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# Agricultural Development in Three Asian Countries: A Comparative Analysis

By Chinkook Lee and David W. Culver\*

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## Abstract

This article examines the role of agriculture in economic development in three Asian countries Japan, Korea, and Taiwan. Agricultural output increased substantially and agricultural exports were achieved at the initial stage of economic development in Japan and Taiwan. In Korea, however, agricultural performance was less satisfactory, particularly in exports. Land reform was a major element of agricultural development in all three countries.

## Keywords

Agricultural development, role of agriculture, economic development

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Our primary objective is to evaluate the role of agriculture in the initial stage of economic development in three Asian countries Japan, Korea, and Taiwan. We examine the hypothesis of Rostow and others that an increase in agricultural output through the growth of agricultural productivity is essential for sustained economic growth to "take off" (9)<sup>1</sup>

A related objective is to evaluate whether the experience of these three countries confirms the conventional view (6) that countries pass through roughly similar development patterns. Thus, we evaluate similarities as well as dissimilarities of the development process.

We selected the following periods for this analysis: Japan, 1868-1920, Korea, 1954-77, and Taiwan, 1949-77. Japanese economic development is often regarded as a model for other developing nations, particularly in Asia. Thus, the factors determining early agricultural development in Japan are particularly relevant to the less-developed countries. We start by examining Japanese agricultural development in its historical perspective and use a similar approach for Korea and Taiwan.

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<sup>1</sup>Italicized numbers in parentheses refer to items in the References at the end of this article.

Researchers in Japanese economic development generally consider the Meiji Restoration beginning in 1868 as the starting point of modernization and 1920 as the point at which the country entered a period of sustained growth. The periods selected for Korea and Taiwan reflect recent economic development in those countries that promise sustained growth.

## Agricultural Development in Japan

Rice was the staple food and by far the most important commodity in Japanese agriculture during the early stage of development, and rice output rose modestly compared with other agricultural products. Growth during the early period was more rapid in sericulture (production of silkworm cocoons), tea, and livestock production. Hayami (3) reports that during the 19th century growth rates of production for the major groups of agricultural commodities in Japan were 0.9, 2.1, 3.9, and 6.8 percent for rice, other crops, cocoons, and livestock products, respectively.

Table 1 shows that the output of six crops (rice, wheat, barley, naked barley, sweet potatoes, and white potatoes), which accounted for nearly 80 percent of Japan's domestic food production, increased steadily over the four decades (1880-1920) and that the final 10-year average (1911-20) was 77 percent above the first 10-year average (1881-90). It is also possible to fairly satisfactorily appraise the increase

Table 1.—Indexes of area, yield, production, and productivity for six major crops, Japan, 1881-1920 (10-year averages)

Period	Area	Yield	Production	Productivity	
				Labor	Land
	<i>Index</i>				
1881-1890	100	100	100	100	100
1891-1900	113	113	127	114	110
1901-1910	116	125	146	137	125
1911-1920	121	146	177	179	143

Sources (2, 3, 5)

in agricultural productivity in Japan in 1880-1920. The last two columns of table 1 show the growth of Japanese agriculture during this period was accompanied by increases in productivity of both labor and land, particularly labor. Labor productivity increased 79 percent while land productivity increased 43 percent above the level of the 1880's.

Japanese rice yields in the 1880's are estimated by Hayami and Yamada (4, p. 108) to have been 2.36 tons of paddy per hectare, compared with yields in other Asian countries in the 1953-62 period of 1.17 tons per hectare in the Philippines, 1.36 tons in India, and 1.38 tons in Thailand. However, yields of 2.75 tons in South Korea and 2.93 tons in Taiwan during 1953-62 compared favorably with Japanese yields during the 1880's.

Although many factors contributed to Japanese agricultural development during this period, we consider only some of the more important ones here. First, the abolition of feudalistic landownership allowed farmers to take full responsibility for agricultural production, including decisions on land use and crop choice. The new landowners were exempted from the feudal taxes in kind, and new taxes were levied in cash based on the value of land. This Land Tax Revision in 1872 was cited by Hayami (2) as the single most important institutional change of the Meiji era. The new conditions encouraged farmers to produce cash crops such as silk, tea, tobacco, and livestock and to increase rice yields. The new taxes, based on the value of land, increased Government revenues which were used in part to finance a network of research and experiment stations.

An important related point was the Government's initiation of export incentive measures for sericultural products (mostly raw silk) and tea. Raw silk alone provided 61 percent of the country's export earnings from 1868 to 1875. These exports at the initial stage of economic development were a crucial factor contributing to agricultural development.

Development of infrastructure during this period contributed to market expansion for agricultural products to satisfy domestic demand. During 1883-98, railroads, both national and private, were extended to 5,500 kilometers from an initial system of 72 kilometers. This system was further extended by 1920 to 25,900 kilometers. The development of the railroad system encouraged farm-sector purchases of industrial inputs in larger volumes at lower prices, and it allowed farmers to sell their products at higher prices. The terms of trade for the agricultural sector had improved.

What is of interest to other countries is not so much the fact of a striking transformation in the productivity of Japanese agriculture as that it took place within a traditional framework of small-scale farming and with no significant reduction in the agricultural workforce. Moreover, the Japanese experience illustrates how agriculture was to fulfill its traditional role in the strategy of overall development. Japanese agriculture during the course of modernization and rising productivity also earned foreign exchange and provided investment resources for other sectors. Thus, the Japanese pattern of economic development can be characterized as moderately rapid with balanced growth of agriculture and industry, based on small-scale units.

### Agricultural Development in Korea

Rice has historically dominated Korean agriculture as the main staple food grain. The long period of Japanese influence (1910-45) until the end of World War II included improvements in crop varieties, irrigation, and other crop practices along the Japanese model. These improvements helped Korea boost farm production, overall agricultural output rose 7 percent annually from 1946 to 1949. However, during the Korea war (1950-53), agricultural production decreased, with growth starting again in 1954.

Table 2 shows output growth rates of major agricultural commodity groups from 1954, the year after the Korean War ended, to 1977. The growth rate was 3.9 percent per year from 1954 to 1965, but only 2.2 from 1965 to 1973. This slower growth rate during 1965-73 was associated with a slower growth rate in rice production during this period. Agricultural output was still dominated by rice production. Thus, even with a sharp increase in silkworm cocoon production, overall agricultural output grew more slowly. It grew about 8.8 percent annually from 1973 to 1977 because of an initial success with new rice varieties and a big push in livestock production.

From 1970, the Government encouraged planting of high-yield rice varieties derived from crosses of the native japonica types with indica varieties, initial yields were approximately 30 percent over indigenous varieties. Furthermore, the Government also stressed irrigation, reshaping of paddies, and heavy use of fertilizers and herbicides. This program generally succeeded through 1977 when Korea produced a record 6 million tons of rice.

Table 3 shows growth rates of major inputs and labor and land productivity during 1954-77. Labor

input, measured as the farm labor force, increased 3.7 percent annually during 1954-65, but declined thereafter. Land input, measured by cultivated land, increased slightly during 1954-65, but did not change much during 1965-77. Although fixed capital, such as farm machinery and equipment, did not increase during the initial stage of economic and agricultural development, working capital (comprised of expenditures for chemical fertilizers and herbicides) increased rapidly following construction of a nitrogen fertilizer plant in the late 1950's.

Thus, the growth of land productivity (particularly paddies) was associated with the increasing application of fertilizers and pesticides accompanied by the development and adoption of high-yield rice varieties and the improvement of irrigation facilities. Labor input in agriculture increased significantly in 1954-65 with the influx of refugees from North Korea and workers displaced from devastated urban industries. Labor productivity increased slightly during this period. Therefore, inputs contributed more to increases in total output (64 percent) than did productivity (36 percent). Labor productivity rose 6.9 percent during 1965-73 and 13.7 percent during 1973-77.

Table 2—Growth rates of major agricultural commodity groups, Korea

Year	Total output	All crops	Rice	Silkworm cocoons	Livestock
	<i>Percent per year</i>				
1954-65	3.9	3.7	2.7	2.3	6.5
1965-73	2.2	2.2	1.3	1.2	5.2
1973-77	8.8	8.7	7.8	-1.2	11.7

Source: *Yearbook of Agriculture and Forestry*, Republic of Korea Ministry of Agriculture and Fisheries, various years.

Table 3—Growth rates of major inputs and productivity, Korea

Year	Labor	Land	Fixed capital	Working capital	Productivity	
					Labor	Land
	<i>Percent per year</i>					
1954-65	3.7	1.3	—	8.3	0.7	3.0
1965-73	-2.9	—	1.2	19.5	6.9	2.4
1973-77	-2.4	-1	1.7	12.7	13.7	9.6

Source: (1)  
— = No change

Land reform was also delayed. Even though a land reform act was passed in 1949, the program was not implemented until 1965, delaying farmers' incentives to increase yields (10). Another delayed initiative was the new agricultural cooperative law, passed in 1961 to assist the land reform program. Thus, significant progress in agricultural development, with labor-saving technology and further development of land-saving technology, was not evident until the late 1960's.

### Agricultural Development In Taiwan

Taiwan's economy was in disorder at the end of World War II. Inflation threatened the people's living, and the large influx of migrants from the Chinese mainland aggravated food shortages. However, this situation did not last long. With favorable prices for farm products and increased supplies of production inputs, particularly through the United Nations Relief and Rehabilitation Administration, agricultural production was quickly revived. Increased crop area planted, rather than crop yields, was initially the main contributor to rising crop output. The increased area came largely from multiple cropping rather than from new lands. For instance, the multiple cropping index rose from 112 in 1945 to 170 in 1951.

The role of agriculture was critical in Taiwan to the balanced strategy of developing agriculture and industry jointly in the early stage of economic development. As table 4 shows, outputs increased sharply even in 1946-51 (the early recovery period from wartime) for all major categories, with total output up over 10 percent per year. Vegetable production, which increased substantially, was stimulated by the production of new crops such as mushrooms and asparagus, largely for export. Growth in total agricultural output slowed in 1951-67, mainly because of the slower growth of rice production. However, growth in output of fruits, vegetables, and livestock and livestock products remained strong.

The high growth rate of agricultural output in the initial period was achieved with significant increases in both land input and productivity (table 5). Land use rose slowly, but labor use was up substantially in the initial period and then rose more slowly from the mid-1960's. However, the most rapid increase in inputs was in current capital, where high growth rates persisted throughout the period. Rising agricultural productivity was a major source of national growth in the early years, with labor and land productivity growth rates of 7.6 and 10.9 percent, respectively, during 1946-51.

Table 4—Growth rates of major agricultural commodity groups, Taiwan

Year	Total	Rice	Fruit	Vegetables	Livestock and products
<i>Percent per year</i>					
1946-51	10.3	9.5	5.6	8.2	14.5
1951-67	4.6	3.1	11.3	8.1	7.6
1967-77	4.0	6	5.4	8.4	7.9

Source: *Taiwan Agricultural Yearbook*, Department of Agriculture and Forestry, Taiwan, various years.

Table 5—Growth rates of major inputs and productivities, Taiwan

Year	Labor	Land	Fixed capital	Current capital	Rice yield	Productivities	
						Labor	Land
<i>Percent per year</i>							
1946-51	3.4	1.0	4.3	23.7	5.4	7.6	10.9
1951-57	1.4	1.6	3.3	8.5	4.5	6.0	6.6
1957-67	1.4	1.6	7.2	8.5	3.1	4.6	5.1
1967-77	9	2	7.2	10.6	9	5.4	3.8

Source: *Taiwan Agricultural Yearbook*, Department of Agriculture and Forestry, Taiwan, various years.

Labor and land productivity grew throughout the period, with growth rates after 1951 generally 4-6 percent per year

The land reform program, allowing farmers to own their own land, was started in 1949 and encouraged rapid agricultural growth in Taiwan. The first step was the reduction of land rent, which increased the incentives for more intensive use of both human and land resources. The second stage of land reform was the sale of public land in 1951. The third stage was the land-to-the-tiller program started in early 1953. Under this program, the Government purchased all privately owned tenanted holdings exceeding 3 hectares of paddy land or 6 hectares of dry land and resold the land to the tenants. The program encouraged multiple-crop farming and widened employment opportunities of agricultural workers. The application of power machinery to rice cultivation in Taiwan began in 1954 with imports of small tractors. Mechanization of land preparation in Taiwan, especially of paddy fields, is now widespread.

The land reform was only part of a systematic and successful agricultural development effort. Taiwan, like Korea, built on the modernization dating from the long Japanese occupation prior to World War II. The agricultural progress allowed transfers from agriculture to the nonagricultural sectors and also provided large agricultural exports, a major source of foreign exchange in the 1950's. Agricultural research sponsored by the Government accelerated growth in the postwar years, great technical advances boosted crop yields, and a better crop rotation system further increased the opportunities for multiple cropping.

Taiwan's most important natural resource is its agricultural land, but only 20 percent of the total area is arable. Thus, if natural resources alone had determined the rate of economic growth, rapid development in Taiwan could not have been expected. However, the experience in Taiwan strongly supports the notation that, in an environment conducive to market expansion through international trade, labor, capital, and entrepreneurship can substitute for natural resources.

## Similarities and Dissimilarities

Land reform was common to all three countries. In Japan, the reforms of the Meiji Restoration removed the restraints of the feudal system. The land tax reform, which granted a fee simple title to the farms and transformed a feudal share crop tax to a fixed rate cash tax, increased the farmers' incentives. In Korea and Taiwan, as in Japan, land reform encouraged tiller-ownership of the land, and farmers were free to choose what to produce based on market conditions. However, the land reform in Korea was not completed until a later stage of economic development.

The main difference lies in the less satisfactory performance of Korea's agricultural sector, particularly in agricultural exports at the initial stage of economic development. The agricultural infrastructure in Korea was less extensive than in Taiwan, and the postwar Korean Government was less active and successful in raising agricultural productivity. The Korean countryside was very heavily damaged by the Korean war and required prolonged efforts to regain prewar production potential. Korea simply started behind Japan in terms of the ability of its agricultural sector to satisfy domestic food and fiber needs and never caught up (especially in per capita terms), it, therefore, never managed to achieve an exportable surplus. Thus, the dynamic role of agriculture in economic development is more apparent in Japan and Taiwan than in Korea during the periods of precondition for takeoff.

Agricultural development was the backbone of industrialization in Taiwan's economy. Use of Japanese small-scale machinery was clearly a characteristic of agricultural modernization in Taiwan. Agricultural growth was less significant in Korean economic development. Modernization of agriculture was not achieved in Korea until well after the manufacturing sector developed and industrialization was well underway.

In Taiwan, foreign exchange earnings from agricultural exports helped finance necessary imports of capital goods and intermediate products. This process was similar to the early stage of economic development in Japan. Japan exported raw silk and tea at the initial stage of economic development whereas

Taiwan exported mainly fruits and vegetables. Korea, on the other hand, had to depend on manufactured exports, heavily supplemented by foreign capital inflow (8). U.S. grants and loans were a major source of import finance through the early 1960's. Korea's export drive based on manufactured products gained momentum in the mid-1960's, and export earnings took over more of the burden. Furthermore, a booming economy attracted greater foreign investment and enabled Korea to borrow large amounts of capital from the International Bank for Reconstruction and Development, Japan, and the United States. Here again, the argument that "agricultural societies must generate a surplus of food and other agricultural products which can be traded for non-agricultural goods through export markets to provide revenues for initial technology and equipment imports" (7, p. 56) is generally supported by experience in Japan and Taiwan, but not in Korea.

## Conclusion

The role of agriculture in economic development in these three Asian countries was somewhat different. In Japan and Taiwan, agricultural output increased substantially in the initial stage of economic development. Furthermore, agricultural and processed agricultural goods were the principal sources of foreign exchange to finance initial industrial growth. In Korea, agricultural output growth was less impressive and significant agricultural exports were not achieved. Korea relied instead on the growth of manufacturing to spur economic growth.

We conclude that the theory of growth in agriculture as a precondition to takeoff applies reasonably well to Japan and Taiwan, but not to Korea. Even for Japan and Taiwan, agricultural development in the initial stage may not have been wholly separate from other economic changes.

The analysis of these countries confirms, however, the conventional view that countries pass through a broadly similar development process. Each experienced systematic changes in the composition of output as economic development progressed, a decline in agriculture's share of the gross national product, and increases in the shares of manufacturing, construction, and public utilities. Improvement in the rural-urban terms of trade was substantial for Japan

and Taiwan, but less important in Korea. Finally, all three countries had strong exports.

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