

Japanese Dairying-Changes in Milch-Cow-Tending Areas and in Milk Transportation-

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Japanese Dairying

— Changes in Milch-Cow-Tending Areas and in Milk Transportation —

Yamato KASAI

I Introduction

It has been widely known that Japanese farming before World War II owed its development mainly to large landholders. Before the 1930's, the economic structure of Japanese farming had been based on rice and cocoons, the successful production of which was closely associated with the old system of landownership, which in prewar days saw agricultural production controlled by the larger landholders.

One of the most important postwar changes in Japanese farming was the Land Reform enacted in 1947 that reduced the percentage of tenants in Japan from 48 percent in 1947 to 10 percent in 1948. It freed the land over 2.5 acres (10 acres in Hokkaido) belonging to resident landlords, and the land over 7.5 acres held by farmers (30 acres in Hokkaido) to be purchased by the government and eventually by farmers. Through the Land Reform, 5 million acres, or one third of Japan's farmland, passed into the hands of new owners. Farmers who were thus freed from high rent payments were now able to pay for machinery, improved irrigation and drainage and for fertilizer, as well as for consumer good in general. However, the size of farms thus acquired by new owners was and is limited. In addition to Land Reform, the enlargement of farmland was restricted by laws such as the 'Agricultural Land Act'. Agricultural administration since 1945 tended to keep the scale of farm management in Japan small, hence few farmers had more 5 acres and 68 percent had 2.5 acres or less in 1965. Thus under small-scale management, important changes in farm production occurred in postwar Japan. Along with the rise of living standards in cities, demand increased such items of food as fruits, vegetables, milk and butter, and in accordance with this, more fruits and vegetables were grown and more milch cows were reared. The production of fruits and milk products especially has rapidly increased with the rising standard of living since the 1950's. Between 1950-1952 and 1965 fruit production, especially of mandarine oranges and apples, was more than doubled, and also milk production was doubled between 1958 and 1965. Rice still holds the lead, however. In 1965 rice was grown by 86 percent of farmers and represented 55 percent

of crop production. The area in mulberry is declining rapidly, and silk lost its position as one of the main crops in Japan. Recently, the increase of milch cows has levelled off, and the number of dairy farmers is declining, but the growth rate of milk production is faster than any other agricultural product except for hogs. On the other hand, regional concentration is taking place in milch-cow-tending and the average number of milch cows in dairy farms is increasing. Moreover, in recent years rice culture, which hitherto has brought a higher income per acre, has become a serious overproduction problem, and it is argued that at least a part of all rice fields should be converted to other crops.

II The Changes of Milch-Cow-Tending Areas in Japan

(1) From the prewar period to the present time

The writer analyses the changes in milch-cow-tending areas and the changing trends of milk transportation accompanying changes in dairying areas.

The milch cows introduced at the beginning of the Meiji Era were mainly reared in pastures around large cities such as Tokyo and Osaka, as well as in the Boso Peninsula, the Izu Peninsula, and Awaji Island. In those days, the milch cows were reared mainly by urban milk distributors in all the milch-cow-tending areas. Consequently, a high percentage of the milch cows, and especially of milch calves and dry cows. As Kurihara and others have pointed out, relations between urban milk distributors and tenant farmers in milch-cow-tending were widely developed before World War II in Japanese dairying. The percentage of milch cows owned by farmers was markedly low in many prefectures in 1935 (Fig. 1). Although the ratio of milch cows owned by farmers was strikingly small, it had risen to 50.7 percent in 1935 from 22.5 percent in 1922. However, this was mainly due to increases in Hokkaido, which had by far the largest number of milch cows. Besides Hokkaido, relatively high ratios were observed in Yamagata, Chiba, Shizuoka, Tokushima and Saga prefectures. The distribution of milch cows at that times was limited to restricted areas, so the total number of milch cows in the top ten prefectures showed the very high percentage of 71.6 percent in 1935 (Table 1). Such an uneven distribution of milch cows also existed within these prefectures. For example, in 1935, the number of milch cows was 532 in Oshima, 575 in Hachijo Island and the total number in Tokyo prefecture was 1447. The Boso Peninsula had 3318, Chiba prefecture 3785, Awaji Island 1538, and Hyogo prefecture 2264.

But in 1945 and in the years following because of a lack of fodder, dairying by urban milk distributors declined rapidly. In contrast to this, farmers with small farms created by the Land Reform began to rear milch cows. The ratio of

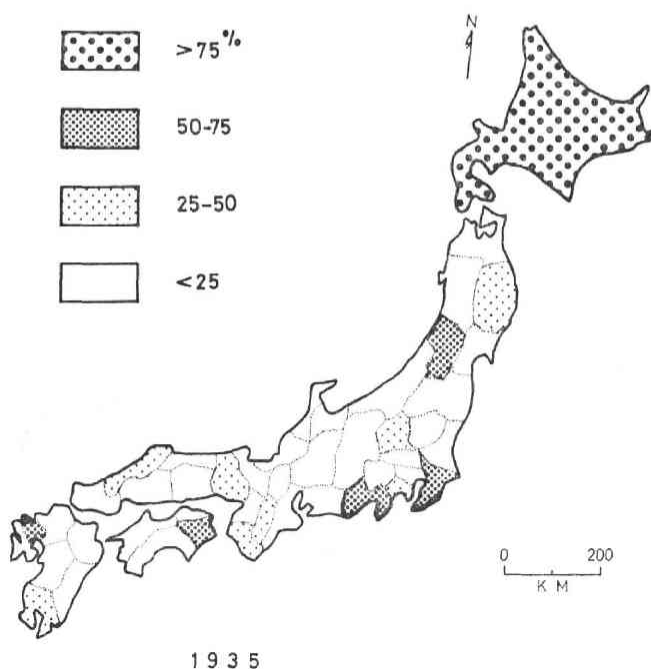


Fig. 1 Ratio of milch cows owned by farmers, 1935

Table 1 Numbers of milch cows by prefecture, 1935-1965

Percentage of milch cows						
Rank	1935 Prefecture		1950 Prefecture		1965 Prefecture	
1	Hokkaido	35.29%	Hokkaido	26.8%	Hokkaido	24.6%
2	Tokyo	6.2	Chiba	5.2	Iwate	4.9
3	Hyogo	5.5	Shizuoka	4.7	Chiba	4.5
4	Chiba	5.3	Kanagawa	4.3	Nagano	3.9
5	Osaka	4.1	Iwate	4.2	Hyogo	3.8
6	Shizuoka	4.1	Nagano	3.7	Gumma	3.7
7	Kanagawa	3.8	Saitama	3.5	Miyagi	3.0
8	Aichi	3.2	Aichi	3.4	Fukushima	3.0
9	Kyoto	2.2	Hyogo	3.2	Kanagawa	3.0
10	Fukuoka	2.0	Tokyo	2.7	Saitama	2.9
Total		71.6		61.6		57.3

milch cows owned by farmers reached 97.2 percent, and milch cow-rearing spread into the villages around cities. Throughout Japan milch cow-rearing passed entirely from urban milk distributors into the hands of rural farmers. The distribution of milch cows is thus becoming less localized (Fig. 2, Table 2).

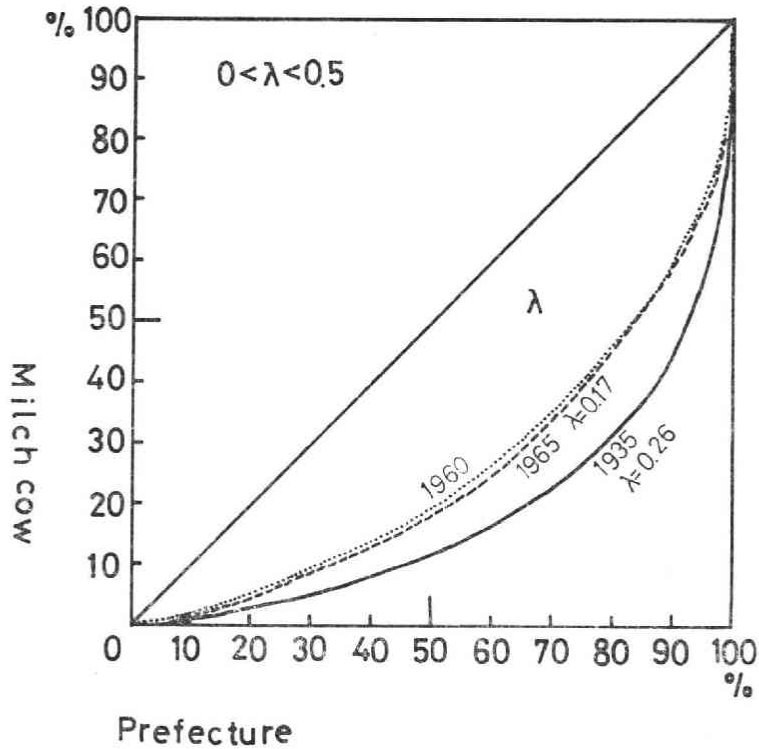


Fig. 2 Lorenz curve of milch cows, comparison between 1935 and 1965

Table 2 Numbers of milch cows by regional subdivision, 1935-1965
Percentage of milch cows

Regional Subdivision	1935	1950	1965
Hokkaido	35.2%	26.8%	24.6%
Tohoku	4.6	12.4	15.2
Kanto	20.1	20.7	20.4
Chubu	14.6	18.5	13.5
Hokuriku	3.1	3.6	2.5
Tosan	2.4	5.9	5.9
Tokai	9.1	9.0	5.1
Kinki	14.5	6.5	7.1
Chugoku	3.7	4.6	6.2
Shikoku	2.0	2.9	4.2
Kyushu	5.3	7.6	8.9

(2) The development of milch-cow-tending after World War II

The index of dairy production in the postwar years is indicated, and it can be seen that it has gradually but steadily increased since 1950. In 1967 the number of milch cows rose to 1,376,000 which was 6.75 times as many as that of 1950. After 1963, (3.12 times of 1950) the index decreases, yet the number of dairy farmers increased to 2.59 times the 1950 figure (Fig. 3). The production of milk rose rapidly also. Compared to 1950 a production of 9.28 times as much as milk in volume was registered. These indices of dairy production also suggest that the average number of milch cows have gradually increased. However, the number of milch cows is now stagnant, and the number of dairy farmers is decreasing, but because the number of milch cows and the number of dairy farmers increased at the

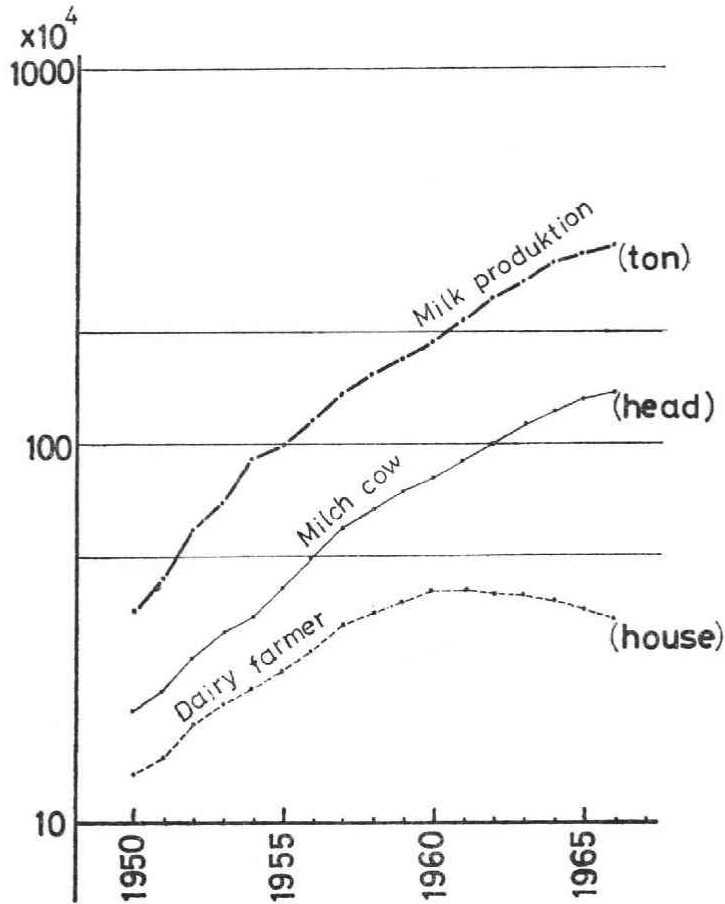


Fig. 3 Change of some production indices in dairying, 1950-1967

same time, the average number of milch cows per dairy farm is small in scale compared to prewar days. It barely reached 2.0 in 1960, and increased to 4.0 in 1967. According to Tanabe, dairying in Japan still remains in the stage of milch-cow-tending. This means that dairy farmers realize only a small portion of total farm earnings from milch cow-rearing. The average number of milch cows is relatively large in two areas; one is Hokkaido where the farms are larger than in Honshu, and the other is within the areas of large cities where milk prices are relatively high because much of the milk is consumed as fluid milk. The fact that average farmers keep only a small number of milch cows is conditioned not only by the minuteness of farms, but also by generally low milk prices. Besides these reasons, the higher income per acre which rice culture offers, has limited the development of dairying in Japan.

Areal expansion (implying an increase of milch cows in new milch-cow-tending areas) accompanying the rearing of only one milch cows, continued for several years in the postwar period (Table 3). But, in later years farmers with small acreage who could not supply sufficient fodder, abandoned their milch cows. This tendency began about 1960, which corresponded to the period of the increase of farmers with part-time jobs, and with the outflow of agricultural population. In consequence, the

Table 3 Percentage of dairy farmers by size of herd, 1949-1967

Percentage of dairy farmers						
Size of Herd	1949	1953	1957	1960	1962	1967
1	75.1%	71.8%	54.6%	46.0%	35.2%	27.4%
2	16.7	18.9	18.1	19.7	21.7	20.0
3				5.9	9.8	12.0
4	6.1	9.2	6.3	2.3	4.8	6.7
5	2.0		1.7	2.6	6.8	11.7
calves alone	—	—	19.3	23.5	21.7	22.2

average number of milch cows per dairy farmer tended to show a new trend. Thus, from this time forward, dairying trends in Japan changed to an internal expansion (implying an increase of milch cows in milch-cow-tending areas on the standard of that time), rather than areal expansion. The stagnation of the number of milch cows in recent years is mainly because dairy farmers with smaller acreage have discontinued raising cows.

With the development of internal expansion, the core regions of milch-cow-tending are shifting to piedmont and dry-field areas with relatively favourable conditions for the supply of fodder. This migration has resulted in the formation of 'Intensive Dairy Regions' designated by 'the Act for the Promotion of Dairying'

in 1954 (Fig. 4). 'Dairy Districts in need of Management Improvement' were designated in 1959, based on partial revision of 'the Act for the Promotion of Dairying'. In 1964, the total number of milch cows in designated administrative units reached 1,238,300. These involved 36 percent of Japanese administrative units, and here were tended 67 percent of total number of milch cows in Japan. These designated districts have relatively favourable conditions for fodder production. It is stated in the conditions for the appointment of 'Intensive Dairy Regions'; that these are designated on condition that they must be areas where the supply of fodder is insured for 5,000 or more milch cows within a range of two hours from the main dairy factory: or that these must be areas with a supply of fodder for 1,000 or more milch cows within a range of one hour from the main collecting facility.



Fig. 4 Distribution of 'Intensive Dairy Regions'

(3) Regional differences in milch-cow-tending

The core regions of milch-cow-tending in prewar times were gradually replaced by new developing regions. Among these regions, the eastern part of Tohoku and the northern part of Kanto have a high percentage in numbers of milch

cows (Tables 1, 2). One can notice that the previous areas of milch-cow-tending, such as Tokyo, Osaka and Aichi prefectures, have changed by 1965 to small ratios. In contrast to these urbanized areas, milch cows have increased in Gumma, Tochigi and Saitama prefectures of Kanto, and also in Fukushima, Iwate, Miyagi and Aomori prefectures of Tohoku, in addition to prefectures such as Chiba, Kanagawa and Hyogo, which are adjacent to large cities. Judging from the ratio of the number of milch cows, the decrease in prefectures near large cities was compensated by new areas in the outskirts of the previous dairy regions. It is noticeable that such prefectures are around the Tokyo Metropolitan Area, where there is only a slight increase in the number of milch cows.

There is a great difference in the distribution of milch cows between Eastern Japan, including Hokkaido, Tohoku, Kanto and Chubu, and Western Japan, as well as in the distribution of milch cows in prefectures adjacent to large cities such as Tokyo and Osaka (Fig. 5). According to this map, Eastern Japan has densely distributed districts continuously from the northern part of Hokkaido, the eastern part of Tohoku, and the northern part of Kanto and Tosan. Besides these regions, the distributions of milch cows in the Boso and Izu Peninsulas is dense also. In striking contrast to this, there are dispersely distributed areas in Western Japan. But high density areas exist in parts of Osaka, Hyogo, Tokushima, Kumamoto and Miyazaki prefectures. The regionality seen in the distribution of milch cows corresponds to the ratio of dairy farmers shown in Fig. 6. The percentage of dairy farmers is high in Hokkaido, Tohoku and Kanto; on the other hand it is low in Kinki and Chugoku.

In spite of the penetration of milch cows into many farms, dairy production since 1945 has remained at a very low level. That is, approximately 80 percent of the administrative units of Japan represented a ratio of under 10 percent (Table 4). The dairying region is limited to a part of Hokkaido which is essentially characterized as a dairy region among agricultural subdivisions.

In the regional analysis of the ratio of increase in the number of milch cows in Japan, a developing trend is to be expected. During the five-year period 1950-1955, milch cows strikingly increased all over Japan as many farmers adopted the practise (Fig. 7). In the following five-years 1955-1960, the ratio of increase indicated a relatively high level in Tohoku, Kanto, Kyushu and Chugoku, but showed only a small increase in the Pacific coastal region. During the five-years 1960-1965, not only did the ratio of increase gradually decline, but also the trend of the previous five-years became clearer. Namely, the ratio of the Sea of Japan coast, and of large metropolitan areas became increasingly smaller, while on the other hand, those of Kyushu, Shikoku, the eastern part of Tohoku and Hokkaido

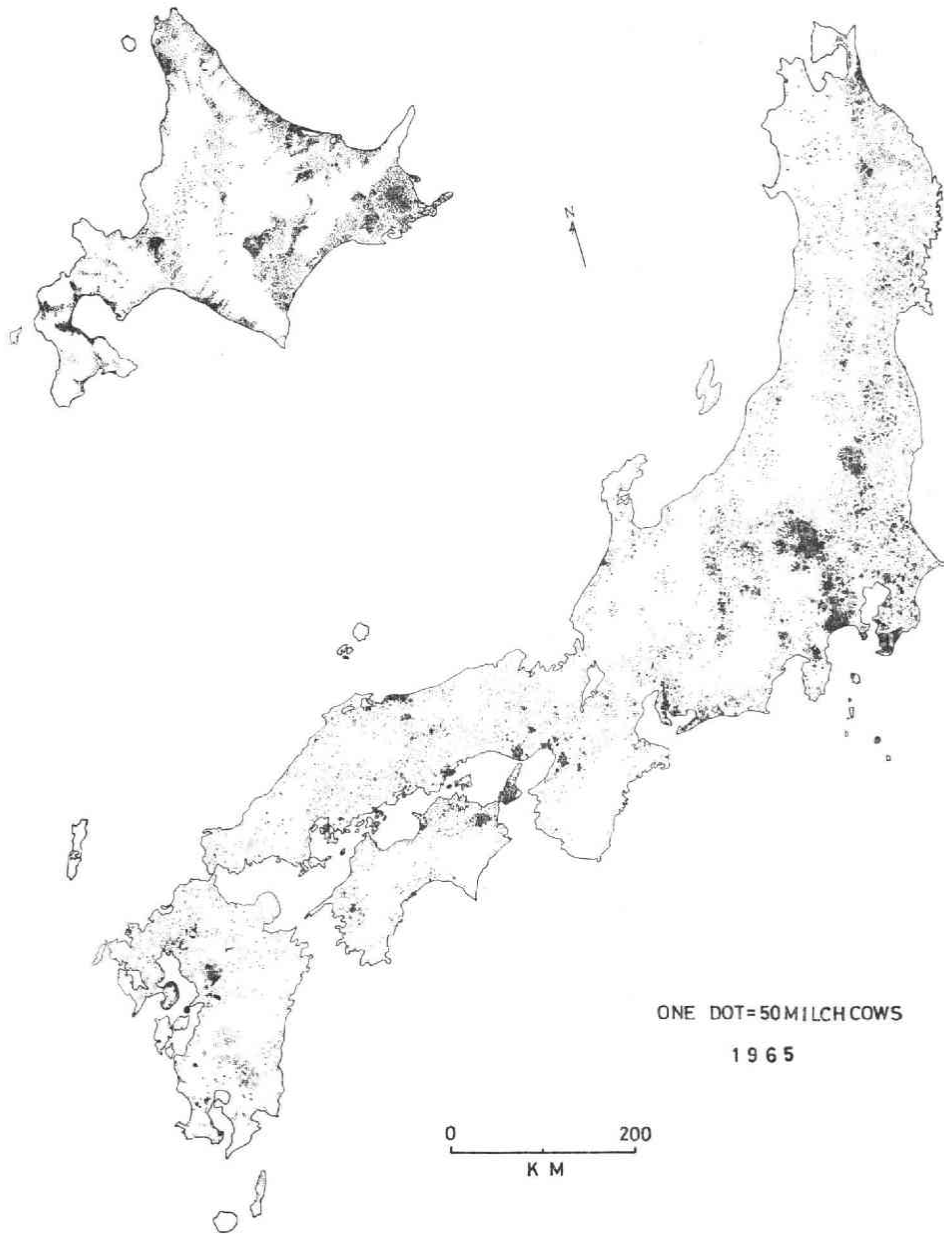


Fig. 5 Distribution of milch cows in 1965, each dot represents 50 milch cows

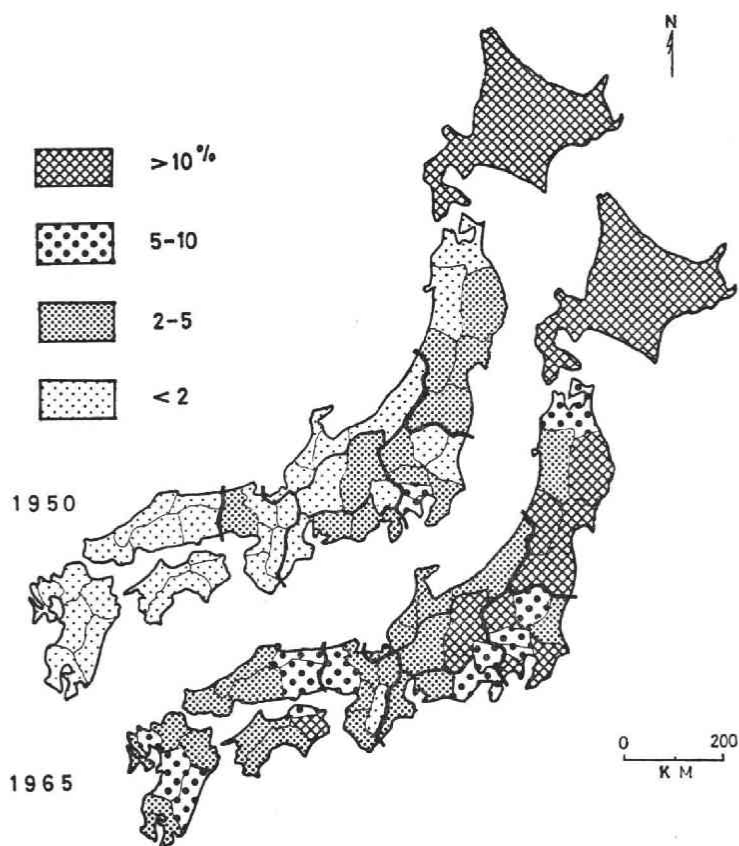


Fig. 6 Percentage of dairy farmer by prefecture, 1950 and 1965

Table 4 Percentage of census-classified dairy farms in Japan, 1965

Numbers of administrative units (shi, machi, mura)

	Hok- kaido	Tohoku	Kanto	Chubu	Kinki	Chu- goku	Kyushu	Shikoku	Japan
0- 4%	38	143	209	524	274	218	139	374	1919 56.5%
4- 10	43	112	131	162	51	110	62	119	790 23.2
10- 22	45	126	99	77	8	29	18	39	441 13.0
22- 46	48	60	35	23	3	7	5	7	188 5.5
46-100	46	4	10	—	3	—	—	—	63 1.8
Total	220	445	484	786	339	364	224	539	3401 100.0

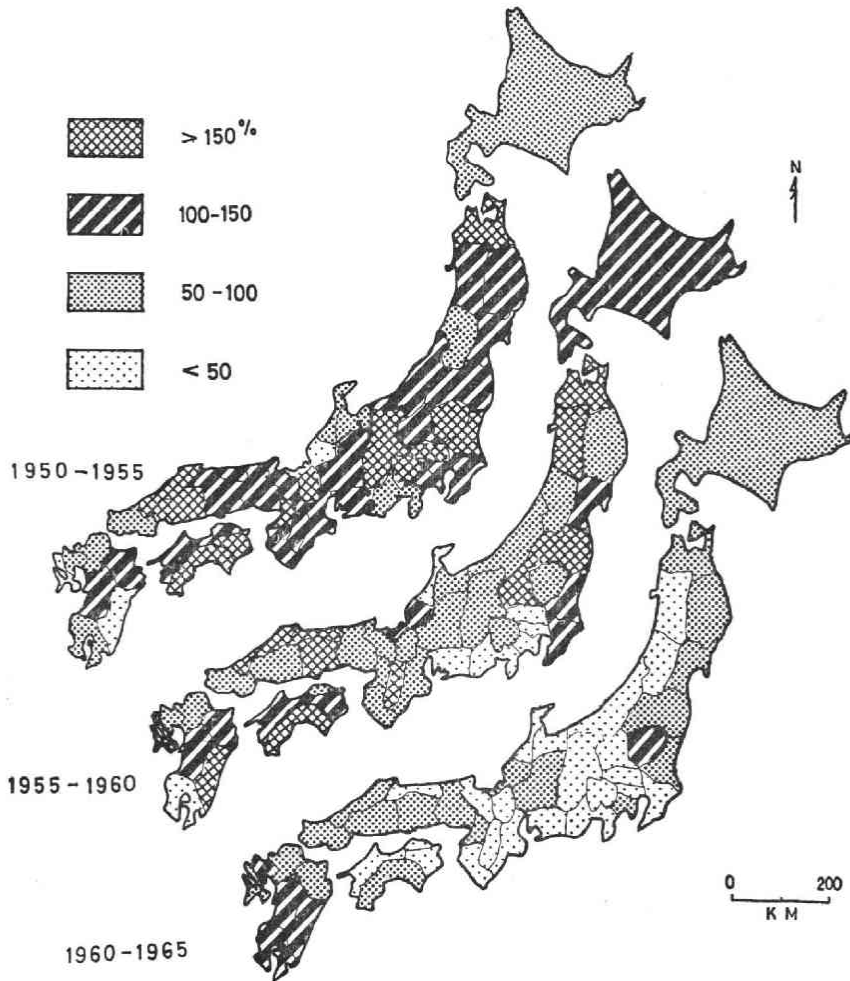


Fig. 7 Increase rate of milch cows by prefecture for five-year periods, 1950-1955, 1955-1960 and 1960-1965

continued of a modest level of increase. There is a clear trend in which the ratio of increase was areally differentiated according to the development of dairying. In regions far from the core regions of economic activity, the future development of milch-cow-tending is expected. This is an inevitable trend, because in prefectures around metropolitan areas there is a high burden of rent which prevents the location of dairying. Therefore, the core regions of milch-cow-tending in Japan will eventually be concentrated in regions of extensive agriculture.

III Regional Differences observed in the Transportation of Milk

(1) The pattern of milk-transport

In accordance with the migration of milch-cow-tending areas, there were marked changes in the transportation of milk around such large cities as Tokyo and Osaka. This migration was basically caused by an unbalance between the demand and the supply. That is, not only did increases in demand fail to keep pace with increases in milch-cow-tending, but also there were strikingly seasonal variations in the demand for milk. The transportation of milk increases every year, for according to the writer's analysis, competition for milk among large dairy processing companies (Meiji, Morinaga and Snow) enlarges the scale of milk transportation, as these three companies control the bulk of dairy production by means of their facilities for long-distance transportation and large-scale processing. In 1964, the ratio held by these three companies compared to the total volume of milk production, reached 64.2 percent. In addition they held ratios of 56.5 percent in fluid milk, 62.1 percent in condensed milk, 94.0 percent in powder milk, and 82.1 percent in butter. In short, regional unbalance in milk production accelerates the transportation of milk which otherwise is used as fluid milk.

The amount of milk which was transported was only 9.2 percent (33,811 tons) of total production (367,319 tons) in 1950, and of the 33,811 tons, the milk supplied to Tokyo was 26,177 tons. This was 77.4 percent of the total transported, and the combined milk supply to Tokyo and Osaka reached 81.9 percent of the 33,811 tons. Thus, in 1950, it was obvious that the transportation of milk was concentrated in a few markets such as Tokyo and Osaka. After 1950, milk production in Japan increased each year, and also the transportation range gradually changed from a local scale to a regional scale. Particularly, after 1960, when the ratio of milk used as fluid milk exceeded 50 percent, the transportation scale was much enlarged. As a result of this, milk transportation reached 838,379 tons in 1966, or 24.8 times as much as the transported quantity in 1950. The increase in milk-transport has been sustained by the development of trucking, in particular through the use of tank trucks and by the improvement of roads.

Today, the pattern of milk transportation is very complicated, yet a special milk collection pattern has formed around metropolitan areas such as Tokyo in Kanto, Nagoya in Chubu, Osaka in Kinki and Fukuoka in Kyushu (Fig. 8). The milk-transport around these metropolitan areas is strongly concentrated especially two areas; one around Tokyo, including Kanagawa, Chiba and Saitama prefectures, and the other around Osaka, including Hyogo and Kyoto prefectures.

Presently in many prefectures in Kanto and Kinki, the amount of milk processed exceeds the output, and there the ratio of fluid milk (market milk) is

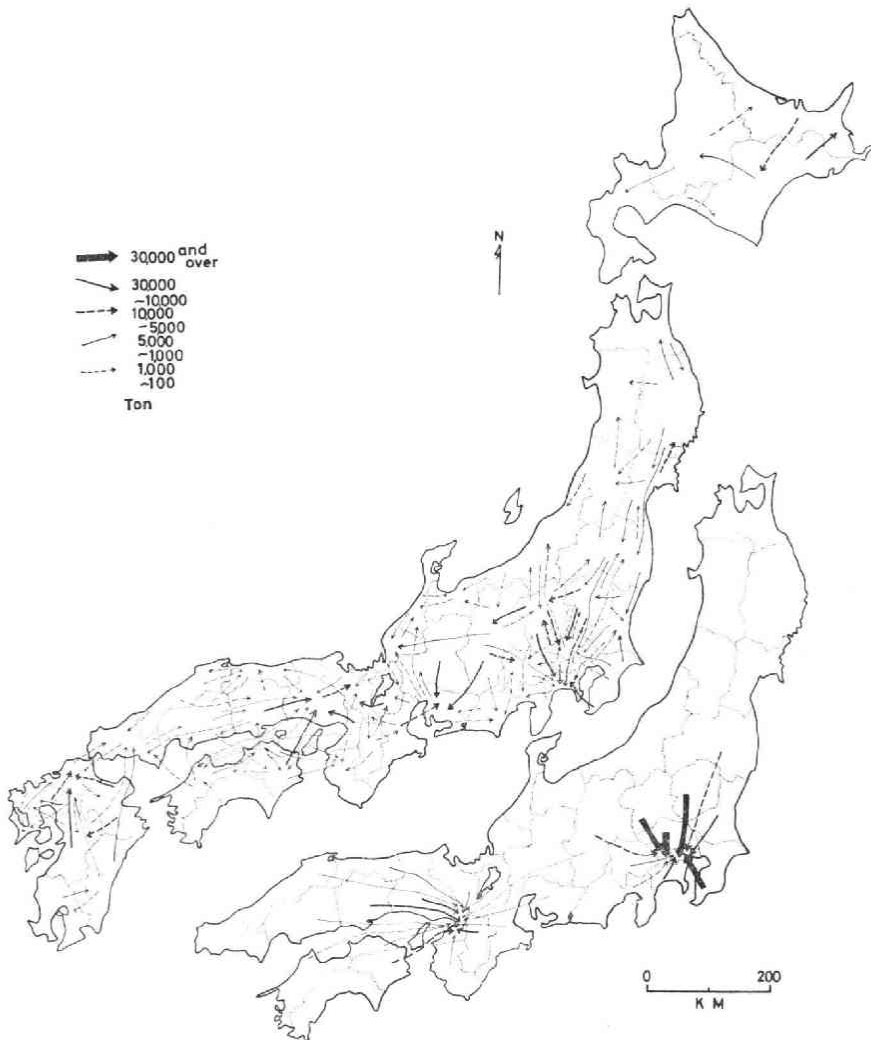


Fig. 8 Transportation of milk, but 100 and more tons is only shown by prefecture (by region in Hokkaido) in 1966

higher than the ratio of manufactured milk (Figs. 9, 10). The transportation of milk is mainly influenced by the distribution of milch cows and by the location of factories belonging to such large companies as Meiji, Morinaga and Snow.

(2) Milksheds of Tokyo and Osaka

The writer will discuss changes in the milksheds of Tokyo and Osaka as examples of changes in milk-transport from the migration of milch-cow-tending



Fig. 9 Milk production in 1966 by prefecture

areas. These two milksheds are distinctively nucleated regions in the milk-transport pattern of Japan. In 1950, the milk flow to Tokyo occupied 77.4 percent of the national total, but in 1966 it accounted for 286,252 tons, or 34.1 percent of the total. When the ratio of milk flow from traditional sources, such as the prefectures surrounding Tokyo, is taken into account, the transportation of milk had been continuously concentrated in the large market of Tokyo. In 1950, the main sources of milk supply to Tokyo were Saitama prefecture to the north, Chiba to the east, and Kanagawa to the south. The order by amount was Kanagawa (31%), Chiba (30%), and Saitama (25%). However, in spite of a striking increase in milk production in the postwar period, the ratio of milk supply to the capital has been declining in the prefectures immediately adjacent to Tokyo. The percentage of the total of such prefectures were 66.2 percent in 1957, 62.0 percent in 1961, and 54.3 percent in 1966. As a result of the relative decline of these three prefectures the ratio of milk supply from Gumma, Tochigi and Ibaraki to Tokyo has considerably increased (Table 5). Tokyo's milkshed has expanded northward beyond Kanagawa, Chiba and Saitama. Thanks to improved transportation the

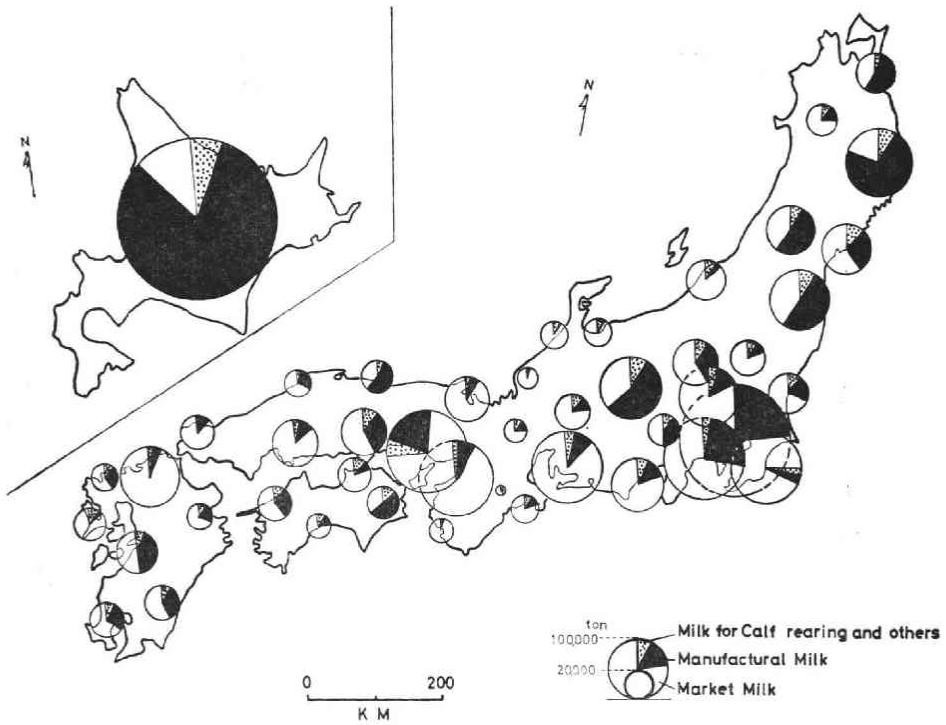


Fig. 10 Ratio of milk by use in 1966, by prefecture

Table 5 Milk supply to Tokyo by prefecture, 1957-1966

Percentage of inflow

Rank	1957 Prefecture		1961 Prefecture		1966 Prefecture	
1	Chiba	31.8%	Chiba	27.5%	Saitama	24.3%
2	Saitama	26.2	Saitama	22.0	Gumma	22.4
3	Kanagawa	18.2	Kanagawa	12.5	Chiba	20.1
4	Tochigi	5.7	Gumma	11.2	Tochigi	11.7
5	Gumma	4.5	Tochigi	8.7	Kanagawa	9.9
6	Ibaraki	4.3	Fukushima	6.3	Ibaraki	6.4
7	Fukushima	2.0	Ibaraki	5.5	Fukushima	2.0
8	others	7.3	others	6.3	others	3.2
Volumes of Inflow	110,000 tons		186,900 tons		286,252 tons	

more distant districts have become more accessible to the market.

Likewise in 1966, milk inflow to Osaka amounted to 86,277 tons, which corresponds to 10.3 percent of total milk flow in Japan, and the traditional source of milk supply to Osaka has been Hyogo prefecture. However, recently the ratio of milk supply from Hyogo to Osaka has declined. Thus, the present milkshed includes not only Nara, Okayama and Tokushima prefectures, but also such prefectures as Hiroshima, Shimane and Tottori which far are from the Osaka market (Table 6). As a result of an increase in milk inflow, Osaka's milkshed now almost equals in areas that of Tokyo. Judging from the population of these two metropolitan areas, it is clear that within the former milkshed the density of milch cows is smaller than in the latter.

Table 6 Milk supply to Osaka by prefecture, 1957-1966

Rank	Percentage of inflow					
	1957 Prefecture		1961 Prefecture		1966 Prefecture	
1	Hyogo	54.5%	Hyogo	35.0%	Hyogo	31.5%
2	Nara	10.6	Okayama	17.0	Nara	25.0
3	Wakayama	8.7	Nara	14.4	Okayama	14.2
4	Kagawa	7.5	Tokushima	8.3	Tokushima	9.6
5	Mie	5.3	Kagawa	7.2	Wakayama	4.1
6	Tokushima	4.4	Wakayama	5.8	Shimane	3.2
7	Shiga	3.7	Shiga	5.5	Hiroshima	2.6
8	others	5.3	others	6.8	others	9.8
Volumes of Inflow	33,000 tons		63,000 tons		86,000 tons	

In addition to the transportation of raw milk, large amounts of bottled fluid milk are supplied to Tokyo from Kanagawa, Chiba and Saitama prefectures, and to Osaka from Hyogo prefecture (Fig. 11). For example, Gumma and Tochigi prefectures supply large amounts of raw milk not only to the Tokyo market, but also to Kanagawa, Chiba and Saitama prefectures. In these prefectures this raw milk is processed and bottled and is shipped to the Tokyo market as fluid milk (Figs. 8, 11).

The milksheds of Tokyo and Osaka are growing in size, corresponding to the migration of milch-cow-tending areas has compelled large dairy companies to rely more on the transportation of milk to be used mainly as fluid milk from the producing areas to the consuming areas.



Fig. 11 Transportation of fluid milk in 1966

IV Summary

1. In the early stages of dairying in Japan those who kept milch cows were limited to urban milk distributors, yet in the years following the number of farmers who keep milch cows has gradually increased, especially in Hokkaido. The ratio of milch cows owned by farmers reached 22.5 percent in 1922, and rose to 50.7 percent in 1935, but this high figure was largely because of increases in Hokkaido. In 1950 the ratio reached 97.2 percent, but in 1967 the number of milch cows



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per dairy farm was only 4.0. Therefore, only a few regions are characterized principally as dairy regions in the agricultural subdivisions of Japan.

2. The increase in milch-cow-tending among farmers in the postwar period has changed from the strikingly localized distribution of milch cows seen in the prewar periods, to only slightly localized distribution. However, in recent years a more regional concentration of milch cow-rearing is again occurring. This was embodied in 1954 in the designation of 'Intensive Dairy Regions'. Thus, the outward expansion which continued after 1945 has gradually turned into internal expansion within milch-cow-tending areas. This tendency has been strengthened since about 1960.

3. The core regions of milch-cow-tending are migrating to areas of dry-field and piedmont areas adjacent to cities. However, the general tendency has been the same since prewar days in that the distribution of milch cows is concentrated in Eastern Japan.

4. In 1950, Tokyo had a milk inflow amounting to 77.4 percent of total milk flow of Japan. With the rapid increase of population in metropolitan areas, not only has transportation of milk increased, but the supply areas have widened. The amount of national milk flow reached 24.6 percent of total milk production in 1966 (9.2% in 1950). The metropolitan areas of Tokyo and Osaka are in command of especially large milksheds.

5. It is clear that large amount of milk flow is mainly derived from the transportation of fluid milk. Tokyo and Osaka have large ratios in the total milk flow. Both cities combined, the ratio reached 44.4 percent in 1966. The supply areas of fluid milk to these cities are expanding from directly around the metropolitan areas to an outer zone farther distant. Namely, Tokyo's milkshed has expanded from Kanagawa, Chiba and Saitama prefectures to include Gumma and Tochigi prefectures, while Osaka's milkshed has moved from Hyogo to include Okayama and Tokushima prefectures. This shifting corresponds to the migration of milch-cow-tending areas.

6. Judging from the trends of increase in milch cows, it is expected that in the future milch-cow-tending will develop in districts farther from the center of Japanese economic activity, to such districts as Hokkaido, Tohoku, Kyushu and northern Kanto.

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Index map of prefectures and main regional subdivisions of Japan

1 Hokkaido	2 Aomori	3 Iwate	4 Miyagi	5 Akita	6 Yamagata
7 Fukushima	8 Ibaraki	9 Tochigi	10 Gumma	11 Saitama	12 Chiba
13 Tokyo	14 Kanagawa	15 Niigata	16 Toyama	17 Ishikawa	18 Fukui
19 Yamanashi	20 Nagano	21 Gifu	22 Shizuoka	23 Aichi	24 Mie
25 Shiga	26 Kyoto	27 Osaka	28 Hyogo	29 Nara	30 Wakayama
31 Tottori	32 Shimane	33 Okayama	34 Hiroshima	35 Yamaguchi	36 Tokushima
37 Kagawa	38 Ehime	39 Kochi	40 Fukuoka	41 Saga	42 Nagasaki
43 Kumamoto	44 Oita	45 Miyazaki	46 Kagoshima		