Some Geographic Aspects about the Milch Cow Keeping in Japan

A Contribution of the Study of Milk Gathering Area

of Milk Product Manufacturing Factory

by

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I. Introduction

As Figure 1 shows, the total number of milch cows in Japan fluctuates. It was apt to decrease about 1918, but began to grow with 1921 as a turning point, and kept increasing gradually from the year on, until they reared 1.5 times as many dairy cows as in 1921 in eighteen years, and it is in 1939 that the number rose to 173,000. Then it exhibits a rapid increase from 1939 to 1944 and amounted to 265,623 in 1944, the value being the greatest one Japan had ever shown. But in 1945 and the next year by the lack of provender and social unrest at the end of World War II the number steeply fell down to 159,181 in 1947. After that time it began to increase again, and revived to 225,820 in 1951, under the slogan of "To Dairying from Crop-farming" as dairy farming has been encouraged.

Fig. 1. Total number of milch cow from 1918 to 1950.

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Such tendency of increase and decrease coincides with that of total number of all the cattle including ones for work and meat, milch cows exceeding in a degree. Especially since 1947 the velocity is observed to have been considerably great and this tendency is expected to continue in future just as before.

The number of milch cows is much smaller than that of horses and cattle. In 1950 the number of cattle for work and meat was eleven times and that of horses is five times as large as that of milch cows. The situation occurred for the following reasons. That is, horses and cattle taking part in rural work are reared as a means of agricultural management among the Japanese farmers, but milch cows, on the contrary, are comparatively of less value as their substitutes from the very nature of them. The author, therefore, must consider those who keep milch cows, next.

Milch cow keeping was introduced at the beginning of Meiji Era as the Western and American civilization became popularized. Before that time milk was regarded as a kind of medicine, and milch cows were only reared in a limited area by special persons. Though the author has not mind to deal with the process of the historical development, yet he thinks it necessary to mention briefly the subject of rearing of milch cows. The milch cows which were introduced at the beginning of Meiji Era were bred in the pastures around some cities, managed by city milk distributors, and then gradually committed to the care of the farms around them, and at last it began to take place that some farmers owned milch cows. Since the middle of Meiji Era when dairy industry was began, it brought about a type which showed the milch cow rearing with the object of supplying raw milk, and consequently gave rise to an expansion of milch cow rearing area, without confining the suburban area to a limited portion which permitted the distributors to supply milk as fresh as it was milked. Nevertheless, the dairy industry makes such progress that no development of rearing traced but in some areas around a very few dairy product manufacturing plants. But milch cows showed a tendency toward decrease to some extent till 1921, yet eighty percent of the total milch cows were still subject to the capital of city milk distributors.

When the farmers who were rearing milch cows formed dairy associations and had co-operatively equipped plants, they could directly supply milk to cities without any help of city distributors. This caused another expansion of milch cow rearing into the villages around cities. At this time, milk product industry showed a tendency toward development, with the result that the total number of milch cows increased steadily and in 1930 the cows of the
distributors were 54 %, which suggests a great decrease in percentage in comparison with 77.5 % in 1922, while the ratio of the cows owned by the farmers rose to 54 % in 1940 on the contrary. There was a rapid and remarkable increase in the number of dairy cows reared on farms since 1940. In 1948 the number of cows owned by farmers was 92.8 %. Thus, it is clear throughout Japan that the subject of milch cow rearing shifted thoroughly from city milk distributors to rural farmers.

In respect of the scale of rearing on farms, the average number of milch cows in the whole country was 1.50 per one farm in 1951, and apart from Hokkaido (2.17 cows) the average number is 1.43. This is slightly over 1.16 in horses and 1.11 in cattle for work and meat.

From the above mentioned facts, we can recognize in Japan that farmers occupy a leading position in rearing milch cows, though the scale of rearing is very small.

In a treatise published by the author, he concluded as follows: (1) In Chugoku Region where more cattle for work and meat have ever been bred, but very few horses kept, there is scarcely any change in the total number of cattle including cows, but slight increase in the number of milch cows only. (2) In the northern Kanto and the north eastern Japan where a greater number of horses has ever been bred, on the contrary, cattle rearing is now taking its place all over the district. But the degree and process of the transition to milch cow rearing which takes place succeedingly, seemed to differ regionally. (3) Tokaido and Southern Kanto where stock keeping has scarcely been popular, are now changing into cattle rearing areas, and in these districts the ratio of milch cows is comparatively great.

These facts suggest there may be some differences or so between the cattle breeding areas and ones where cow rearing is replacing horse breeding when milch cow rearing is adopted.

In this paper the author will discuss the differences shown from the background and the site of milk manufacturing factories, and the process of development of milk gathering areas in Chugoku and Tohoku Regions, both regions having different bases of milch cow rearing.

II. Several distributions relating with milk cows.

A) Distribution of milk cows.

The distribution map representing the ratio of milk cows to 100 farms could not show distinctly milk cow distributing areas because the absolute number of milk cows was too small in comparison with that of agricultural households. But when the distribution of the absolute number per county-city is read in Figure 2, several areas of concentration can be clearly recognized.

The area stretching along Tokaido to Nagoya on the southwest, as far as Nagano Basin on the northwest and to the middle part of Tohoku Region, is the largest one, with its centres in the southern part of Kanto Region. Although others are much smaller except the north east section of Tohoku, there are such centering areas as the northeastern Kyushu, the eastern Setouchi (the coast of Inland Sea), the middle Hokuriku, the southern Kyushu and the parts around Kyoto-Osaka-Kobe. And the areas where milk cows

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are extremely few are the middle part of Kyushu, the northern portion of Chugoku, Shikoku, the southern section of Kinki, and the north-west of Tohoku Region.

Generally speaking, milk cow rearing is not prevalent in Western Japan with the exception of the northern Kyushu and Setouchi, but popular along the Pacific Coast in the Eastern Japan, seldom found along the coast of Japan Sea, and differs regionally in each basin of Eastern Japan.

Such state of distribution as above exhibits a striking contrast to that of cattle, and therefore milk cow rearing is thought to have a character quite different from cattle rearing for work and meat.

B) Relation between raw milk, market milk and the number of milking cows.

Figure 3 shows the relation between a ratio of the raw milk consumption to total consumption and a ratio of the market milk consumption to whole production per prefecture. It is natural that this should show negative correlation, and the figure clearly indicates three groups.

Those which belong to the first group are higher than 60% in the proportion of raw milk consumption and lower than 25% in that of market
milk consumption. Hokkaido, Nagano, Iwate, Okayama, Yamagata, Fukushima, Chiba, Aomori and Shizuoka prefectures are thought to be in this group.

The second group contains the prefectures of Hyogo, Wakayama, Ishikawa, Tottori, Kagoshima, Aichi, Kanagawa, Kumamoto, Ehime, Kagawa, Gunma, Saitama, Yamanashi, and Ibaraki, in which the proportion of raw milk consumption is 60-38% and that of market milk consumption 24-51%.

Under the third group come the following prefectures: Niigata, Toyama, Yamaguchi, Miyazaki, Kyoto, Tokushima, Shimane, Nara, Saga, Shiga, Tochigi, Miyagi, Mie, Hiroshima, Akita, Fukui, Gifu, Osaka, Oita, Fukuoka, and Kochi, and in these the consumption of raw milk is under 30% and that of market milk is 55-100%.

The case of Tokyo is a special one, at which the proportion of raw milk consumption is not higher than 12.6% but the city milk consumption extremely surpasses the whole milk production of its own, showing 168.5%.

Then the number of milking cows is thought together with above mentioned relation. The total number is 112,891, and it is 56.9% of that of milch cows in 1950. Generally, the prefectures of the first group except Aomori have many milking cows. Those of the second group which lie near great cities also have many milking cows, — for example, Hyogo, Aichi and Kanagawa have a large urban population in each prefecture, and Gunma and Saitama also lie near the Tokyo metropolitan district. In the third group there are Fukuoka, Osaka and Gifu prefectures which have many milking
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cows, though do not possess so many as those of the second group. The number of milking cows is few in the other prefectures of the third group.

When the quantity of liquid milk transported among prefectures is observed according to Figure 4, it is clear that no striking movement can be seen except a transportation system which concentrates to Tokyo and somewhat conspicuous one in Setouchi district. The movements of liquid milk from Fukui to Kyoto, from Saga to Fukuoka, and from Yamaguchi to Hiroshima are for the sake of city milk supplying. The most part of the milk transported from the vast areas around Tokyo also represents city market milk. And it is also a striking feature in this figure that very small quantity of liquid milk moves out of prefectures. That is, the whole amount of transported raw milk is 109,000 kl and 0.04% of the whole production of milk in 1949. This is because milch cow rearing is limited only around a dairying factory. That is, milch cow rearing comes into being in close

Fig. 4. Transportation of liquid milk in 1949.
relations to a dairy factory, which is suggested by the distribution of factories in next section.

C) Distribution of milk product manufacturing factories

Though the author does not intend to discuss here the scales of factories, the capacities of plants and the systems of capital to which they belong, but the distribution of milk product manufacturing factories, as shown in Figure 5 almost resembles that of milk cows. It is very sparse in the prefectures of the third group — especially Fukuoka and Osaka — and in Tohoku Region it is also sparse in spite of those of the first group, while in
Tokaido district between Nagoya and Tokyo the number of factories and the amount of milk production are relatively balanced.

This distribution shows that milch cows are kept in the northern Kyushu and the areas around Kyoto-Osaka-Kobe in order to supply city market milk. And it is quite natural that Saitama Prefecture should have few factories because it produces much city milk for Tokyo, but it is worthy of note that Tokyo, Kanagawa Prefecture (Yokohama) and Aichi Prefecture (Nagoya) possess many dairy product manufacturing factories of their own, though they consume much city milk themselves. The fact of the latter shows that a type of milch cow keeping with the object of producing manufactural milk intermixes with that of milch cow keeping for city milk around cities in the same area, which is quite different in Japan from in Europe and America, where a city milk producing zone can be clearly differentiated from a raw milk producing one in proportion to the distance from cities. In other words, this suggests that milch cow keeping farmers are forced to produce manufactural milk as well, though their chief purpose is city milk production, because the influence of city milk distributors is still strong as they were before, in respect of supplying market milk for cities and the demand of city market milk does not increase more than they expected.

III. Difference of the background of dairy manufacturing factories between Chugoku and Tohoku Regions.

In Chugoku Region, except the coast of Inland Sea, milch cow keeping is sparsely distributed as Figure 2 shows, and almost all factories seen in its mountainland stops working at present. But in the eastern part of the mountainland Hinokami-Gun, Hyogo Prefecture (north of Kobe) is an exceptionally concentrated area of milch cow keeping. In the coastal region, milch cows are concentrated in the four areas: the coastal part of Hiroshima-Bay, the east and west parts of Kojima-Bay, and southern half of Awaji Island. In those areas except the coast of Hiroshima Bay, milk manufacturing factories of somewhat large scale are situated respectively. And so, those three areas are regarded as raw milk producing ones.

The following two three figures show the examples of milksheds in Chugoku Region: Figure 6 is in the case of Kasaoka-Factory, Meiji Milk Products (3) Products of Kasaoka F. — Condensed milk, Butter; Awaji F. — Condensed milk, Dry Milk, Butter, Cheese; Hirota F. — Condensed milk, Butter, Cheese.
Co. Ltd., in Imai-mura, Oda-Gun, Okayama Prefecture; Figure 7 is in the case of Awaji Factory, Meiji Milk Products Co. Ltd. and Hirota Plant, Société des Produits Nestlé S. A., in Hirota-mura (Awaji Island), Hyogo Prefecture. And in those figures the sites of factories, and the routes along which raw milk is gathered, and the number of milch cows in each village is denoted.

In the middle part of Tohoku Region, the intermittent lowland of Yonezawa, Kaminoyama, Yamagata and Mogami basines and Shonai coastal plain are seen prevalent milch cow keeping, but the rest region is poor. In the southern part of Tohoku Region, milch cow keeping zone stretches from the north-eastern Kanto through Abukuma valley to the above zone.

In other words, the lowland zone can be regarded as a long range of milch cow keeping region with Shirakawa, Fukushima, Yonezawa, Kaminoyama, Shinjo and Amarume as its knots, which are more concentrated keeping areas.

Fig. 6. Milkshed of Kasaoka Factory.

Fig. 7. Milksheds of Awaji and Hirota Factories.
However in this zone some villages possess about 200 milk cows, most of them being 30 to 50.

Another milk cow keeping zone is seen more east from the lowland zone. This region, the most centralized rearing region in Japan except Hokkaido, is from the middle coast to the north eastern part of Kitakami Mountain region. In this area the number of milk cows is generally high, especially in the dissected area of the so-called Kitakami uplifted peneplain in its northern part, where four villages keep about as many as 500 cows each.

Tohoku Region has such a vast area of the milk cow keeping and much production of raw milk. Nevertheless, the dairy manufacturing factories are sparsely distributed in each area.

These factories and their milksheds are enumerated as follows: Kamino-yama, Shinjo and Amarume Factories of Meiji Milk Products Co. in Kamino-yama-machi, Minami-murayama-Gun; Shinjo City, Mogami-Gun; and Amarumemachi, Higashi-tagawa-Gun, Yamagata Prefecture (these are shown in Figure 8); Takekoma Factory of Meiji Milk Products Co. in Takekoma-mura, Kesen-Gun. (also shown in Figure 8). In Figure 9 is shown Fukushima Factory in Fukushima City, Fukushima Prefecture, and in right Figure 9 are shown Morioka Factory in Morioka City, Iwate Prefecture, and Aozasa Dairy Association Factory, in Aozasa-mura, Kamihei-Gun, Iwate Prefecture. And also in those figures the sites of factories, the forms of transportation and the routes along which raw milk is gathered, and the number of milk cows each village have denoted.

In the most densely concentrated milk cow keeping section in Chugoku Region, the milkshed of the dairy factories measures 20 km from east to west and 30 km from north to south, in which the two factories, Awaji Factory of Meiji Co. and Hirota Plant of Société des Produits Nestlé S. A., are co-operatively gathering their liquid milk by truck, bus and ship. Kasaoka Factory has its milkshed of 20 km from east to west and 15 km from south to north.

On the other hand, in Tohoku Region the milksheds of Kuzumaki, Iwai-zumi and Takabatake Factories have almost equal area compared with that of Awaji, Hirota or Kasaoka Factories in Chugoku Region. However, they have a large capacity of plant compared with Awaji, Hirota and Kasaoka. Kuzumaki Factory of Moriyania Co. is shown in the north-east corner of Figure 9, and Iwai-zumi Factory of Meiji Milk Products Co. is not shown but lies in the east of the former factory. And Takabatake Factory of Nihon Milk Manufacturing Co. Ltd. (Nihon-seinyu) is on the western side of Yonezawa Basin, Yamagata Prefecture.
On the contrary, the factories of Kaminoyama, Shinjo, Fukushima and Morioka, having equal capacity to that of them, are gathering raw milk from a vast area of their own. That is, both milksheds of Fukushima and Morioka factories are 100-120 km from south to north and 25-35 km from east to west. The factory of Aozasa Dairy Association, even though the scale and capacity
are small, has a wider milkshed than those of two factories at Awaji. Its milk-shed is 30 km from east to west and 15 km from north to south.

Morioka Factory of Meiji Milk Products Co. was built in 1947 (after World War II) and is one of the largest dairy factories managed on a large scale. But in its surrounding area the distribution of milch cows was so sparse that the factory had to possess a vast milkshed and is could not help making a raid on the gathering area of another factory, in order to gather more raw milk enough for its capacity. Even if it dared to do so, the raw milk is still not enough. At present, the average 5.4 kl of raw milk is supplied for the capacity (9 kl per day) of the plant. Every large factory generally experienc-
ces such a situation in its first stage and no factory can risk such a heavy loss except ones belonging to the system of great capital.

Several factories in the eastern Aomori Prefecture which were established by the National Agricultural Association (Zenkoku-Nogyo-Kai) and the factory of Aozasa(4) Dairy Association in Iwate Prefecture are on small scale, and have comparatively small milksheds. In these cases, as capacity and scale are small at the starting stage, it is necessary to enlarge the capacity and scale with the development of milk cow keeping around the factories. But there is a tendency to obstruct the development of milk cow keeping in the milkshed, for the enlargement of the factory by the selffund of the association is impossible. On the contrary, when a great enterprise invests the capital in such small factories, the enlargement of the factory is possible and milk cow keeping in its own milkshed is able to make a great and sudden progress, although its milkshed is not enlarged. The factories managed on a great scale having small milkshed in Kuzumaki, Iwaizumi and Takabatake are good examples of such a case.

Let the author discuss again the vast milk gathering area of a large scale factory. The situation of the milkshed of Morioka Factory can be called the first stage, for the milk cow keeping is not so popular and many cows are kept only near the factory. That of Fukushima Factory(4) is recognized to be in the next stage. That is, milk cow keeping has become popular all over its vast milkshed and the quantity of liquid raw milk is enough to become economically independent of the factory management, though the quantity is somewhat less for the capacity of the plant. Trucks and railways are used for gathering milk, and many gathering-points are scattered all over the area.

Thus, in this second stage, the management of the factory is stable economically and will make a profit in accordance with the advance of milk cow keeping in the background.

At the end of this stage, a branch factory, generally a creamery, is established at one of the gathering points which is seen in a remote part of a vast milkshed owing to a concentration of milk cow keeping or for the purpose of acceleration of a concentration. This suggests a state just before the break-up of the early vast milk gathering area into two milksheds. A

(4) Products of Iwaizumi F. — Condensed milk, Dry milk, Butter; Takabatake F. — Condensed milk, Dry milk, Butter; Morioka F. — Condensed milk, Butter; Fukushima F. — Dry milk, Cheese, Butter.
good illustration can be seen in the process of segmentation in the case of Kaminoyama Factory of Meiji Milk Products Co. and its milk gathering area.

The Factory of Kaminoyama was established in 1936. In the starting stage, its milk gathering area was a vast one, including in it Kaminoyama Basin, Yamagata Basin, Mogami Basin and Shonai Coastal Plain in Yamagata Prefecture. The area is nearly equal to that of Morioka Factory and Fuku-shima Factory (Fig. 9).

Kaminoyama Factory\(^{(6)}\) enlarged the capacity from 9 kl to 14.4 kl per day in 1942, and branched Shinjo Creamery in 1944. Shinjo Creamery\(^{(5)}\) gathered the milk from the whole area of Mogami Basin and sent the cream to the mother factory at Kaminoyama. In 1948 Amarume Creamery was branched from Kaminoyama Factory. In 1951 Shinjo Creamery enlarged the capacity into 3.6 kl per day and at the same time the scale of the factory became so large as to meet the next expansion of its capacity. And then, the factory was promoted from a creamery to one of the independent factories under the system of Meiji Milk Products Co. — it being called Shinjo “Factory”\(^{(5)}\) — and had absorbed Amarume Creamery as its branch factory.

Thus the early milkshed of Kaminoyama is divided into three parts. The area of milk gathering of Kaminoyama Factory is 60 km from north to south and 35 km from east to west in width. Shinjo Factory gathers the milk from the area of 35 km east to west and 50 km north to south. And the raw milk of Amarume Creamery\(^{(5)}\) is gathered from the area of 65 km northeast to southwest and 20 km northwest to southeast.

In the result of the segmentation, the mother factory and its branch factory, or the first factory and the second factory, always can not help gathering less raw milk than the capacity of their own, and suffer from the lack of milk in each stage. The development process through such a segmentation might be seen only in the case of the enterprise under a great capital. Although the process of segmentation of milk gathering area of Kaminoyama Factory has occurred under the same capital, it is necessary to notice the fact that the southern half of the milk gathering area of Morioka Factory under the Morinaga System will be divided by the other systems of great fund in the near future.

\(^{(5)}\) In Japan chief work done in creameries is only to separate cream from milk and sends the cream to the mother factory.

\(^{(6)}\) Products of Kaminoyama F. — Condensed milk, Dry milk, Butter; Shinjo F. — Condensed milk, Butter.
As above, it is clear that two types of development of the dairy manufacturing factories exist. That is, the one shows the development which does not bring the expansion of the milk gathering area in accordance with the enlargement of the capacity of a plant and the scale of a factory, and the other does the development which causes the break-up of the milkshed with the advance of the milch cow keeping of the background. In both types it is supposed that the three phases come together in the last stage; a large scale and large capacity, a small milkshed, and a concentration of milch cow rearing in the milkshed.

In Chugoku Region such a tendency as in Tohoku is not to be discerned. It is quite adverse in the region; the combination of some milksheds appears — in the case of Awaji and Hirota Factories, for example — and the stoppage of working is also observed — in the case of factories on a smaller and medium scale. It is thought that these tendencies suggest a type of stagnation and retrogression of milch cow rearing in Chugoku Region.

Therefore, both processes of the type of increase of capital and the type of division of milk gathering area show a rapid development of milch cow rearing in Tohoku Region. Especially the latter type may suggest the tendency of conservation of milk gathering area for a factory of its own by a monopolistic enterprise.

IV. Summary and Conclusion

(1) Milch cow rearing occurred eighty years ago in Japan. In the early stage those who kept milch cows were only confined to market milk distributors in cities. Then, the milch cow rearing of farmers gradually increased, and since 1940 the number of milch cows reared by farmers has surpassed that of milch cow owned by the distributors, and in 1948 the former reached 93% of the total number (201,788).

The average number of milch cows per one farmhouse rearing milch cows is 1.50 throughout Japan, that of milch cows becoming much lower than 1.43, apart from Hokkaido (2.17). The milch cow keeping areas, which are distributed radially from the southern Kanto as its centre, are not the exceptions in the view point of the scale on which the cows are kept, and in those areas, too, one cow per one farmhouse is popular. Therefore, it will be said that no region is characterized principally as a milch cow rearing area in Japan.

(2) The general rule regarding the consumption of milk is to be applied also in the case of Japan, though the milch cow keeping is on a small scale.
or very poor. That is, the prefectures are classified into three groups: metropoli-
tan district almost consumes market milk; around the district the prefect-
tures which have a large urban population, consume both market milk and raw
milk equally; and the prefectures which consume raw milk are found in the
outer zone.

However, even in such an area as Tokyo where an immense amount of
market milk is consumed dairy manufacturing factories are sited. This shows
that a raw milk supplying area is not completely detached from a market
milk supplying zone in proportion to the distance from a city, though the
detachment usually appears around a city in Europe or America. It
is because the farmers rearing milch cows are forced to produce manufac-
tural milk in spite of the purpose of supplying market milk, and market milk
is spent as manufactural milk for the reason of the stagnation of city milk
consumption and the daily variation of the city milk production.

(3) There are two types of the development of milch cow keeping in
the view point of milk manufacturing factory and its milk gathering area.

The first type: The dairy factory on a small scale comes into existence
with a small milk gathering area, and then the scale of plant is enlarged by
a new investment and consequently the milch cow keeping is developed, but
the milk gathering area is not enlarged.

The second type: a dairy factory on a large scale is constructed with a
vast milk gathering area in which the milch cow rearing is in an undeveloped
stage, and then, according to the development of the milch cow rearing in the
area, the factory sends out a branch factory or a secondary factory, splitting in
its early stage area.

The first type seems to be general and the second type seems charact-
eristic of Tohoku Region.

In other words, in Tohoku Region the factory of the second type has
been constructed in anticipation of the future development of farm milk pro-
duction, or its broad milk gathering area is secured by a large enterprise in
consideration of the future advancement of milch cow rearing.

It is concluded that, when a different view point is taken, the milch cow
rearing of Japanese farmers is brought into existence and developed within
milk gathering areas of factories under the protection of large enterprises.

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