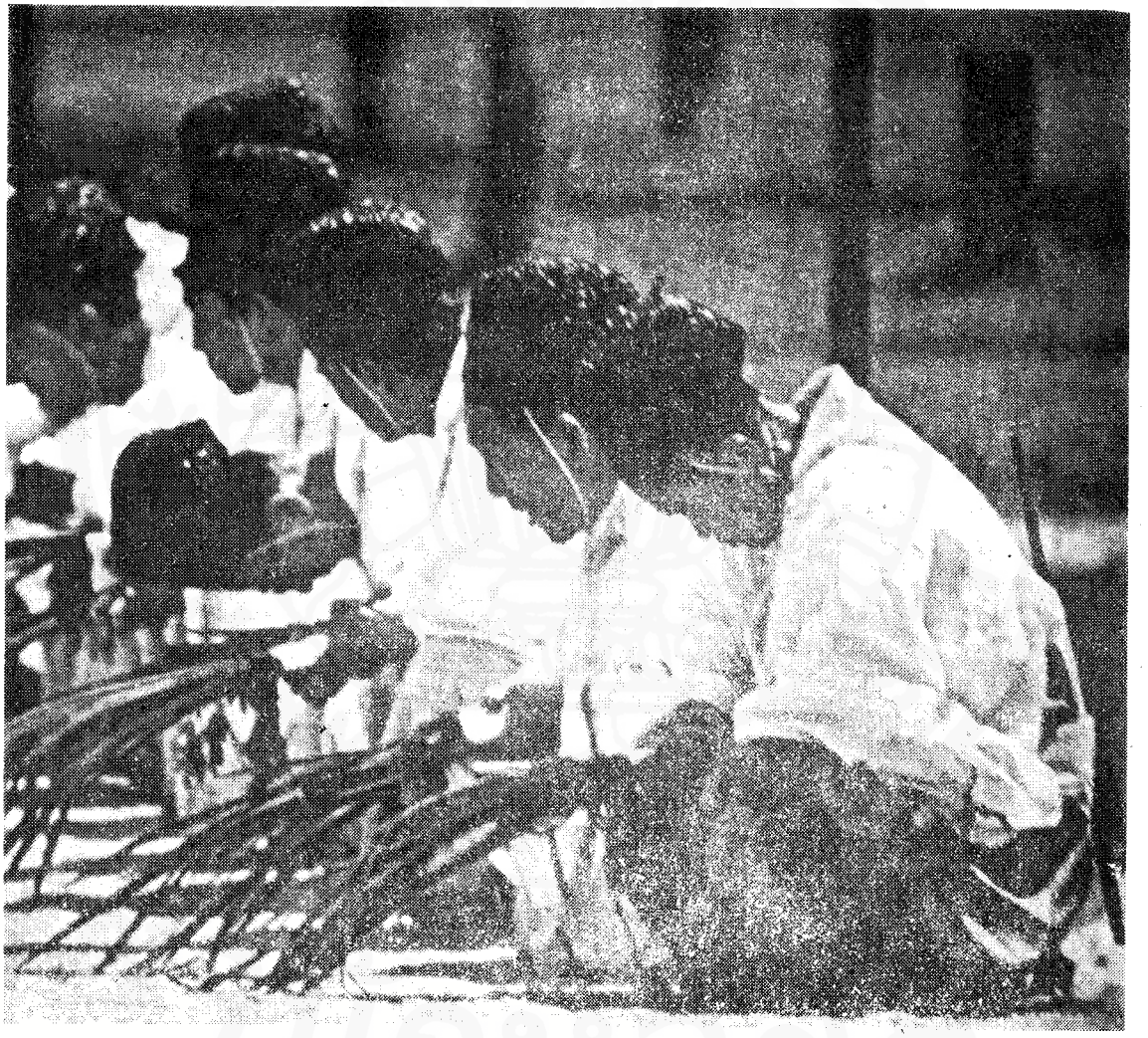
JAPAN AND THAILAND

1868 - 1920

The Study of Technological Change in Agriculture

Nuch Pinyowatanacheeb



This article is aimed to examine technological changes in agriculture in Japan as well as the impact of technological change from the Meiji Restoration to prewar Japan. It is hypothesized that the Meiji Government supported on technological changes and put agriculture sector as the base of other development attributed to economic growth. Modern agricultural technology not only increases the agricultural productivity but also has some impact to farmers's lives and Japanese society.

Comparing Japanese society with Thai society enables us to see how similarly or differently agricultural technology in both societies has been developed. In part, it helps answering the question of why Japanese society has become highly developed.

Technological change in Japan

Before the Tokugawa period, Japanese agricultural techniques advanced slowly in raising its productivity. By the end of the Tokugawa period, advanced techniques such as, the increase in the number of plant varieties and the increase in the use of commercial fertilizer, were already practiced in various districts.[1] In the Meiji era, political and economic reforms provided a stimulus to farmers' efforts to improve agricultural techniques. In contrast, the restraints of the feudal system had suppressed the diffusion of new techniques. Under the feudal system, peasants were bound to their land and were not allowed to leave their villages except for the pilgrimages to the temple. They were not free to choose what crops to plant or to choose what varieties of seed to sow. Many feudal territories interrupted nationwide communications. Though feudal lords were anxious to raise agricultural productivity within their territories, in many cases they prohibited the export of the improved techniques from their territorial boundaries. Even within the territory of a lord, technological diffusion was not quite free. For example, a village called Maesawa in Toyama Prefecture placed a guard at its border to prevent exportation of a variety of rice seeds selected in the village.[2] The abolition of such feudal restraints in the Meiji Restoration and the modernization of modern communication and transportation brought an increase in technological diffusion.

In contrast, no technological changes occurred in agricultural sector in the same period in Thailand. The level of advanced techniques was low when comparing with the Meiji era. As far as the application of fertilizer was concerned, natural fertilizer was still the main source during the Rama V period. No evidences showed the existing of varieties of rice. It was immediately after the second World War that commercial fertilizer was first used in Thailand and has been widely used since 1950. Agricultural productivities, such as rice were increased by opening new cultivated area rather than by increasing new techniques. After the Bowring Treaty (1855), farmers were able to take advantage of the growing rice export market by opening new land in the Central Plain region. However, there was little change in rice cultivation methods between 1850–1950.[3]

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1 Thomas C. Smith, *The Agrarian Origins of Modern Japan* (Stanford : Stanford University Press, 1959) pp. 92–94

2 Yujiro Hayami and Saburo Yamada, "Technological Progress in Agriculture." in *Economic Growth : The Japanese Experience since the Meiji Era* Klein and Ohkawa et.al (Illinois : Richard D. Irwin, 1968) p. 144

3 Robert J. Muscat, *Development Strategy in Thailand* (New York : Frederic A. Praeger, 1966) p. 18

The Meiji government not only encouraged the introduction of Western agricultural techniques but attempted to establish facilities for experimenting on seeds, crops, livestock, and farm tools. The imported techniques failed to set up in Japan because the farmers had some difficulties in adopting those Western techniques. However, the Meiji government recognized the importance of employing the services of veteran farmers.[4] The techniques which characterized Japanese agriculure in the Meiji period was called Rōnō Gijutsu (veteran farmer's techniques). The technological potential embodied in the Rōnō (veteran farmers) provided the basis for technological progress. In 1893 a national agricultural guidance from the hands of veteran farmers to the national and local agricultural experiment stations.[5]

Seed improvement

Ohkawa and Rosovsky mentioned two majon categories of improvements -- the improvement of land and the improvement of seed and fertilizer.[6] Seed improvement began to have an effect with the development of new varieties in the 1890's. In 1880, the Department of Agriculture issued a circular to all prefectures urging the establishment of agricultural associations. Seed Exchange Societies (Shushi kōkan-kai) and Agricultural Discussion Societies (Nōdan-kai) had been formed after the abolition of feudal restraints by the Meiji Restoration. The Department of Agriculture wes charged with promotional and extension activity. Some functions listed in the Department's charter of organization as drafted in 1874 were,

"1. To keep an eye open for all inventions and improvements which the Minister might reward with prizes and honors.

2. To make plans for the loaning of seeds and implements, or of cash to purchase them, to individuals and organizations.

3. To investigate all suggested schemes which could contribute to the national welfare, to test experimentally the principles involved, to make detailed estimates of costs and benefits and make suitable recommendations to the Minister."[7]

The new seed, the so-called national standard varieties (Zenkoku tōitsu hinshu) such as Shinriki and Kameno-o were selected

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[4] Takekazu Ogura, *Agricultural Development in Modern Japan* (Tokyo : Fuji Publishing Company, 1963) p. 301

[5] Ogura, Ibid., p. 303

[6] Kazushi Ohkawa and Henry Rosovsky, "The Role of Agriculture in Modern Japanese Economic Development" in *Economic Development and Cultural Change* Vol. IX No. I part II Oct. 1960 p. 50

[7] R.P. Dore, "Agricultural Improvement in Japan : 1870-1900" in *Economic Development and Cultural Change* Vol. IX No. I part II Oct. 1960 p. 73

by the farmers. Those varieties of seeds were necessary for Japanese agricultural development because they gave higher yields by absorbing larger quantities of fertilizer. The Department played an important role in supporting the diffusion of new seeds.

Farm tools

The improvement of farm tools began in 1900's. Ploughing with draught-animals was practiced in Japan from ancient times. Modern short-bottomed ploughs which made deeper cultivation possible were developed after 1900. Fixed comb-type threshers through which bundles of grain in the stalk were pulled by hand continued to be used until they began to be replaced by rotary threshers in the 1900's.[8] Weeding implements showed little change from the traditional long-pronged hoes until an improved hand rotary hoe and standard spacing of rows made a substantial advance possible in the 1900's.

During the war, there were research investments for military purposes but not for agricultural purposes. Nevertheless, they formed a foundation for the advancements in agricultural techniques.

Land improvement

Land improvement took the form of rearrangement of fields for better irrigation and drainage. The basic systems of irrigation had already been improved before the Meiji Restoration, either by reservoir or river irrigation systems it was about 2.2 million hectares or half of the total cultivated area or 80 per cent of the lowland paddy field on which the irrigation projects had concentrated.[9] The Arable Land Adjustment Law of 1899 made a contribution to land productivity after 1900. Before the Meiji Restoration, larger-scale flood control, irrigation, and land reclamation projects had been undertaken from time to time by the Shogunate or by local administrations. After the Restoration, smaller-scale water utilization programmes, which had been handled by villages or groups of villages, were put under the control of local government and Water Utilization Associations. This clearly shows that land improvement has developed under the support of the government.

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[8] Ogura, Ibid., p. 14

[9] Masakatsu Akino, "Land Infrastructure Improvement in Agricultural Development : The Japanese Case, 1900-1965" in *Economic Development and Cultural Change* vol. 28 No. 1 Oct. 1979, p. 98 and Isao Minami and Kiyoshi Torii, A Model on the Technical History of Rural Development in Japan." Kongsak Santiprukswong tran. in *Thai-Japanese Studies* Vol. 3 No. 2 Aug. 1981 pp. 70-87

Table 1 : Investment in Land Infrastructure Improvement

Year	Total Investment (1,000 Yen)		Ratio of Government to Total Investment (%)
	Total	Government Investment	
1905	23,216	5,164	22.2
1910	51,602	8,711	16.9
1915	72,012	10.552	14.6
1920	87.766	16,154	18.4
1925	135,221	26,506	19.6
1930	174,790	45,041	25.8
1935	158,286	49.161	31.1
1940	74,998	30,425	40.6

Source : Masakatsu Akino, "Land Infrastructure Improvement in Agricultural Development" in *Economic Development and Cultural Change* Vol. 28 No. 1 Oct. 1979 p. 104

In the case of Thailand, there had been little change in rice cultuvation methods in the Ayutthaya Dynasty an the early period of the Bangkok Dynasty. As Robert Muscat pointed out, "Modern government investment in irrigation and transportation facilities designed to stimulate rice production played a minor role for the first seventy years after the Bowring Treaty."[10]

The backwardness of means of production of Thai farmers did not help increase rice productions. Thai farmers employed basic tools for cultivation, such as plow, barrow, and hoe. The water system for cultivation had remained the same as they were in 1850. It was not until 1902 that the government hired a Dutch engineer to draw up an irrigation plan for the country.

Modern transportation to markets had not been well developed in the same period. The government did little to improve marketing conditions. The role of Thai elites in technological change was absent in Rama V Reform. In contrast, the Meiji Restoration intensified the possibility of change by opening up new sources of technical knowledge.[11] The reason why the Thai government did little to encourage technological changes, in part can be explained by the concept of Patrimonial economics of Thai ruling elites. Even though the irrigation system had been set up but" the elaborate systems of canals, especially in the delta, had been thought of in terms of serving primarily navigation, communication, trade and political control rather than in terms of irrigation."[12]

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[10] Muscat, Ibid., p. 14

[11] Dore, Ibid., p. 70

[12] Norman Jacobs, *Modernization without Development* (New York : Praeger Publishers, 1971) p. 101

Institutional Change

Agricultural development requires continuous improvement in technology and organization. The Meiji government did not overlook the importance of agricultural sector. Shinagawa, the head of the agricultural Promotion Bureau, said at the first agricultural congress in 1881 "Agriculture is the base of the country; if agriculture flourishes then the country prospers; if agriculture declines then the country is on the ruin."[13]

Following the Restoration, the Meiji government changed many aspects of the feudal economic, social, and political structure that were the obstables to the unification and economic development of Japan. A number of changes in the agarian and fiscal structure were included in the Meiji Land Reform. The purposes of the land reform were :

"(1) to seperate the daimyo from their hereditary source of income and power and to insure that their economic and social base for any move against the government would be weakened;

(2) to obtain a source of stable revenue

(3) to achieve a great equity in the distribution of the tax burden; and

(4) to institute a system of private property owenership that would assign individual tax responsibility to improve the economic performance of the nation."[14]

Table 2 : Land Tax

Year	Amount in thousand yen	Percentage to total main tax revenue
1888–1892	38,446	85.6
1893–1897	38,679	80.4
1898–1902	44,632	63.2
1903–1907	71,579	55.8
1908–1912	79,541	42.9

Source : Ogura, Ibid., p. 23

[13] Dore, Ibid., p. 71

[14] James I. Nakamura, *Agricultural Production and the Economic Development of Japan* (Princeton : Princeton University Press, 1966) pp. 16–20

Land reform in the Meiji Restoration provided saving for the economic development. James Nakamura estimated that agricultural output increased at a rate ranging between 0.8 and 1.2 per cent per annum in the 35 year period from 1878–82 to 1913–17.[15] The role of Japanese agricultural development in providing a market for the products of a growing industrial sector is often cited by many economists. However, the contribution of agriculture to economic growth decreased as the growth of other sectors proceeded. Its contribution to total output decreased from around the 1880's and 1890's. Until about 1910, agriculture and secondary industry grew together and the rates of growth tended to be in the same rate. By 1920 agriculture's role was over and it remained a more or less depressed state until the war.

There were evidences supporting the argument that the government took the lead to induce agricultural development in both technological and institutional change from Japanese experience between 1881 and 1920. Thomas C. Smith suggested the significance of a political revolution in the Meiji Restoration. Modern Japanese agriculture owes a lot to the Meiji period by the facts, that (1) it had a leadership with a vision of a future, (2) the leadership had controlled over a government with a high degree of authority and stability, (3) the economy afforded the means of investing on a significant scale, and (4) industry had a satisfactory supply of labor.[16]

Japanese experiences imply the strategy of modern economic growth. When we look at Thai experiences, the role of the ruling elites in economic development during the Ayutthaya and early Bangkok dynasties were manifested in the control of the population. That control had negative effects not only on the productivity but also on the kinds of economic activity they could involve in. Boonsanong Punyodyana reveals the government intervention into economic activity on Thai society.

> "...the control over the rights to land tenure based on the central royal authority's imposed notion of kinship (namely, the crown's ownership of all land) and the non-hereditary *sakdina* grace system have evidently perpetuated the inability of citizens to accumulate private capital over generations. ...This historical situation contrasts sharply with the corporate production units of feudal domains in Japan. The owners of some such private domains were able to accumulate wealth to such a degree that they became major business entrepreneurs who served as the bac bone of Japanese industrialization."[17]

To some extent, the "selective change" model of Thai ruling elite can be applied to

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[15] Nakamura, Ibied., p. 15

[16] Smith, Ibid., p. 201 and in the case of Thailand, Likhit Dhiravegin suggests the role of political leadership and environmental factors should be taken into account when comparing Japan and Thailand in this period. See his study in Likhit Dhiravegin, "The Role of Political Leadership in the Modernization of Chulalongkorn's Siam (1868–1910) and Meiji's Japan. 1867–1912" in *The Journal of Political Science* Vol. 8 No. 3 Sep.–Dec., 1982 pp. 197–222.

[17] Boonsnong Punyodyana, "Thai Selective Social Change : A Study with Comparative Reference to Japan Ph.D. Dissertation, Cornell University, 1971, p. 237

Thai agricultural development.[18] Many Thai scholars agreed that the central power emphasized the growth of the central city over the countryside. All changes have been selected to come about by the central power without the participation of common people. This way of development supports the status quo of the Thai ruling elite.

The tenancy problem in Thai society is more severe than technological problem. Though the time frame of this study is focused on 1868–1920 period but it is worth noting that by the end of the Third National Economic and Social Development Plan (1972–1976), tenancy problem has appeared to be acute. Even though the agricultural institutions have been set up, the government accepts that the poor farmers still have not received the fruit of economic development. By the end of the Third plan, little work had been done to develop agricultural research. The government capacity in seed production was still very limited. Some agricultural researches which could be helpful to farmers remained unknown to them because of lacking extension workers.[19] The First and the Second plan emphasized big–dam construction but in the Third plan, major irrigation development policy was aimed at reducing big–dam construction and emphasizing on the improvement and expansion of water delivery system.

In the case of Japan, social and institutional reforms had been launched by the Meiji government. Agricultural cooperatives were supported by the government. In contrast, the history of Thai agricultural cooperatives is the history of failure. Agricultural cooperatives cannot be set up if the political authority do not support. Most Thai farmers beleive that agricultural cooperatives are merely another organ of the government.[20] Agricultural cooperatives are established at the government's initiative and developed under bureaucratic control. Cooperatives are ideally voluntary organization of farmers, actually they are managed under the supervision of the government.

Before agricultural technology plays its role, the land tenancy problem should be solved by the government. More Thai peasants have become tenants. The problem of indebtness arises when there are crop failures. In Japan, the land reform inspired by the U.S. Occupation was important. The Occupation instituted a land reform program aimed at distributing the ownership of the land to the farmers who cultivate it.

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[18] Jacobs, Ibid., 1971 and Punyodyana, Ibid.,

[19] Government of Thailand, *The Fourth National Economic and Social Development Plan (1977–1981)* (Bangkok, Thailand)

[20] Akin Rabibhadana, "Krong Sang Sang kom Thai : Panha Kiewgab Kasetakorn Nai Karn Pattana, in *Kow Tor Pai Kong Sangkom Thai* (Bangkok : Rongpim Charoenphol, 1980) p. 184

Agricultural technology and farmers

In Japan, farmers received the fruit of agricultural development. While Japanese farmers are discussing about sending their children to the best schools in the cities, Thai farmers are discussing about who they can borrow money from. Could he get enough money to support his family this year? Agricultural technology has increased income of Japanese farmers. It helped increase their productivity and save their labor. The living standard of farmers have risen considerably compared with the past. However, the size of land in Japan is small and even with the rapid diffusion of agricultural mechanization, it does not promise a bright future for Japanese agriculture.

Japanese farmers show an interest in adopting new techniques and agricultural study groups are organized in villages. In similarity, Thai farmers tend to adopt new techniques if it benefits them.

In Thailand, the process of rice production has been changed to the market economy through mechanization. Poor farmers become wage labor farmers. Technological innovation in rice production has changed the peasants' reciprocal relationship into that of impersonal economic exchange based upon market mechanism.[21]

Conclusion

One can argue that the introduction of technological changes into Japanese agriculture is basically due to the strong support of the government. The Meiji government took a positive role in agricultural improvement. The government pursued an active policy for promoting agricultural practices. The Department of Agriculture was established as well as agricultural education in different levels of educational system. Research and experiment stations made a major contribution to Japanese agricultural development. The improvement of land, the better methods of crop cultivation had been supported by lhe Meiji government. The improvement of seeds and the application of commercial fertilizer increased agricultural productivity. Tool improvement is also an important factor for agricultural development.

The Thai ruling elite played a very limited role in technological innovation. Agricultural sector is an important sector of the economy, however, it has not been received much attention from the government. Thai ruling elite gives the central city more important than the countryside. Land reform must be solved before agricultural techniques plays its Positive role.

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21 Takashi Tomosugi, *A Structural Analysis of Thai Economic History* (Tokyo : Institute of Developing Economies, 1980) p. 44

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