 1952 and 1980 to 2.1 percent between 1981 and 1995 (Table 1). In the process of

Table 1. Major Agricultural Economic Indicators

Item	1952-1980	1981-1995
	----- Percent -----	
Economic growth rate	11.9	13.1
Increased rate of agricultural production	4.8	2.1
Farm crops	2.7	-0.2
Forestry	1.2	-13.0
Fishery	8.1	1.9
Livestock	7.5	6.1

^{1/} Chairman, Taiwan Grains and Feeds Development Foundation, Taipei, Taiwan.

^{2/} Professor and Director, Agricultural and Food Policy Center, Texas A&M University, College Station, Texas.

^{3/} Chief, Agricultural and Food Policy Division, Dept. of Agriculture and Food, Council of Agriculture, Taipei, Taiwan.

structural change, agriculture has provided labor for nonagricultural development. Early in this time period, part of the agricultural surplus was exported to finance imports of much needed foreign capital goods, helping to alleviate the foreign exchange constraint which hindered development.

Agriculture has influenced other aspects of the domestic economy. For example, the expanding agricultural sector, accompanied by rising farm family income, represents a major market for consumer goods produced by domestic manufacturers. Subsequently, the agricultural sector shares were adversely affected by import-substitution strategy emphasizing feed grains and oilseeds, importantly of U.S. origin. An adequate food supply has been vital for controlling inflation, thus helping to effectively mobilize and reallocate domestic resources. In addition, the existing agricultural infrastructure was utilized by the nonagricultural sector as a basis for transportation and public utilities. In all these ways, the agricultural sector has contributed decisively to overall economic development.

To foster general economic development, these contributions from the agricultural sector need to grow constantly. In order to ensure this continuity of growth in agriculture, certain policies, including physical investment, technological upgrading, institutional arrangements concerning the distribution system, and credit rationing are required. In addition, the agricultural sector had to adjust constantly to changes in the overall economic environment, which included a rise of farm wages due to a higher general income level, the gradual exhaustion of surplus agricultural labor, and changes in composition of the food supply. These aspects of economic change represent the effects of the nonagricultural sector on agriculture. However, the agricultural sector has paved the way for a more balanced development pattern in terms of stable

prices, more equitable income distribution, less regional dualism, and a higher degree of social stability.

China did not solve its food supply problem until 1978. Although China has invested most of its manpower and resources to develop agricultural production, it still has not been able to attain its target of food sufficiency. Thus, how to feed its population is the major agricultural policy issue for China. How persistently China pursues its self-sufficiency policy is an important issue that contrasts with the Taiwan strategy. To provide more food, China adopted a market-oriented reform of its agriculture system. With the establishment of the objectives of building a market economic structure and rapid growth of the national economy in 1992, there have been increasing opportunities for the reform and development of agriculture. But the difficulties and challenges have been unprecedented, especially since 1994. China's experience resembles the early stages of agricultural development in any developing economy.

China and Taiwan have been separated for about 50 years, since 1947. Taiwan has been successful in agricultural transformation and adjustment. Taiwan's experience of high economic growth and significant structural change in a relatively short period may indicate that accelerated growth in the agricultural sector is associated with the development of the nonagricultural sector. It also may indicate that rapid economic development is an aid to agricultural development. Taiwan's experience may provide useful insight to policy makers of China as they seek to promote the development of its agriculture.

II. Agricultural Development in Taiwan

In the small farm economy, the role of the government in stimulating development should not be ignored. The atomistic agricultural sector requires a tremendous amount of support from the

public sector because of its inability to manage production and the fixity of resources. The following are some of the more important institutional factors that have contributed to the successful development of agriculture in Taiwan.

1. Land Reform Program

In the immediate postwar years, Taiwan's farm population constituted more than 50 percent of the total population. The pressure on land was great and many farmers did not own the small pieces of land that they cultivated. They were tenants under the age-old tenure system. Share-crop rental rates were at least 50 percent of the crop harvest. As a result, it was difficult to motivate farmers to improve farming practices to increase production. The result was discontent and unrest in the rural areas. Land reform was the first measure the Taiwan government took to remedy this situation and promote rural development.

Land reform in Taiwan was launched in 1949 and completed in 1953. It consisted of three steps: rent reduction, sale of public lands, and the land-to-the-tiller program. These steps were carried out sequentially as a bloodless revolution in which farmland was gradually and peacefully transferred to the actual tiller. This program helped the farmers improve their livelihood and brought about a more stable social order in the villages.

In the first step of the program, emphasis was placed on two aspects: reduction of rent and security of tenancy. Under this measure, the farm rental rate was set at 37.5 percent of the annual main crop yield, and the lease tenure period was fixed at a minimum of six years -- which could be extended after expiration.

Successful implementation of the rent reduction program paved the way for the subsequent introduction of the sale-of-public-lands program, which involved vast areas of public lands on

which a sizable farm population was working as tenants. The government thought it was unfair to ask landlords to sell their holdings to tenants while the government itself held large estates. To set an example, the government proceeded to sell public lands to their incumbent tenants. The price of the public lands offered for sale was fixed at 2.5 times the value of the annual main crop yield. This purchase price was to be paid in 20 semi-annual installments over ten years.

Following the sale of public lands, the government started the final step of land reform, known as the land-to-the-tiller program. Under this program, each landlord was allowed to keep three chia (about 2.907 ha) of medium-grade paddy fields or six chia of drylands. Holdings exceeding that limit were purchased by the government and resold to tenant farmers who had been tilling them. The price of land again was set at 2.5 times the annual main crop yield. The landlord was paid 70 percent of the land price with land bonds and 30 percent with shares of government-owned industries. This payment arrangement forced the landlords to shift their investment from land to industry.

The rural land reform program fostered a profit-based market economy. After the program, farm families owning all or part of the land they tilled increased from 61 percent to 88 percent. Tenant families decreased from 39 percent to 12 percent of the total number of families. Other benefits of a social and economic nature can also be observed. On the economic side, land reform gave profit incentives to farmers and facilitated the successful implementation of various agricultural measures. As a result, great improvements were made in Taiwan's agriculture. Farmers worked much harder after reform. The index of multiple cropping increased from 170 in 1953 to 190 in 1964. On the social and political side, farmers became better fed and clothed. Many of them started to build and repair their houses. Since land is the major source of farm

income, land reform also played an important role in the redistribution of income which, in turn, brought a large measure of social justice to the rural areas. As a result of land reform, farmers have shown greater pride of ownership and interest in community activities. Many have run for and won local public offices. With improved social and political status, farmers have acquired a greater feeling of responsibility and citizenship.

2. Agricultural Trade and Economic Development

The agricultural sector earned a large amount of foreign exchange in the 1950s and 1960s, thus greatly improving Taiwan's balance of international payments. Agriculture provided exports in exchange for the capital goods needed for industrial development. The increase in agricultural production made it possible to satisfy domestic food requirements and also left a substantial surplus for export. Agricultural products long dominated the island's total exports -- with a share of about 90 percent in the 1950s (Table 2). Agriculture still financed a majority of Taiwan's total imports through the mid-1960s -- a crucial period in which the most serious constraint upon economic development was the amount of available foreign exchange.

Table 2 indicates that, even though the total value of agricultural exports continued to increase after 1965, agriculture's share of exports precipitously decreased to a 1996 low of 4.7 percent due to the rapid expansion of the industrial sector. In 1996, Japan was by far the most important export market for Taiwan's agricultural products, accounting for 44.8 percent of total agricultural exports. Hong Kong followed with 18.1 percent, and the United States with 9.1 percent. Agriculture's share of total imports likewise fell from about 30 percent in the 1950s to 9.8 percent of total imports in 1996. It will be noted from Table 2 that agricultural imports have

Table 2. Agricultural Trade in Taiwan

Year	Agricultural Exports	Agricultural Imports	Agriculture's Share of Total Exports	Agriculture's Share of Total Imports
	----- Million US \$ -----		----- Percent -----	
1952	114.2	66.5	95.5	32.1
1955	124.4	65.5	92.8	34.5
1960	121.0	75.8	71.0	30.1
1965	286.5	153.8	63.7	27.7
1970	388.1	376.5	26.2	24.7
1975	1,041.7	1,244.7	19.6	20.9
1980	2,251.0	3,088.7	11.4	15.7
1985	2,294.7	3,413.5	7.5	17.0
1990	3,661.4	6,088.3	5.5	11.1
1995	5,638.8	9,763.9	5.1	9.4
1996	5,484.9	9,986.6	4.7	9.8

Source: Basic Agricultural Trade Statistics of Taiwan, 1996.

increased more rapidly than exports and to a level that is about 80 percent higher. Total agricultural imports increased very rapidly from US\$75.8 million to US\$9,986.6 million, a 132-fold increase in a period of 36 years. This reflects Taiwan's increased dependence on the imports of feed grains and oilseeds and the related change in the diets of Taiwanese people from rice to pork, chicken, vegetables and fruit. Taiwan's policy has recognized that its comparative advantage lies in meat, fruit and vegetable production.

The United States was the main supplier, providing 54.5 percent of Taiwan's total agricultural imports. Other sources of agricultural imports were Malaysia, 9.3 percent; Australia, 5.5 percent; Indonesia, 4.5 percent; Thailand, 3.4 percent; and Japan, 2 percent. The high

concentration of both exports and imports is in the hands of two countries -- Japan for exports and the United States for imports.

3. Changes in Food Consumption Patterns and Food Self-sufficiency

During the past four decades (1956-1995), the population of Taiwan increased at an annual rate of 2.5 percent, while agricultural production grew at 3.5 percent. The higher growth in agricultural production indicates that agriculture in Taiwan has been able to provide enough food at reasonable prices to meet the rising and changing demand of an increasing population. Daily per capita calorie intake increased from 2,262 to 3,103 calories, and protein intake increased from 54 to 98 grams during the same period.

Table 3 indicates changes in food consumption patterns during the period from 1956 to 1995. Since 1970, there has been a significant decrease in the per capita consumption of sweet potatoes and rice, combined with a remarkable increase in the consumption of meat, sugar, vegetables, fruits and milk. The change in the food consumption pattern was mainly due to the increase of per capita income in Taiwan. The increase in meat and fish consumption has not only provided an opportunity for the development of poultry, livestock and fishery industries, but also has resulted in a big increase in feed grain and soybean imports, as analyzed in the previous section. The increase in the consumption of vegetables and fruits has provided market incentives for farmers to change the composition of crop production to more vegetables and fruits. This change in demand patterns precipitated adjustments in production patterns which greatly increased the intensity of agricultural production and the farmers' incomes.

Increases in the level of food intake, combined with changes in consumption patterns and slower growth in agricultural production, have resulted in a decline in the food self-sufficiency

Table 3. Per Capita Annual Food Consumption in Taiwan

Item	1956	1960	1970	1980	1990	1995
Polished rice	132.6	137.7	134.5	105.5	65.9	59.1
Sweet potatoes	64.2	65.4	18.4	4.1	2.7	2.5
Subtotal	196.8	203.1	152.9	109.6	68.6	61.6
Wheat flour	16.6	20.0	25.4	23.6	28.7	31.9
Sugar	9.4	9.4	15.0	24.0	29.8	24.2
Pulses, nuts and seeds	10.9	11.4	18.3	18.8	29.0	31.7
Vegetables	58.4	61.1	84.8	129.6	93.3	101.9
Fruits	14.5	22.1	45.8	70.2	131.5	137.4
Meat	17.0	16.2	25.3	39.6	62.9	76.1
Eggs	1.6	1.6	4.1	8.0	12.1	16.2
Fish	18.8	21.7	34.2	38.7	47.5	38.4
Milk	6.0	3.2	11.0	27.6	43.0	58.8
Oils and fats	3.7	4.7	7.7	10.8	23.3	26.3

Source: Basic Agricultural Statistics, Council of Agriculture, 1996.

ratio (Table 4). Prior to 1960, domestic food production was able to meet domestic food requirements and the food self-sufficiency rate was about 100 percent (on a value basis). Since then, the self-sufficiency rate has persistently declined to 85 percent in 1995. This means that 15 percent of domestic requirements had to be met with imports. Taiwan has had to rely heavily on imports to satisfy the domestic demand for wheat, corn, soybeans, other feed grains, and dairy products.

Although per capita consumption of cereals declined over the last 20 years, consumption of cereals used as animal feed has increased substantially, rising from 8 kg in 1952 to more than 372 kg in 1995.

Table 4. Food Self-Sufficiency Rate (Percent) in Taiwan, 1950-1995

	1950	1960	1970	1980	1990	1995
	----- Percent -----					
Total food	105	99	97	92	88	85
Cereals	103	93	82	66	58	55
Rice	110	102	104	113	99	103
Others	27	21	6	3	0	0
Starchy food	100	100	101	102	100	100
Sugar	826	739	280	200	93	84
Pulses, nuts and seeds	60	66	31	16	11	15
Vegetables	100	100	160	147	117	96
Fruits	106	127	148	110	94	87
Meat	100	102	102	99	105	110
Eggs	100	100	101	101	100	100
Fish	84	100	120	123	118	114
Milk	4	13	11	11	22	25

4. Infrastructure and Agricultural Production

1) Irrigation

Since paddy rice is the major food crop, irrigation is an indispensable factor of production. Without a reliable water supply, the full potential of high-yielding varieties and chemical fertilizers could not be realized. In Taiwan, the yield of the first rice crop is always higher than the second. One of the reasons is that the first crop is largely irrigated while the second crop, to some extent, depends on rainfall, which is generally plentiful but varies greatly from year to year. A regression analysis indicates a very high

correlation between area irrigated and yield per hectare (Rada & Lee, 1963). Similar correlation has also been observed in Thailand and the Philippines.

Building a large irrigation network has been one of Taiwan's major objectives. The Taiwan irrigation system consists of 1,644 structures for diverting water from the rivers and 30,000 kilometers of canals, laterals and ditches. With this system, over 60 percent of Taiwan's farmland is irrigated. Irrigation projects in Taiwan are financed with government subsidies, long-term and low interest loans, and assessments collected from the farmers. Irrigation associations have responsibility for the management of irrigation facilities.

2) Rural Roads

Roads are of prime importance to rural development because they reduce the costs of transporting and marketing farm products. Productive rural areas require a good network of roads both within the area and to market centers. The development of a rural area requires three kinds of roads: farm roads, area roads, and roads leading to major highways or railway stations. In Taiwan, the construction of farm roads is coordinated with irrigation and land consolidation programs. This has facilitated the movement of farm machinery and vehicles. Area roads and roads leading to the highways are usually county roads. Although these roads are not wide, most of them are paved. Except for the mountain areas, it is rare in Taiwan to see a village without paved roads.

To summarize, Taiwan's agricultural development efforts may be divided into three steps: first, to give farmers a market incentive to produce more; second, to provide them with modern farm inputs; and third, to encourage them to participate in business and community activities

which are of importance to their livelihood. These factors are not the only ones that have helped Taiwan's agricultural development. They are all an integral part of Taiwan's overall development program. Some of them are closely related and dependent upon one another and, therefore, they need to be well coordinated.

5. Transformation to an Industrialized Economy

Taiwan's modern economic development began in 1952. By then, economic output had recovered to pre-war levels in most sectors, even surpassing previous levels in some basic commodities such as rice, sweet potatoes and cotton fabrics. Inflation decreased from the hyperinflation of the late 1940s to a more reasonable 18 percent for consumer products. Former Japanese enterprises had been rehabilitated and, in most sectors, reached or surpassed pre-war levels. Government policy makers looked forward to further industrial development, and 1953 marked the implementation of the first Four-Year Economic Development Plan.

Over the next two decades, Taiwan changed from an agricultural-based economy with an over-supply of labor to an industrial-based economy. The agricultural sector, which comprised 32.2 percent of GDP in 1952, accounted for only 12.7 percent in 1975, while industry's share increased from 19.7 percent to 39.9 percent in the same period (Table 5).

In 1952, 56.1 percent of the population was employed in primary industry and only 16.9 percent in the industrial sector (Table 6). By 1975, the labor force in the agricultural sector fell to only 29.9 percent while industry rose to 35.4 percent. This declining trend in agriculture and the corresponding increased importance of industry continued through the 1970s and 1980s. By 1995, the relative shares of employment were 10.6 percent in agriculture and 38.7 percent in

Table 5. Share of Gross Domestic Product by Industries

Year	Agriculture	Industry	Services
	----- Percent -----		
1952	32.2	19.7	48.1
1955	29.1	23.2	47.7
1960	28.5	26.9	44.6
1965	23.6	30.2	46.2
1970	15.5	36.8	47.7
1975	12.7	39.9	47.4
1980	7.7	45.7	46.6
1985	5.8	46.3	47.9
1990	4.2	41.2	54.6
1995	3.5	36.3	60.2

Table 6. Share of Employment by Industries

Year	Agriculture	Industry	Services
	----- Percent -----		
1952	56.1	16.9	27.0
1955	53.6	18.0	28.4
1960	50.2	20.5	29.3
1965	46.5	22.3	31.2
1970	36.7	27.9	35.4
1975	29.9	35.4	34.7
1980	19.5	42.4	38.1
1985	17.5	41.6	41.0
1990	12.9	40.8	46.3
1995	10.6	38.7	50.7
1996	10.1	37.5	52.4

industry. The industrial sector has become the mainstay of Taiwan's economy. The foundation and conditions for this economic transformation from an agrarian to an industrialized economy were essentially complete by the early 1970s.

6. Food Policy in Transition

Between 1946 and 1948, price inflation in Taiwan was about five-fold and it jumped to about thirty-fold in early 1949. In the meantime, two million soldiers and civilians were added to the population. The need for price stabilization was extremely urgent and led to the New Taiwan Dollar Reform in the middle of 1949. The old currency was devalued by a factor of 40,000, and a conservative full-reserve system was established.

To fight inflation, a high-interest policy was adopted with the introduction of "preferential interest savings deposits." At the very beginning, these deposits carried an interest rate of as much as 7 percent per month, equivalent to 125 percent per annum. This high rate was lowered as prices came down. In the nine years during which these deposits were accepted, they proved very effective in absorbing an enormous amount of idle capital, thus contributing greatly to price stabilization. The high interest rate policy not only promoted savings but also helped direct investment toward more efficient enterprises.

On the fiscal side, the government made determined efforts to curtail public expenditures and increase tax revenue. The timely arrival of U.S. economic aid in 1951 greatly facilitated the task of post-war rehabilitation and fiscal management. Aid-financed imports in the 15 years before Taiwan was graduated in 1965 accounted for about 30 percent of total imports. Equally important, local currency generated by the sale of U.S. aid-financed commodity imports not only

reduced inflationary pressures but also helped offset government budget deficits until the budget was balanced in the early 1960s.

In the meantime, substantial imports of U.S. aid-financed commodities and increases in domestic production, especially food production, helped relieve pressures on demand. Such increases in farm output were due primarily to institutional innovations; those in industrial output were due largely to investments in relatively simple manufacturing operations with support from the U.S. aid program.

As a result of these anti-inflationary policies and measures, prices were gradually brought under control. Between 1952 and 1960, the annual increase in the level of prices fell to an average of 8.8 percent, and decreased to only about 3 percent in 1961. While success in the fight against runaway inflation took about a decade, it laid a healthy foundation for sustained rapid growth in the years that followed.

The role of rice as a wage good had a particularly important influence on government policy. In many instances, rice was used to hedge against inflation and, often, financial transactions were made in terms of, or in relation to, rice. Under these conditions, fluctuations in the price of rice were considered to have an adverse influence on the price of other commodities and services. It was argued that a rise in rice prices would raise labor costs, thereby raising the cost of production of labor-intensive industries. Increases in the cost of producing industrial goods, in turn, would affect their competitive position in international markets, and the pace of industrialization would slow. Consequently, stabilizing the general price level meant maintaining rice prices at relatively low levels.

During the first two decades of postwar agricultural development, government policies were quite successful in achieving both greater rice production and greater control over rice marketing for the purpose of maintaining a stable rice price. The government had purposely collected large rice stocks. Before 1973, the major means of accumulating rice stocks included paddy land taxes in kind, compulsory purchases of paddy from the paddy landowners, rent on government-owned farmland, proceeds in kind from the sale of public farmland, barter of fertilizers for rice, sales proceeds collected from ex-tenants who received land under the land reform program, and repayment of rice production loans provided by the government. Under the slogan of "more food for the people and the military," government policies toward rice were not seriously challenged (Chen, Hsu and Mao, 1975).

Rice prices in Taiwan have been very stable except in 1953, 1960 and 1974 when they experienced sharp upsurges because of bad weather and short supplies. In addition, the price spread between producers' prices and consumers' prices has been narrow. Seasonal price variations in normal years were small. To a large extent, this price stability resulted from government participation in rice marketing and strict application of government regulations in the rice market. The stabilization of the rice price served as a basis for overall price stabilization that facilitated the development of labor-intensive industry in the period from 1950 to 1970.

III. Difficulties in the Future Agricultural Development in Taiwan

By the mid-1960s, industrial production overtook agriculture in both percentage contributions to net domestic product and as a major source of exports. Concurrently, the role of agriculture in development marked a turning point from a major supporting role to a sustaining role. The slowdown in the growth rate of agricultural production became evident by the end of

the 1960s. Moreover, the agricultural product mix changed in response to market opportunities. For example, the mix adjusted toward more production of livestock and fishery products and high-value export crops. This change in structure presented Taiwan's agriculture with new problems similar to those existing in some other industrial countries at a comparable development stage.

With rapid expansion in industrial employment, the farm operations faced rising labor and production costs. Consequently, the gap between farm and nonfarm per capita income widened during the 1960s (Table 7). To raise farm income, government has carried out a series of

Table 7. Per Capita Farm and Nonfarm Family Income

Year	Farmers	Nonfarm	Farm Family Income As a Percent of Non-Family Income
----- NT\$ -----			
1966	4,509	6,464	69.8
1970	5,350	8,894	60.2
1975	14,274	21,285	67.1
1980	37,891	55,560	68.2
1985	54,558	79,031	69.0
1990	98,004	142,569	68.7
1995	172,206	227,637	75.6

measures since 1970. The ratio of per capita farm to nonfarm family income increased from 60.2 percent in 1970 to 75.6 percent in 1995. The relatively low income in agriculture has become a major issue in policy making. Unbalanced growth between the agricultural and nonagricultural

sectors affects the production, prices and wages of the agricultural sector with impacts on the economy as a whole.

The greatest challenges facing contemporary agricultural development in Taiwan include:

1. Rigid Farmland System

After the implementation of land reforms in Taiwan, the land tenure system became very rigid. Many part-time farmers left their land to overseers and would not lease it to other farmers because they feared that the government might revoke the land reform regulations and force them to give up their land ownership. Consequently, it has become extremely difficult for full-time farmers to enlarge their farm size by renting additional farmland. A system originally designed to prevent land concentration unwittingly prevented more productive use of land which constitutes a serious bottle-neck to further agricultural development.

Since 1960, group farming has been encouraged by the government to promote the efficiency of small farms. Farm mechanization has also been encouraged with group farming to realize economies of scale and to solve the labor shortage problem. Thus, small landowners were encouraged to turn over cultivation of their small pieces of farmland to full-time large farmers. Through group cultivation, no change in land ownership was needed and small farmland owners were free to seek full-time jobs.

The Council of Agriculture is drafting a new law which will provide more flexibility in farmland transactions and the tenancy system. Under the existing land laws, only bona fide farmers are qualified to purchase farmland. The proposed new law will allow agricultural school graduates, young men and women who have received special training

in farming, agribusiness, and agricultural production cooperatives to buy farmland. The new law will free all tenancy contracts except those signed under the 37.5 percent Rent Reduction Act. In addition, the proposed new law will put more restrictions on the conversion of farmland to nonagricultural uses after a comprehensive land use plan is drawn. The new law is expected to prevent land speculation in rural areas and to enlarge the farm size for improving farm efficiency.

2. Pollution

Rural industrialization has contributed positively in Taiwan by providing employment. However, the industrial sector has become the major source of pollution in the rural areas and has adversely affected agricultural production. The most serious problem is water pollution. All rivers and streams in western Taiwan have become polluted by industrial wastes in various degrees. Factories also took advantage of irrigation and drainage canals in the rural areas to discharge the industrial waste water without treatment. In a few cases, industrial wastes have resulted in soil contamination so bad that surrounding farmland had to be abandoned. People in the rural areas have become more and more concerned about the deterioration of the rural environment. They have refused to tolerate any pollution from rural industries and farms, which created strong pressure on the government to take pollution control measures in the rural area.

In many cases, agriculture is responsible for deteriorating rural environmental conditions in Taiwan. For example, over-use of fertilizers and chemicals has polluted the surface as well as the ground water in the rural areas. The wastes discharged from the livestock farms have caused the water and air pollution. Ground water over-use for

irrigation by agriculture has resulted in serious land subsidence in the southern coast area of Taiwan. To solve these problems, the government has taken regulatory actions. For instance, the agricultural farms have been encouraged to raise brackish water fish instead of fresh water ones. Livestock farms are not allowed to discharge the animal wastes without treatment. With these measures, the rural environment is expected to stop deteriorating and gradually improve.

3. Rapid Changes in Food Demand Structure

As the per capita income in Taiwan increased, food consumption patterns changed significantly. Farmers in Taiwan are facing two big challenges, i.e., to adjust production to the changing demand and to compete with foreign agricultural producers both in the domestic and foreign market. Sharp increases in labor costs, combined with these rapid switches in demand and competition, have created great pressure on Taiwan's farmers. Many of them have been unwilling to adjust and have lost interest and confidence in agriculture.

It would be an unprecedented achievement if Taiwan could create a dual structure consisting of a small number of internationally competitive full-time farmers and a rural majority of part-time farmers holding their land while staying in the villages with the bulk of their income from nonfarm occupations. Hence, the agricultural policy in the future should focus on improving the management, production practices, income and welfare of full-time farmers. The small part-time farmers have the options of either maintaining their small-scale farm by subsidies from off-farm income or of discontinuing farming. It is important to note that the new agricultural system needs firm and strong support from the

government to maintain its competitiveness while performing in an environmentally friendly manner.

4. Small Scale Farm Operation and Low Farmers' Income

Despite its inefficiency and low labor returns, the small farm system is likely to continue even though there is limited cultivated land and a high population density. Taiwan's average farm size was 1.12 hectares in 1955, decreased to 0.79 hectare in 1980, and increased gradually to 0.83 hectares in 1995 due to a decrease in the number of farm households. In the early days, small farms could be competitive because labor-intensive farming manifested no significant scale economies. Now the situation has changed. Machines have been substituted for manual work in order to overcome farm labor shortages. As a result, a one-hectare farm is too small to be operated efficiently. In the process, land use has become less intensive. The multiple cropping index dropped from its peak of 190 in 1964 to 114 in 1996. This indicates a switch toward an extensive use of farmland and calls for actions to encourage better use of the limited land resources.

Until the mid-1960s, agriculture was able to generate a steady increase in real income to farm families at a level that was commensurate with that of nonfarm families. Since then, net farm income has risen relatively slowly. In 1970, the per capita income of farm families was down to 60 percent of that of nonfarm families. Per capita farm family income recovered steadily to 76 percent in 1995 due to various supportive policies implemented by government.

Low income from farming has made farmers look for other income sources. Many farmers have chosen nonfarm, part-time work. In 1966, 66 percent of farm family incomes came from agriculture and 34 percent was nonfarm income, but these proportions have been reversed since

1981. The low returns from agriculture have resulted in the sluggish growth of the agriculture sector.

5. Falling Competitiveness in the World Market

Largely because of the surge of wage rates and, hence, the costs of farm production, many farm products have become unprofitable. For example, imported corn has replaced sweet potatoes as the major foodstuff and forced many farmers to give up growing sweet potatoes. Rice and sugar are no longer profitable for export. Once hot export items, canned mushrooms, asparagus and pineapple have lost their world market shares to other countries.

6. Policy Adjustments

In order to cope with structural change in agriculture and to ensure a sound and balanced development of the economy, a new agricultural development policy entitled "The Guidelines of Agricultural Policy" was announced in November 1969. The policy was designed primarily to accelerate agricultural modernization and to maintain a balance between the agricultural sector and the rest of the economy. The policy set forth 14 guidelines for gradual implementation step-by-step. A number of action programs have since been developed, including: (1) reduction in the price of fertilizer in 1970 and in 1971, (2) establishment of an Agricultural Finance Coordinating Committee in June 1970, (3) improvement of the agricultural marketing system in 1970, (4) promotion of the farm mechanization program in 1970, and (5) reduction in the farmers' tax burden in 1971.

For the purposes of accelerating rural and agricultural development and improving the welfare of farm families, the Accelerated Rural Development Program (ARDP) was announced in 1972. The set of new policy measures included: (1) abolishing the rice-fertilizer barter system,

(2) abolishing the educational surtax on farmland, (3) easing agricultural credit terms, (4) improving agricultural marketing, (5) strengthening rural infrastructure, (6) accelerating the adoption of integrated use of improved cultivating techniques, (7) establishing specialized agricultural production areas, (8) strengthening agricultural research and extension and (9) encouraging the establishment of industrial parks in rural areas.

The ARDP was designed to increase agricultural production, raise farm income, improve rural environment and accelerate agricultural modernization. The government appropriated a total of NT\$ 2 billion in the next two years to carry out all nine measures listed above. This program marked the change of economic development policy from "squeezing" agriculture to supporting agriculture. The program was originally scheduled to be concluded at the end of 1974. However, in view of the need for more efforts to lay a solid foundation for modernizing the agricultural sector, the government decided to extend the program to 1978.

In 1973 and 1974 when world food shortage became intensified and there was also a shortage of rice in Taiwan, the government made self-sufficiency in rice a national policy. To increase rice production and to improve farmers' income, the government adopted the guaranteed rice price policy, a sharp switch from the previous one. The Food Stabilization Fund was established simultaneously with the guaranteed rice price. This policy was expected to halt the decline of rice production and to narrow the disparity between the income of farmers and nonfarmers. In principle, the floor support price was fixed with a 20 percent profit margin above the production costs. Under this favorable condition, rice production reached a record 2.7 million metric tons in 1976. From 1974 to 1977, the government set no limit on the quantity purchased from rice growers. Due to the large outlays resulting from this policy, the government has limited

the quantity purchased to 970 kilograms per hectare per crop since 1977. The government also participated in the market operations by buying rice in order to maintain a politically acceptable price. The guaranteed price of paddy rice of NT\$10 per kilogram in 1974 was increased to NT\$11.5 per kilogram from 1975 to 1978, to NT\$12.5 per kilogram in 1979, to NT\$18.8 per kilogram in 1982-1988. Since 1989, the rice price has been maintained at NT\$19 per kilogram. The rise in the price support was inconsistent with what was happening on the demand side of the market. That is, while the government provided increased incentives for production, per capita consumption of rice declined from 140 kilograms per year in 1968 to 128 kilograms in 1976, 105 kilograms in 1980, and 66 kilograms in 1990, and 59 kilograms in 1995.

As expected, rice surpluses became a serious problem for the government. In the late 1970s, the government carried out an extension education program to shift paddy fields into production of other crops, livestock and poultry. There was no economic incentive attached to the program. With continuing declines in consumption, the rice surplus problem became even more serious. In reaction, in 1984, a Six-Year Rice Production and Paddy Field Diversion Program was implemented which gave a direct subsidy of one metric ton of paddy rice per hectare to farmers who shifted their paddy fields to corn, sorghum or soybeans. In addition, corn, sorghum and soybeans were purchased by the government at a relatively high guaranteed price. If farmers changed from rice to the production of crops other than corn, sorghum and soybeans, the subsidy increased to 1.5 metric tons of paddy rice per hectare.

Many farmers participated in the diversion program and the production of rice decreased significantly year after year. In 1995, rice production was 1.7 million metric tons -- a big reduction compared to 2.7 million metric tons in 1976. To make the program more beneficial to

farmers and reduce the management costs, the payment-in-kind subsidy was changed to the cash payment in 1988. At that time, the cash payment price for paddy rice was set at NT\$16.5 per kilogram. Thus, a total payment of NT\$16,500 and NT\$24,750 per hectare was made to farmers to replace one metric ton of paddy rice and 1.5 metric tons of paddy rice, respectively. Since 1988, the cash payment price for paddy rice has changed many times and it is now NT\$18 per kilogram.

Starting in 1989, the quantity of rice the government is committed to purchase at the guaranteed price increased to 1,400 kilograms per hectare and the quantity purchased at a price that is higher than the market price was set at 1,000 kilograms per hectare. Obviously, the purpose of the policy is to give more income to rice growers.

In the 23 years since the establishment of the Food Stabilization Fund (1974-June 1997), the fund has lost a total of NT\$102 billion in buying and selling rice. The current rice policy has suffered from a basic policy inconsistency -- the program of shifting from rice to other enterprises is aimed at reducing rice production on the one hand, while the guaranteed rice price provides incentives to produce more rice. The government understands the contradiction of these policy measures, yet is reluctant to abolish the guaranteed rice price immediately as a means of protecting farmers' economic and political interests. Discontinuing the guaranteed rice price policy would hurt farmers' economic interests, which would become a political problem and may result in a social instability. However, continuing these policies will be an increasing government financial burden and make the rice surplus problem persist. Now, a direct payment scheme linked to farmers' income and the land use is under consideration as a substitute for the current guaranteed rice price policy.

In 1979, the government launched a subsequent program called the Program on Enhancing Farm Income and Strengthening Rural Reconstruction which was, in essence, a continuation of the Accelerated Rural Development Program. In 1980, the government initiated a Program on Basic Infrastructure Development. Then, in 1982, these two programs were merged into the Program on Strengthening Basic Infrastructure and Enhancing Farm Income. This program coordinated and integrated long-term rural development projects.

In 1985, a six-year Program on Improving Agricultural Structure and Enhancing Farm Income was launched. This program places emphasis on: (1) adjustment of crop production to reduce rice production while increasing high-value crops, (2) enlargement of the scale of farming operations, (3) improvement of agricultural marketing, and (4) strengthening agricultural research and extension. From 1991 to 1997, the government proposed an Integrated Agricultural Adjustment Program, the goals of which were to take care of farmer welfare, develop agriculture, and develop infrastructure in rural areas. In 1997, an Across Century Agricultural Development Program was initiated. The goals of this program include:

- # Continued development of modern agriculture,
- # Building rich and beautiful rural areas, and
- # Raising and strengthening the welfare of farmers.

From 1989 to 1998, a total of NT\$487.7 billion was spent on these programs. For a small country, public capital investment and expenditure of this magnitude to vitalize the small farm economy during a period of 10 years is impressive. By 1995, Taiwan had 872,000 hectares of cultivated land, 779,000 farm families and a 3,716,000 farm population. This means that the average amount of public investment and expenditure on the farm economy over the past 10 years

was NT\$559,289 per hectare of cultivated land, NT\$626,059 per farm family and NT\$131,243 per capita for the farm population.

Public expenditures on the agricultural sector will continue to grow as the national economy expands. The supply of capital for investment in agriculture will not be a serious problem as the enlarging industrial and service sectors enhance the ability to support agriculture. The question will be how to best use public investments so that new technology can be introduced and diffused quickly, the scale of farming enlarged, and the efficiency of agricultural production improved. These are the challenges for the people and the government in Taiwan.

IV. Agricultural Development in China

In China, since 1978, the decentralization of decision-making -- combined with appeals to develop commodity production -- encouraged specialization and generated large increases in agricultural output and income. Over the past two decades, agriculture has made important contributions to the development of the national economy in terms of products, markets, labor force, capital and foreign exchange. The position of agriculture in national economic development can be analyzed as follows:

1. Position and role of agriculture in economic development

Since 1978, China has achieved a steady increase in agricultural production. From 1978 to 1985, the average annual growth rate of gross domestic product (GDP) was 9.4 percent (Table 8) and agriculture 10.1 percent. Agriculture's value added totaled 1,428.5 billion yuan. The contribution made by the growth of agriculture to real GDP growth in this period reached 4.3 percent with the value of agricultural output accounting for 42.3

Table 8. National Economy and Agricultural Average Annual Growth Rate

Year Period	Gross Domestic Product (GDP)	Agriculture	Agricultural	Nonagricultural
			Sector Share to GDP	Sector Share to GDP
			----- Percent -----	
1978-1985	9.4	10.1	3.98	5.42
1986-1990	4.3	5.5	2.23	2.07
1991-1995	12.0	10.1	3.64	8.36

percent of total economic activity. The nonagriculture sector's growth rate was 5.8 percent, accounting for 57.7 percent of economic activity.

Between 1986 and 1990, the average annual growth rate of the gross domestic product was 4.3 percent, and agriculture 5.5 percent. The real agricultural value added totaled 733.9 billion yuan. The contribution made by the growth of agriculture to real GDP growth in this period reached 2.2 percent, with the value of agricultural output accounting for 51.8 percent. The nonagricultural sector grew by 2.1 percent with total output accounting for 48.2 percent of the economic activity. From 1991 to 1995, the average annual growth rate of the domestic product was 12.0 percent, and agriculture was 10.1 percent. Agriculture's value added totaled 1,895.1 billion yuan. The contribution made by the growth of agriculture to real GDP growth in this period was 3.6 percent, with agricultural output accounting for 30.3 percent of the economic activity. The nonagriculture sector amounted to 8.4 percent and accounted for 69.7 percent of economic activity. The steady increase in agriculture laid a foundation for the growth of the national economy as a whole.

Since 1978, agriculture has made a steadily increasing contribution to China's economic growth. From 1978 to 1985, agricultural growth made a bigger contribution than in 1986-90 and 1991-95 (2.2 percent and 3.6 percent, respectively). Although the growth of the national economy between 1991 and 1995 remained at a high level, the contribution of agricultural value added indicated a declining trend. Judging from the long-term development trend, agriculture's share of the gross domestic product will continue to decline. In the future, China will need to continue to encourage the appropriate scale of farm operations in places having good growing conditions to improve agricultural productivity and to coordinate the development of industry and agriculture.

2. Coordinating in industry and agriculture

Industry and agriculture are the two primary sectors of the national economy engaged in material production. Whether these sectors develop proportionally has a direct impact on the sustained and stable growth of the national economy. International experience and past practice of the country indicates the desirability of proportionate growth of industry and agriculture in both physical and value terms.

In the seven years from 1978-1985, the policy of "readjustment, reform consolidation and improvement" led to more rapid growth of agriculture than industry. This was a marked change from the situation under which industry had for so long developed too fast while agriculture had grown too slowly. From 1986-1990, the development of agriculture declined as large quantities of resources were transferred to urban industry and rural nonfarming sectors. Growth in production of grain, cotton and oil-bearing

crops declined, resulting in a proportionate gap of industrial and agricultural development. Between 1986 and 1990, the average annual industrial growth rate was 8.4 percent, while that of agriculture decreased from 10.1 percent to 5.5 percent (Table 9). In 1988, under the dual pressure of rapid industrial development and the tight supply of major agricultural products, inflationary pressures developed.

Table 9. Average Annual Growth Rate¹ in Industrial and Agricultural Sector

Year Period	Agriculture	Industry	Proportion (Agriculture as 1)
	----- Percent -----		
1978-1985	10.1	8.3	1 : 0.82
1986-1990	5.5	8.4	1 : 1.53
1991-1995	10.1	18.1	1 : 1.79

¹The annual growth rate is calculated using the total value.

To correct the uncoordinated development of industry and agriculture and control the existing inflation, China started a new round of three-year economic readjustment in the fourth quarter of 1988. The result was the stimulation of both agricultural and industrial growth, although the latter advanced much more rapidly. During 1991 to 1995, the average annual industrial growth rate increased from 8.4 percent to 18.1 percent, while that of agriculture increased from 5.5 to 10.1 percent (Table 9). The ratio of growth of agriculture to industry deteriorated to 1:1.79. This suggests that China could become more import-dependent as its consumers respond to higher incomes with increased demand for higher valued and resource-using foods such as chicken and pork. This, in turn, suggests reduced growth in rice consumption.

3. Rural Reform and Development

China's rural reform and its cycles of agricultural development can be divided into four stages:

1) Establishment of farmer households as the main operators and the unconventional growth of agriculture (1979-1984).

The most successful dimension of rural reform has been the development of family farmers as the major production unit. In the short span from 1979 to 1984, China transitioned from contracting output to households to contracting the whole production process to households. By the end of 1984, farm households became the basic units of agricultural production and the base of the rural economy.

To enable the farmers to get better prices for their products, in 1979, China raised the prices of major agricultural produce and sideline products. Meanwhile, China reduced the scope and quantity of agricultural produce subject to mandatory purchase.

During this period, agricultural production grew rapidly, which not only solved the problem of insufficient food and clothing for most farmers but also created an environment for further reform. In the process, the purchasing and marketing system was improved and provided a solid foundation for economic reforms in cities.

2) Reform of purchasing quotas for agricultural products (1985-1988).

Agricultural products experienced a low-level structural surplus in 1985. Subsidies to grain, oil-bearing crops and other bulk agricultural products imposed a large financial burden on the Chinese government, second only to the losses incurred

by state-owned industrial enterprises. Thus, China decided to abolish the system of quotas for purchasing agricultural products and imposed a dual-track system of purchasing grain, oil-bearing crops and other bulk agricultural products by signing contracts and purchasing through the market. All other agricultural products were traded on the open market with production adjustments being determined by market forces.

To lessen the financial burdens, China relaxed the controls over the prices of agricultural capital goods and gradually reduced subsidies to industries serving agricultural production. In response, the prices of agricultural capital goods rose sharply, resulting in a cost-price squeeze for crop farmers. As a result, the production of grain, cotton and other bulk products stagnated and animal husbandry, fisheries and township enterprises experienced a boom period. The result was rapid adjustment in the rural economic structure.

3) Readjustment of the national economy (1989-1991)

Starting in 1988, China corrected its national economic policy to control inflation through a tightening of macroeconomic policies. Although agricultural production grew, the government purchase prices for grain and cotton were far lower than the market prices. As a result, it was difficult for all places to purchase grain and cotton as planned. In reaction, China's government monopolized its rice policy at the end of 1988. In 1990, the system of contract purchasing was changed into direct purchasing by the state. However, cotton purchasing and marketing continued to be monopolized by rural supply and marketing cooperatives. The development of

nonagricultural activities was curtailed. The development of township enterprises slowed down markedly. As a result, the income of farmers began to decline for the first time since the introduction of reforms. The income and consumption gaps between urban and rural areas retrenched to the level that existed before the reforms started in 1978.

During this period, the rural reform was mainly characterized by local breakthroughs in the grain purchasing and marketing system. Grain marketing firms began to introduce the market-oriented grain purchase and market system by reducing the amount of grain purchased by the government (the contracted purchase), reducing the amount of grain sold (at state-pegged prices), raising the prices of grain both for contracted purchase and for marketing, and lifting controls over grain purchases and market prices. This led to the introduction of the system of purchasing and marketing grain at the same price.

4) Development of a market-oriented agricultural economy (1992-1997)

In this period, a series of reform measures were initiated which included creating the floor price for grain, building standardized central and regional grain wholesale markets, establishing grain reserves and implementing the “grain bag” and “vegetable basket” projects. The macroeconomy also was marching toward a market system. The agriculture and rural property right system was also reformed in that the term of land contracting was extended by another 30 years and a turnover mechanism for land use rights was established for the first time in history. External investment in agribusiness and agricultural production and food processing grew very fast during

this period. The result was diversified development of the agriculture sector and rural economy, including expanded grain and vegetable production capacity and the development of township enterprises. Agriculture and the rural economy supported rapid development of the national economy.

The following conclusions can be drawn from this analysis:

- # The income gaps between urban and rural areas continued to widen. This suggests that the allocation of national income was biased toward cities.
- # Though policies and measures produced by the state were quite strong, their implementation left much to be desired. While the reforms touched deep in the problems of agriculture and the rural economy, traditional interest structures were very hard to change.

V. Difficulties in China's Future Agricultural Development

The objective of China's reform program, initially, was to build the basic framework for a socialist market. This has been accomplished by reforming the property right system, macroeconomic system, and the urban and country governmental system. It also created an agricultural and rural economic system with the market being a major means for allocating resources with effective guidance, support, protection and control by the state. However, China is sure to meet many difficulties in increasing the output and income of farmers because of its less efficient production technology, small scale of production and the traditional interests in rural areas. The major difficulties can be described as follows:

- # Its quantity of available farmland decreases as population increases.

- # Its system for developing and extending advanced and adaptable technologies is not sound.
- # Its supply of agricultural inputs cannot be ensured.
- # Its excess supply of rural labor must find alternative employment.
- # Its small scale production makes it impossible, in the near-term, to achieve economies of size for grain production.

Overcoming these difficulties requires that China approach its agricultural policies from a long-term perspective with well-defined concepts and goals, and that it seek new policy paths and methods.

VI. Conclusions

Over the years, Taiwan's agriculture has experimented with various adjustments in farm management to cope with fierce competition from other sectors for land, labor and other resources while minimizing the adverse effects of farmland fragmentation and small-scale farming. Improvements have been introduced in the scale of farming, farm mechanization, farm organization, infrastructure development and farmer training. The result has enhanced farm income and improved living conditions for farmers. In addition, Taiwan introduced a series of agriculture policies to balance the growth of agricultural and industrial sectors.

Despite increased market orientation, China's government seems to have entered a phase of uncertainty regarding what should be done about prices, markets, investments and control of land utilization. The core of these problems lies with the farm households that are typical of China's agriculture. Small, inefficient farms reduce the rate of private investment in agriculture. Increases

in farm product purchase (support) prices after 1978 were designed to foster increased production and to generate increased investment by peasants in their farm operations.

China's agricultural markets have gradually changed to a unified purchasing and marketing system where prices are more responsive to forces of supply and demand. However, agricultural development has lagged relative to that of the industrial sector. Industrial and agricultural development still keep a high level. To reduce this gap, China has introduced many policies and programs. However, because of system rigidities, its performance lags that of other agricultural economies in the region.

In contrast, Taiwan's longer-term approach to developing its small farm economy is a well-known success story. It started in the early 1950s with a peaceful land reform which was followed by improvement in farm resource utilization, building rural infrastructure, provision of agricultural extension services and introduction of production structure changes. This approach can be characterized by close cooperation between the government and farmers, strong linkages between the farm and nonfarm sectors, and effective coordination between planning and financing. Taiwan's policies have become a development model attracting global interest. Its experiences with agricultural development and policy implementation should be of great value to China and to other small farm economies.

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