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Regionalization of Some Major Crops of Japan in Recent Years

George H. KAKIUCHI* and Hiroyoshi KOBAYASHI**

Introduction

As the economy of Japan gradually improved after the end of WW II, the shortages in the basic foods were eased and certain changes in cropping systems and patterns became evident. These changes were to reflect increased demands for vegetables, fruits, and dairy products, resulting from the improving standard of living, especially after 1955, when Japan's economic growth gained momentum. Also, there has been a rapid increase in urban populations, which added to the demand for farm products. Farmers were now willing to try crops which might bring higher profits, rather than concentrating their efforts on traditional and "safe" crops.

Although rice continued to be, by far, the most important crop, other crops, namely vegetable and fruit crops, began to expand in value of production and in acreage¹⁾. The trend can be definitely observed after 1954 (Table 1, Table 2, & Figure 1). Meanwhile there was also competition developing between the various regions of Japan to specialize in a certain crop or crops. The formation of specialized cash crop regions was influenced by such factors as economic distance from the principal urban markets, the regions' marketing season, scale of production and scale of marketing. This paper will study the developing trends toward regional specialization of some of the major farm products, such as vegetables, *unshu mikan* (Mandarin orange), dairy foods, and rice.

Towards the Regional Specialization on Rice in Northeastern Japan

Rice has been the foundation of Japanese agriculture and the principal staple food in the Japanese diet from ancient times. Thus both the many governments and farmers have come to focus their attention on the cultivation of rice. During the Second World War and in the immediate postwar years, the national government, due to the food shortage, had put rice and other grains under a ration system, controlling their collection, distribution, and pricing. Today, although controls

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1) Out of the total cultivated acreage of 5,938,000 hectares, rice acreage accounted for 3,260,000 hectares in 1967. Nihon Nogyo Nenkan Kanko-kai, *Nihon nogyo nenkan* (Agricultural Yearbook of Japan), Tokyo: Seibundo Insatsu Kabushiki Kaisha, 1969, pp. 416 and 437

Table 1 Changes in the Acreage Index of Major Crops in Japan (1947=100)

Year	Rice	Wheat, Barley, Naked Barley	Sweet Potato	Lesser Grains	Vegetables	Fruit
1947	288.3*	141.2*	37.7*	22.9*	39.0*	8.1*
1948	102	128	113	98	98	106
1950	104	132	105	116	103	122
1952	104	122	100	104	112	132
1954	105	125	93	93	112	153
1956	112	122	102	87	117	243
1958	112	114	95	83	121	271
1960	114	107	87	73	128	308
1962	113	94	85	64	140	354
1964	113	74	78	42	175	409
1966	112	61	64	31	181	461
1968	113	48	49	23	176	501
1972	92	18	24	15	173	528

* Unit: 10,000 hectares Source: Prime Minister's Office, *Japan Statistical Yearbook*

Table 2 Changes in Shares in Total Value of
Agricultural Production (Percent)

	1955	1971
Rice	53.1%	34.2%
Wheat, Barley, Naked Barley	7.2	1.1
Potatoes	4.0	1.3
Fruits	4.1	8.0
Vegetables	6.6	15.8
Sericulture	2.9	2.3
Livestock	10.5	26.4

Source: Yano Tsuneta Kinen Kai, *Nihon Kokusei Zue*, 1972, 1974, pp. 224 and 211

have been removed on the other grains, rice is still heavily subsidized.²⁾

With so much attention given to the cultivation of rice, its cultivation became quite advanced. Through cooperative efforts and greater mechanization, labor inputs per unit area of rice were substantially reduced. For example, the number of hours required to cultivate 0.25 acre of rice during the year has been reduced from about 245 hours (1945-50 average) to about 170 hours (1965-69 average). At the same time, yields were substantially increased, even though the

2) Prices paid for rice purchased by the Government Food Agency were about \$ 380 per ton during 1968-70. This price was about double those on the world market. In 1972, the price paid was \$ 485.00. *The Agricultural Situation in the Far East and Oceania*, Washington, D.C.: U.S. Dept. of Agriculture, April 1974, p. 28. Joseph R. Barse, "Japan Struggles With Heavy Surpluses of Rice," *Foreign Agriculture*, Vol. IX, No. 45, Nov. 8, 1971, pp. 2-5

yields were already one of the highest in the world.³⁾ Rice became a safe and profitable crop to raise, and its production constantly increased. In fact, together with decreased per capital consumption, there is now a surplus accumulating in the government warehouses (Table 3).⁴⁾ As a result, since 1971, the government has been attempting to reduce acreage and production by subsidizing the farms to not grow rice.⁵⁾

There has been a remarkable change in the yield of rice per unit area and in the regional focus of rice cultivation and high yield (Figures 2-7). In the pre-WW II years and the immediate years after the war, the highest yields and the principal rice growing regions were found in southwestern Japan namely the Kinki region and Kyushu (Figures 8 & 2). However, as newer short-season high-yielding varieties of rice and new techniques of cultivating rice suited for colder climates were developed, the focus of rice cultivation moved northwards, such as into Tohoku and Hokkaido and into the higher basins of the central mountains of Honshu (Figures 8, 4 & 5). Today, the yields and the rates of increase in paddy acreage are the highest in the colder regions of Japan.⁶⁾ For example between 1952 and 1962, Tohoku accounted for 63% of the increase in wet-rice acreage and 65% of the increase in the rice production.

Before WW II, the farmers of Japan looked to such prefectures as Saga in northern Kyushu and Nara in the Kinki region where the highest per unit acre yields were produced, as model areas for the cultivation of rice (Figure 2). It was not until 1955 that the northern regions began to dominate (Figure 3). But by 1960, yields per unit area were substantially greater in the northeastern prefectures

3) The yield of irrigated rice per 0.25 acre increased from an average of 376 kilograms (1955-59 average) to 470 kilograms in 1972. Yano Tsuneta Kinenkai, *Nihon Kokusei Zue*, Tokyo Kokusei-sha, 1974, p. 220

4) According to one source the Government-owned surpluses of rice (brown) was 6.7 million tons on March 1, 1971. Joseph R. Barse, *op. cit.*, p. 3

5) The total wet rice acreage had been reduced from 3,173,000 hectares (1969) to 2,570,000 hectares (1973). However the production did not decrease proportionately and the wet rice crop in 1973 was 12,073,000 tons (unhulled), whereas the 1969 production was 13,797,000 tons (unhulled). In 1970, it was 12,528,000 tons. Yano Tsuneta Kinenkai, *Nihon Kokusei Zue*, Tokyo: Kokusei-sha, 1974, 1972, pp. 220 and 235 respectively. However it is to be noted that in Tohoku, which has the highest productivity, decrease in production was very small, and some districts within the region showed an increase in output. Much of the acreage and production decreases took place in southwestern Japan, especially in areas where rice productivity is relatively low, or where alternative occupations exist, or where dependence on rice production is relatively small. *Understanding Japan: Postwar Japanese Agriculture*, Tokyo: International Society for Educational Information, Inc., 1973, pp. 20-21

6) George H. Kakiuchi, "Recent Developments in the Cultivation of Wet-Rice in Northeastern Japan", *The Journal of Geography*, Vol. 63, No. 4, April, 1964, pp. 155-161

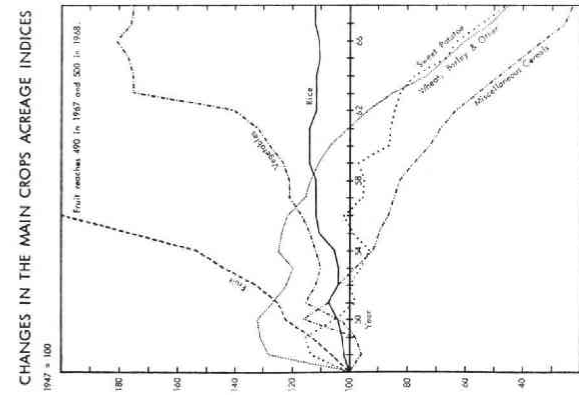


Fig. 1

Source

- Fig. 1: Japan statistical yearbook
- Fig. 2-7: Nihon nogyo nenkon
- Fig. 9: Chiki nogyo no doko (1966)
- Fig. 10: Tokyo Central Wholesale market statistics

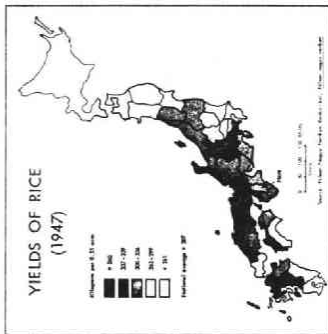


Fig. 2

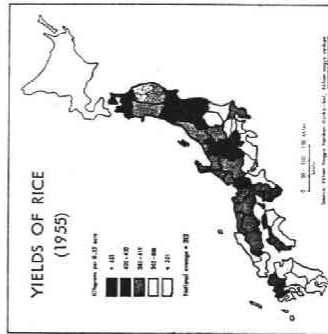


Fig. 3

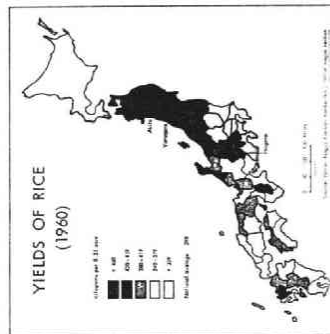


Fig. 4

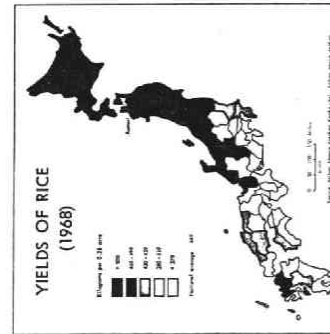


Fig. 5

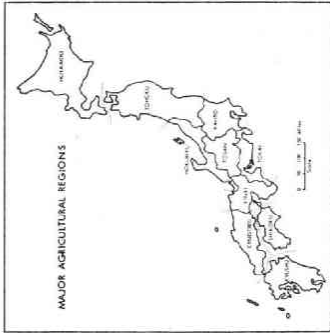


Fig. 8



Fig. 11

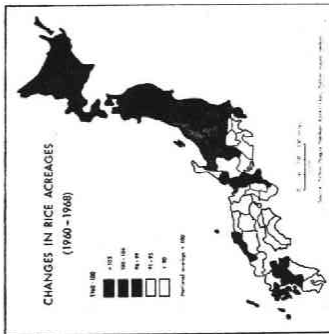


Fig. 7



Fig. 10

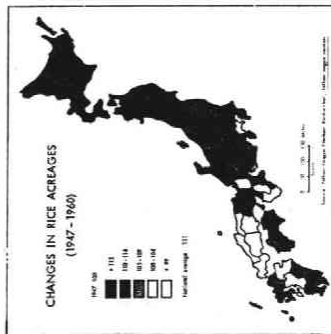


Fig. 6



Fig. 9

Table 3: Supply and Demand for Rice in Japan in Recent Years

* unit=10,000 tons unhulled rice ** unit=kilogram

Year	Production*	Imports*	Surplus in Storage at the end of October*	Average Consumption Per Capita Per Year**
1960	1285.8	21.9	45.9	114.3
1964	1258.4	50.2	27.5	115.8
1968	1444.9	23.0	242.8	100.2
1971	1088.7	84.9	329.5	93.2

Source: Nihon Nogyo-nenkan Kanko-kai, *Nihon nogyo nenkan* (1974 edition), p. 210

and in the highland basins than in the warmer southwestern prefectures. The high yields of Nagano prefecture in the central highlands and Yamagata prefecture in central Tohoku (Figure 4) became the goals for the rice farmers of Japan. In 1968, the highest yields were associated with Yamagata and Aomori prefectures, the latter located in northernmost Tohoku (Figures 8 & 5). Also, after 1960, rice acreages increased in the prefectures of northern Honshu and Hokkaido, while they decreased in many prefectures in southwestern Japan (Figures 8 & 7). Thus, both in acreage increases and high yields, the northern and highland regions of Japan have become relatively more significant. There are many interlocking factors which account for the regional shift in emphasis in the cultivation of rice. However, one of the more important reasons may be that the cold and long winter months in much of the northern and highland regions do not permit the planting of any two crops in any one single year as in the warmer southwestern regions. Most of the farmer's efforts have been put into the growing of the "safe" crop, rice. Then too, industrialization is much less developed in these regions, so farming is much more important and stressed in the economy. Topographically the plains and basins suitable for rice farming are more extensive in Tohoku, and the average farm is larger, making it possible to mechanize more effectively. Thus, the trend towards a high degree of regional specialization in this one crop will very likely continue in Tohoku, parts of Hokkaido and in the central highlands, especially if rice continues to be highly subsidized by the national government.

The Trend Towards Cash Cropping on the Dry-Field Croplands of Southwestern Japan

As mentioned earlier, the rising standard of living in Japan has created a strong demand for a variety of vegetables and fruits. This, however, has not meant the converting of paddy fields, remembering that the rice crop is highly subsidized, to the cultivation of non-grain crops, but in southwestern Japan the farmers are making far better use of their dry-field croplands than before, growing

such cash crops as hothouse and field vegetables, melons, greenhouse and field flowers, and Mandarin oranges. The raising of milk cows and other livestock should also be included in this trend. Although there are some dangers involved in cultivating these products due to the fluctuating prices from season to season and year to year, profits per unit area can be better than for rice (Table 4).

The trend toward a higher degree of commercialization and diversification of farm activities in southwestern Japan is also a result of a combination of a number of factors. Here the climate is warmer and the seasons longer, allowing for greater choice in cropping. More important, all the major industrial nodes with their high concentration of population exist in the regions southwest of Tokyo. The Keihin Industrial Region focused on Tokyo and Yokohama, the Hanshin Industrial Region centered on Osaka and Kobe, and the Chukyo Industrial Region focused on Nagoya (Figure 9), together, accounted for 68 percent of Japan's industrial production, and the three metropolitan regions associated with them accounted for one-third of the population of Japan in 1960.⁷⁾ Thus these and the lesser urbanized areas provide large markets with constant year round demand for a variety of food products.

Table 4 Net Income Per 0.25 Acre for Selected Crops and Milk Cows in Japan (1966)
Unit: 1,000 yen

Per 0.25 Acre						Milk Cows	
Rice	Hothouse Vegetables	Field Vegetables	Apples	Mandarin Orange	Silk-worms	2 Heads	3 Heads
40.3	82.0	64.0	47.7	72.9	47.9	43.8	47.0

Source: Norin-sho, *Noka keizai chosa*

The Diffusion of Vegetable Farming and Regional Specialization

Similar to the control of grains during and after WW II, shortages of vegetables and fruits caused the national government to control their marketing, distribution and pricing in the six largest cities of Tokyo, Osaka, Kyoto, Nagoya, Yokohama and Kobe. However, by 1949 Japan had recovered sufficiently from the wartime disruption so that regulatory controls could be removed. A sharp rise in the shipments of fresh vegetables to the urban centers was observed. For example the shipments of vegetables into the Tokyo Central Wholesale Market nearly tripled between 1949 and 1962 (Table 5). A similar sharp rise was seen for the shipments of fruit into Tokyo (Table 5).⁸⁾

7) Glenn T. Trewartha, *Geography of Japan*, Madison: University of Wisconsin Press, 1966, pp. 138, 271-272, and 580

8) Nosei Chosa Iinkai, *Nihon no nogyo*, No. 24, 1963, pp.4-5

Table 5 Shipments of Vegetables and Fruits into the Central Wholesale Markets of Tokyo After the Removal of Controls

Year	Vegetables			Fruits		
	Shipments (Unit: 100 tons)	Index	Price (Av. per kg.)	Shipments (Unit: 100 tons)	Index	Price (Av. per kg.)
1949	4253	100	15.81 yen	1791	100	48.65 yen
1950	6045	142	12.53	2306	128	35.09
1952	6292	147	15.40	2358	131	39.71
1954	7167	168	19.48	2282	127	52.03
1956	8147	191	19.34	2918	162	49.03
1958	9008	211	20.52	3743	208	47.48
1960	10653	250	22.20	4518	252	51.09
1962	11403	268	31.85	4719	263	70.81

Source: Nosei Chosa Inkai, *Nihon no nogyo*, No. 24, 1963, p. 5

Traditionally, vegetables for the large cities were largely grown in the so-called "truck" gardening zones immediately surrounding the urbanized area. Two of the more obvious reasons for this were the ease of transportation or accessibility and perishability of the crops. However, with the construction of more roads and railroads, the improvement of transport technology, and the use of chemical fertilizers, vegetables could be more easily and cheaply brought into the expanding markets of the large cities from more distant areas.

The rising standard of living, combined with the above-mentioned factors, made possible the taking advantage of hitherto under-utilized aspects of the physical environment, such as differences in seasonal and regional weather conditions, to grow out-of-season and different kinds of vegetable crops. These factors contributed to the expansion of the vegetable growing regions and the development of specialized crop regions. These developments can be illustrated by examining the vegetable regions which supply the markets of the Tokyo metropolitan area, which is by far the most important consumer market in Japan.⁹⁾

The areas from which the Tokyo Central Wholesale Market receives its vegetables can be divided into three general concentric zones (Figure 9). (Today this Market not only supplies the needs of the Keihin metropolitan region but also re-distributes the vegetables to cities farther away.) The first or inner zone lies adjacent to Tokyo and its outer boundary is determined by the time distance of three hours by truck from the Central Wholesale Market. The prefectures which

9) In 1969, of the total value of fresh fruits and vegetables sold in wholesale markets throughout Japan, the Tokyo Central Wholesale Market accounted for no less than 23.4 percent of the vegetables and 20.2 percent of the fruit, and its relative importance is growing each year. *Understanding Japan: Postwar Japanese Agriculture, op. cit.*, p. 89

lie within this zone are Tokyo, Kanagawa, Chiba (excluding the southern half), and Saitama. The second or middle zone includes the prefectures of Ibaragi, Tochigi, Gunma, Yamanashi, Nagano, Shizuoka, and the southern half of Chiba, and its outer boundary is determined by the trucking distance of 5 to 6 hours from the Central Wholesale Market. The third or outer zone is all that which lies beyond the second zone. Currently the principal prefectures within this outer zone which ship to the Tokyo Central Wholesale Market are Hokkaido, Kochi, Miyazaki, and Aichi (Figure 10). In contrast to the other two, which ship most of their produce in by trucks, the fresh vegetables from the outer zone come in by rail. Also the products shipped tend to be much more highly specialized and oftentimes are out-of-season or luxury items.

Logically most of the vegetables come into the Central Wholesale Market from adjacent prefectures (Figure 10). However, if the three zones are examined over time, certain significant spatial changes can be observed (Table 6). Up until about 1956, over 60% of the vegetable supply came from Tokyo and the nearby prefectures in the first zone, but by 1965 the percentage had dropped to about 45%, with the percentage supplied by the second zone substantially increasing.

More specifically, up until 1956, Tokyo Metropolitan prefecture was the largest supplier of vegetables into the Tokyo Central Wholesale Market, but in 1957 Saitama prefecture surpassed it and in the following year Chiba also did the same. Then in 1962, Ibaragi prefecture in the second zone also surpassed it,

Table 6 Percentages of Vegetables Shipped from the Main Producing Areas into the Tokyo Central Wholesale Markets

(Unit: %)

Prefecture		1956	1958	1960	1962	1965
First Zone	Tokyo	19.2	15.2	13.4	10.4	8.0
	Saitama	18.3	17.5	18.0	17.7	14.3
	Chiba	16.5	17.0	17.6	17.6	17.4
	Kanagawa	8.6	7.9	6.9	6.1	5.3
	Total	62.6		55.9		45.0
Middle Zone	Ibaragi	4.7	6.6	9.1	11.1	11.2
	Tochigi	0.8	1.4	2.4	3.5	3.4
	Gunma	4.1	4.9	4.7	6.0	6.6
	Nagano	—	—	—	3.3	5.0
	Shizuoka	—	—	—	3.3	3.5
	Total	9.6		16.2		29.7
Outer Zone		—	—	—	21.0	25.3

Source: Seikabutsu Tokei Kenkyu-kai, *Tokyo-to chuo oroshi-uri ichiba nenpo*, 1963

dropping Tokyo Metropolitan prefecture into fourth place. The main reason for this extension outwards, undoubtedly, is the expansion of the urbanized areas, as Japan continues to rapidly industrialize. The middle zone is therefore becoming more important in supplying the fresh produce needs of the Keihin Industrial Region. The continued development of the transportation systems will further enhance the trend.

Reference has already been made to the use of particular environmental conditions in the growing of out-of-season vegetables. One example of this is the growing of cabbage, *daikon* (a large and long white radish), carrots, *hakusai* (Chinese cabbage), celery, and lettuce in the cooler highlands (3,000 feet or more above sea level) of central Honshu during the summer months when it has become too hot, above 77° Fahrenheit, in the lowland plains. From the central highland to the west of Tokyo, these crops can be easily trucked into the Central Wholesale Market over all-weather modern roads. In contrast to the highlands, out-of-season crops can be grown during the cooler months on the warmer coasts of the several peninsulas jutting out into the Pacific, where the north-flowing tropical current, the Kuroshio, helps to keep the temperatures relatively warm. Average January temperature on the peninsulas southwest of Tokyo is about 42.8° Fahrenheit or above. In many of these areas, located in both the second and third zones, one can see row after row of greenhouses and hotbeds for the growing of specialized out-of-season vegetables and other crops for the Tokyo or Osaka area markets.

Another factor which has contributed to the rising importance of the second zone as well as the outer zone is the larger scale of operation. For example, in the second zone, many farmers cultivate between 2.4 to 7.5 acres of vegetables, which is about 10 times larger than those in the first zone. Also a less tangible factor, but still very important, is the closer cooperative marketing efforts of the newer regions. These cooperatives ship in larger quantities and maintain tighter control on quality, which are attractive to the wholesalers. The higher degree of local specialization in a particular crop or set of crops on a large scale, has enabled cooperative spraying, dusting, planting and other collective efforts, which have contributed to better control of crop cultivation and have lowered costs of production. Many of the cooperatives have their own trucks, and their use has become widespread since 1955. Generally speaking, the quality of fresh produce, fruit, and milk can be maintained if they can be transported into the markets within six hours from the producing areas. This would approximate the outer boundary of the middle zone (Figure 9).

The Development of New Mandarin Orange Growing Regions

Although there has been a large increase in fruit acreage, increasing from

Table 7 Acreages for the Main Fruit Crops of Japan

	1963		1967		1972	
	Acreage (hectares)	%	Acreage (hectares)	%	Acreage (hectares)	%
Mikan (Mandarin Orange)	90,500	29.5	139,300	35.9	171,300	40.0
Apples	65,900	21.5	65,200	16.8	58,200	13.6
Persimmon	37,900	12.4	38,400	9.9	34,500	8.0
Japanese Pear	19,200	6.3	18,600	4.8	18,300	4.2
Grapes	21,100	6.9	23,100	6.0	25,500	6.0
Total Fruit Acreage	306,300		388,200		428,000	

Source: Nihon Nogyo-nenkan Kanko-kai, *Nihon nogyo nenkan* (1965, 1969, 1974 editions), pp. 448, 151, and 227 respectively. Yano Tsuneta Kinen-kai, *Nihon Kokusei Zue*, 1974, pp. 210 and 236

about 83,000 hectares in 1950 to approximately 428,000 hectares in 1972,¹⁰⁾ the two most popular fruits grown in Japan are the Mandarin oranges and apples, with the former being more important (Table 7). The growing of Mandarin oranges will be taken as an example of the regionalization trend in the fruit industry. Most of the Mandarin oranges have been grown on the slopes facing the Pacific Ocean and the Inland sea on the islands of Honshu and Shikoku southwest of Tokyo. Although the acreages of apples and other fruits seem to have stopped increasing, that for Mandarin oranges has been expanding rapidly (Table 7). Little spatial change is expected in the growing of apples, which is highly concentrated in the two prefectures of Aomori (northern tip of Honshu) and Nagano (central highlands of Honshu), but there is definite shift in the growing areas of Mandarin oranges.

The traditional Mandarin orange growing areas have been dominated by such prefectures as Shizuoka, Kanagawa, Ehime, Wakayama, and Hiroshima (Figure 11). Recently, however, there has been a rapid expansion of acreage on the southernmost island of Kyushu (Table 8), and six prefectures have become significant, Fukuoka, Saga, Nagasaki, Kumamoto, Oita and Miyazaki (Figure 11). In 1951, these six accounted for about 16% of the total national acreage of Mandarin oranges, but by 1968 they had increased their share to 39%. Within these prefectures such areas as the foothills of Tensan, Seburi and Taradake in Saga prefecture, Nishi-sonogi peninsula and coastal areas of Omura bay in Nagasaki prefecture, and Kunisaki peninsula in Oita prefecture have become known for their Mandarin oranges.

The demand for fruits, especially Mandarin oranges, expanded rapidly with the

10) *Understanding Japan: Postwar Japanese Agriculture, op. cit.*, p. 22, and *Nihon Kokusei Zue, op. cit.*, p. 210

Table 8 Changes in the Acreage Indices for the

	National	Traditional Mikan Growing Areas				
		Shizuoka	Ehime	Wakayama	Hiroshima	Kanagawa
Aver. Cult. Acreage Between 1950-52 (hectares)	33,032	6,402	4,002	4,110	2,487	1,908
Year						
1950-52	100	100	100	100	100	100
1956	134	147	128	112	114	124
1960	192	184	214	141	150	150
1964	306	221	324	214	216	167
1968	457	260	482	274	327	201
1971	506	280	550	307	340	217
1971 Cult. Acreage (hectares)	167,100	17,900	22,000	12,600	8,460	4,020

Source: Until 1955=Norin-sho, *Norin-sho tokeihyo*. After 1955=Nihon Nogyo-nenkan

rising standard of living after 1955. The markets of the huge Hanshin and Keihin industrial regions reached out to distant parts of the nation for many of its agricultural products, and the Mandarin orange industry of Kyushu was to benefit from the growing demand. It is estimated that upwards to 50% of the total production of Kyushu enters the above two market areas. One distinct advantage the growers of Kyushu have over those farther north is that because the climate is warmer, they can market their Mandarin oranges earlier and enjoy the good prices of the early season. Practically all of their crop is shipped between August and December. It is also said their fruit is sweeter.

The plantings of the orchards are taking place mostly on the gently sloping foothills and lower slopes of the mountains in Kyushu, where very little cropping had been done because of poor soil, lack of irrigation and steepness. But the Mandarin orange does relatively well under such conditions, and consequently it has been easier to find space for rather large orchards, at least by Japanese standards.

It is expected that the acreage of Mandarin oranges in Kyushu will continue to increase as the demand increases, both at home and abroad. The environmental conditions are relatively suited to the growing of citrus fruit and the markets are fairly accessible with improved transportation systems.

Principal Mikan Growing Prefecture in Japan

(1950-52=100)

New Areas of Kyushu					
Fukuoka	Saga	Nagasaki	Kumamoto	Oita	Miyazaki
748	859	720	1,177	1,432	372
100	100	100	100	100	100
135	226	206	161	119	140
415	430	395	247	189	365
687	785	1050	525	347	803
1060	1431	1805	1011	596	1435
1171	1618	1972	1105	673	1737
8,760	13,900	14,200	13,000	9,690	6,460

Kanko-kai, *Nihon nogyo nenkan* (Acreages include both mature and immature orchards.)

Regional Specialization in the Production of Raw Milk

Historically, the raising of milk cows in Japan is very recent.¹¹⁾ In fact it was not until around the 1890's that few of the farmers in villages around the large urban centers began to raise cows to sell fresh milk into the cities. Even as late as the 1930's, drinking of milk had not become popular. But as Japan recovered from the destruction of WW II and the standard of living rose, Western foods became more popular, and milk and dairy products began to be consumed in greater quantities, especially in the large urban centers. The introduction of milk through the school lunch programs in 1954 (School Meals Law) helped introduce milk drinking into the Japanese diet. These factors stimulated the rapid increase in the number of milk cows and in the number of farm households keeping milk cows, especially after 1955 (Table 9). These two trends continued until around 1962. But since then the number of milk cows has continued to rise but the number of farm households keeping milk cows began to decline. This indicates that the keeping of milk cows is also becoming more specialized. Furthermore, there seems to be developing regional specialization in dairying (Tables 10 & 11). Four regions have shown substantial increases in the average number of milk cows

11) For more details, see George H. Kakiuchi and Kazuo Ninomiya, "The Dairying Industry of Japan," *Yearbook of the Association of Pacific Coast Geographers*, Vol. 32, 1970, pp. 23-39

Table 9 The Number of Farm Households Keeping Milk and the Number of Milk Cows and Changes in their Indices

Year	Number of Farm Households Keeping Milk Cows	Indices	Number of Milk Cows	Indices	Number of Milk Cows per Household Keeping Milk Cows
1947	134,800	100	167,449	100	1.24
1952	183,149	135	275,590	164	1.50
1958	364,800	257	654,340	390	1.79
1962	415,710	308	1,001,690	598	2.40
1966	360,660	267	1,309,970	798	3.63
1968	336,700	249	1,489,000	889	4.42
1973 (Feb)	212,000	157	1,777,000	1,061	8.40

Source: Nihon Nogyo-nenkan Kanko-kai, *Nihon nogyo nenkan*

Table 10 Changes in the Average Number of Milk Cows per Farm Households Keeping Milk Cows

Regions	1960(A)	1963(B)	1969(C)	1973(D)	B/A × 100	C/A × 100	D/A × 100
Japan	1.9	2.7	5.1	8.4	142	268	442
Hokkaido	3.1	4.5	10.6	17.7	145	341	570
Tohoku	1.5	2.1	2.8	4.1	140	186	270
Kanto	1.8	2.9	5.3	8.4	161	294	470
Hokuriku	1.5	2.2	3.6	8.0	147	240	530
Tosan	1.4	1.8	3.5	4.6	129	250	330
Tokai	1.8	2.9	6.2	10.7	161	344	590
Kinki	2.0	3.3	6.7	9.7	165	335	485
Chugoku	1.7	2.4	4.2	7.0	141	247	410
Shikoku	1.5	2.3	4.1	6.2	153	273	410
Kyushu	1.6	2.4	4.8	8.2	150	300	510

Sources: Nosei Chosa Iinkai, *Nihon no nogyo*, No. 29, 1964, p. 8 and Nogyo-nenkan Kanko-kai, *Nihon nogyo nenkan*, 1970, p. 178; 1974, p. 235

per farm households, Hokkaido, Kanto, Tokai, and Kinki (Figure 8). More recently dairying seems to be becoming more important in Kyushu. Except for Hokkaido and Kyushu, the others lie within the manufacturing belt, stretching along the Pacific coast from Tokyo to Osaka, indicating that these three are suppliers of fresh milk to the many large urban centers within the manufacturing belt.

The dairy farmers and other keepers of milk cows, as is true with the other farmers, are trying to increase their profits and efficiency and would like to enlarge their operations and become specialized. The fact that the average milk cow holdings are growing larger is an indication of this, although by any Western standards the number per farm household is still very small, averaging 8.4 in 1973 (Table 10). It must be remembered that many of the farmers keeping milk cows

Table 11 Number of Farm Households Keeping Milk Cows and the Number of Milk Cows by Regions (1972)

Unit: 1,000

Region	No. of Farm Households Keeping Milk Cows	Number of Milk Cows
National	212	1,777
Hokkaido	32	568
Tohoku	56	226
Kanto	41	342
Hokuriku	5	39
Tosan	13	62
Tokai	11	115
Kinki	11	102
Chugoku	14	96
Shikoku	11	67
Kyushu	20	161

Source: *Nihon nogyo nenkan*, 1974, p. 235

today still do so on a part-time basis. Only in Hokkaido or in areas near large cities are herds relatively large.

The raising of milk cows in Hokkaido differs from the other regions in that raw milk goes mainly for the production of processed dairy products, cheese, butter, powdered milk and condensed milk. Hokkaido is not only far from the major fresh milk markets, but in much of northern and eastern Hokkaido, due to the cooler climate and poor soils, most of the common crops, such as rice and vegetables cannot be grown. Because crop farming is difficult in this area, the land is sparsely settled, and larger land holdings, more suited for large-scale dairy farming, is possible and recommended.

The eastern half of Hokkaido is particularly cool and the coastal regions are often foggy, further limiting most crop farming. But hay and other kinds of fodder crops can be grown and substantial pasture lands are available which enable the farmers to supply much of their own feed. The average herd of Hokkaido is twice that of the national average (Table 10). These conditions have enabled the Hokkaido farmers keeping milk cows to reduce the production costs for raw milk (Table 12). Outside of Hokkaido, much of the feed (both fodder and concentrated feed) have to be purchased (Table 12), because their farms are much smaller and are usually planted to staple food crops or market crops. It is estimated that almost 0.4 to 0.7 acre of farm land is required to maintain each head of milk cow. Unfortunately in Japan, outside of Hokkaido, very few farms have such acreage to spare for even a few milk cows.

Table 12 Cost for Labor and Feed Per Head of Milk Cow According to Size of Herd and Region (1959)

	Cost of Feed (yen)						Cost of Labor (yen)	
	Japan Except Hokkaido			Hokkaido			Japan Except Hokkaido	Hokkaido
	Purchased Feed	Self-supplied Feed	Total	Purchased Feed	Self-supplied Feed	Total		
1 head	45,670	41,373	87,043	20,272	36,078	56,350	39,983	38,709
2 head	47,123	34,435	81,558	17,733	32,203	49,936	31,596	26,021
3 head	48,229	28,805	77,034	23,694	31,199	54,893	27,565	25,913
4 head	57,518	26,096	83,614	18,535	28,937	47,472	29,079	21,466
5 head	69,256	10,875	80,131	22,186	26,203	48,389	24,344	17,164

Source: Nosei Chosa Inkai, *Nihon no nogyo*, No. 29, 1964, p. 20

Summary

There is increasing evidence that commercial farming is becoming more specialized by crop or production and by region in Japan. This is in some way true even for rice. Thus Japan's agricultural land use seems to be undergoing fundamental changes. Although the rice is still by far the most important crop, other crops and production, more commercially oriented, are receiving increasing attention. It is expected these changes will continue, especially if Japan's economy continues to grow at its present high rate.