Recent Changes in the Distribution of Rice Farming in Hokkaido

Recent Changes in the Distribution of Rice Farming in Hokkaido

Hideo FUKUI

Some studies have been published on the agricultural geography of rice in Hokkaido, with emphasis on its location in the northern marginal region of rice culture. J. Kawaguchi analysed the progress of the location of rice agriculture since 1869, and explained the pattern of the rice agriculture region in 1932, the year when the acreage of rice fields reached to its maximum in Hokkaido[1]. Later, J. Okamoto reported on the changes from rice field into upland fields after 1932, in a case study of the Bifuka town in the northern submarginal region of rice culture.[2] The rice agriculture region in 1932 is regarded as the pattern at the time when the acreage of fields was increased beyond the level of the cultivation technique, encouraged by the reclamation policy and the rising price of rice. Some aspects of the location pattern, such as its relation to the ordinary crop culture within farm management, is not sufficiently explained. During the 25 years since 1932, there has been a great change in the social and economic conditions due to World War II. Hence, the location pattern must have also been greatly changed in its character.

In this paper, the author describes the general changes of the rice agriculture region in the period 1932 to 1957, and points out the recent progress of the regional differenciation, comparing the data of 1932 shown by J. Kawaguchi with those of 1957.

I. The Changes in Rice Agriculture

The trends of yearly changes of the acreage of rice fields are divided into the following seven periods (Fig. I). In the first period during 29 years preceding 1897, the acreage was less than 5,000ha, and the rice fields were mainly located in the Oshima Peninshula in the southwestern part of Hokkaido. The second period, 1898 to 1919, was the time showing a fairly large increase of the acreage, which amounted more than 70,000ha in 22 years, and the present principal rice agriculture region in the Ishikari plain and Kamikawa basin was formed at that time. In the third period, 1920–1931, the most rapid increase took place, the

1) J. Kawaguchi: Geographical Study of Rice Agriculture in Hokkaido" G.R.J. 1934
2) J. Okamoto: Change from Rice Field to Ordinary Crop Field in Bibuka Town, Hokkaido. "Some geographical problems of economic development" 1959.

increase being more than 130,000ha in 12 years, and the rice culture expanded to the north and east coasts of Hokkaido under the severe climate for rice plant.

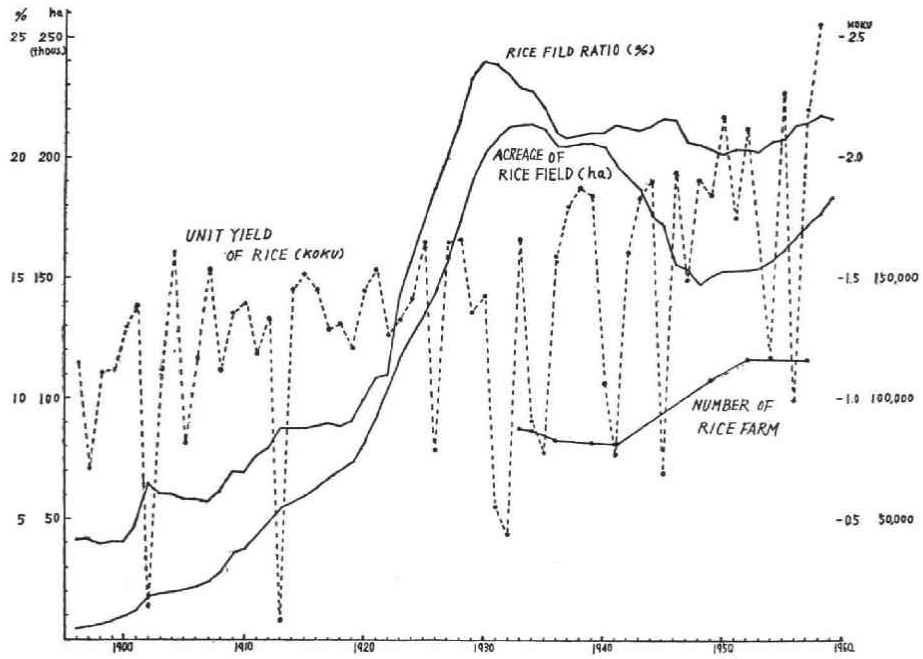

Fig. 1.

The forth period, 1932–1940, was the time showing little change in area, and the area was over 210,000 ha in the former four years. In the fifth period, 1941–1946, the change in area turned out to be a quick decrease by the influence of the World War II. And after the stagnation time of the sixth period, 1947–1953, the acreage of rice fields has steadily increased, accompanied by the recovery or improvement of the management condition. The acreage in 1959 was 85.9% of that in 1934, the year showing the maximum in area.

As one of the indicators to graps the relative importance of rice culture in the agriculture of Hokkadio, the percentage of the acreage of rice fields to that of all cultivated land (rice-field-ratio, hereafter) will be considered. The rice-field-ratio increased from 4% to 11% in 25 years from 1896 to 1922, and quickly reached to the maximum ratio of 24% in 1930. After that, the ratio went down till 1936, due to the rapid increase of the acreage of ordinary crop fields. Since 1937, it has not greatly changed, showing 20–22%.

The number of farmers raising rice increased to 116, 119 (134%) in 1957 from

86, 816 (100%) in 1934 and the rice-farm-ratio (the percentage of number of farmers raising rice to total number of farmers) got up from 43.7% to 50.3%. Therefore, in spite of the decrease in the acreage of rice fields in that period, one can say that the rice agriculture relatively gained more importance in the agriculture of Hokkaido. The average of rice fields per farm with rice fields went down to 1.47ha from 2.24ha, due to the decrease of the acreage and the increase of the number of farm. On the other hand, the productivity of rice fields increased recently, such is shown in the yearly change of the yield of rice per nuit area (unit yield, hereafter). Before 1945, the unit yield was 2.10–2.85 t/ha even in the years of good crop, and its increase was almost imperceptible before 1930, because of the remarkable increase of newly cultivated rice fields. But, in the recent twenty years, the unit yield has definitely increased attaining the record of 3.82 t/ha that in 1958. Every year after 1957, the total yield of rice has been above the maximum yield (1938) and Hokkaido has been changed from the importer to the exporter of rice. Thus, the rice agriculture in Hokkaido has greatly changed after 1932. The areal analysis of rice agriculture region will be considered in the following chapters.

II. Changes in Rice Region between 1932 and 1957 seen from the Acreage of Rice Fields

The changes of the acreage of rice fields between 1932 and 1957 are shown in Fig. 3. The total acreage in 1957 is 81% of that in 1932, but the trends of the changes strikingly differed by region. Generally, the decreased region prevails, but the increased regions too are recognized especially in the western half of the island. Most of the western regions show the figure above 80% and is interpreted as the slightly decreased or increased area. The figures in the eastern part of the island are mostly under 59%, and the region is regarded as the remarkably decreased area. As the area showing 60–79% is very scarce, there is a clear difference between both regions.

The regional division of the rice producing area was made based on the acreage of rice fields in the smallest legislative units (mura or village, machi or town, and city) as a criterion. (Fig. A and 5). The area without rice fields has expanded in the northern and eastern districts during the 25 years above mentioned. By the example of Sari machi in the Siretokao Peninshula, the acreage of rice fields has dropped to 0 from 3635ha. In addition to the spread of the regions under 100ha, the figures in the Abashiri and Tokachi districts have been reduced to 8,000 ha and 3700 ha from 18,000 ha and 7,400 ha respectively, forming separate regions by themsevles. According to the distribution of the accumulated air

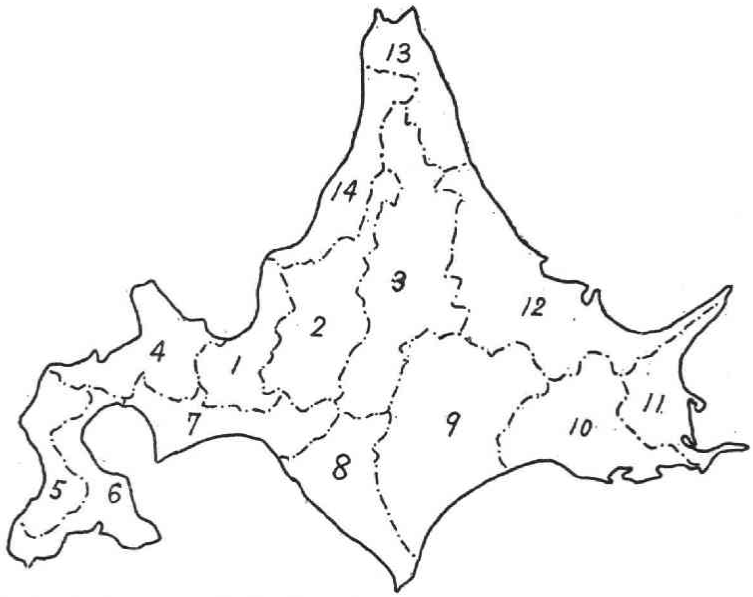

Fig. 2. Index map. 1~14 show the names of the branches, see Table I.

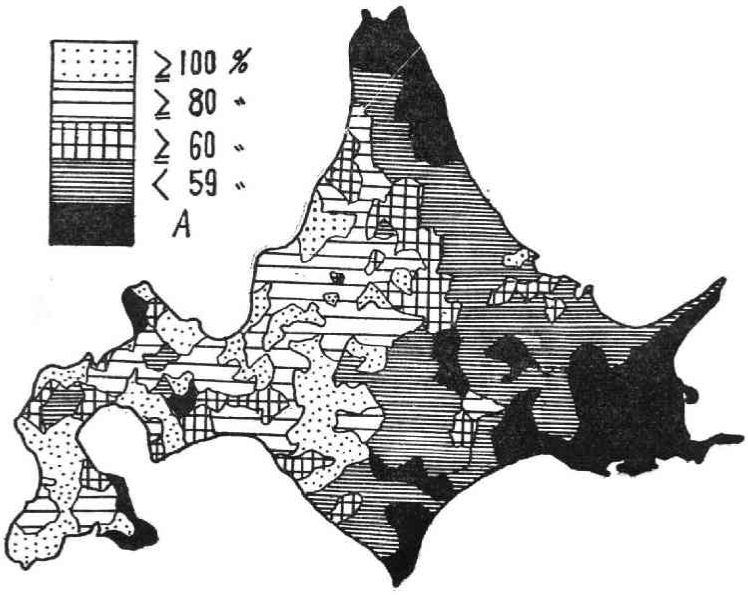

Fig. 3. Change of acreage of rice fields between 1932 and 1957 (1957/1932× 100). A shows the area of 20ha or under 20ha in the acreage of rice fields.

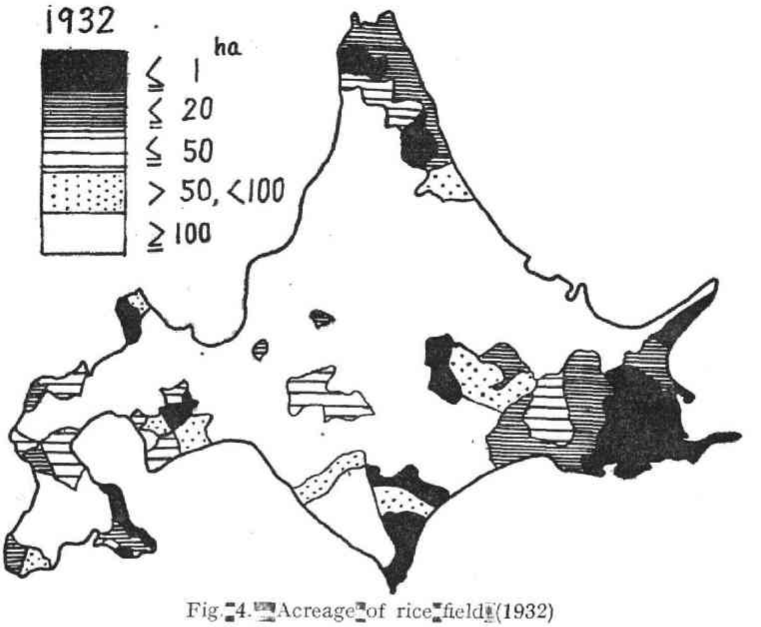

Fig. 4. Acreage of rice field (1932)

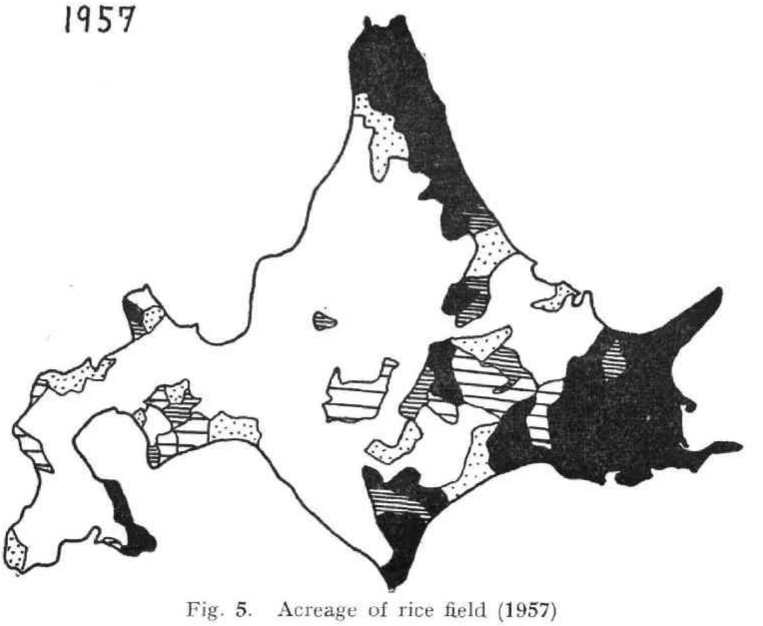

Fig. 5. Acreage of rice field (1957)

temperature from June to September and the monthly mean air temperature of July, the region under 100ha fairly coincides with the region under 2400–2500°c and 18–19°c. J. Kawaguchi already, considered the relation between the rice culture and the climate[1], and the author will analyse it from another view-point in his next paper.

The rice-field-ratio has decreased to 21% from 23%, but the areal difference of its change is fairly large. (Fig. 6). In the western districts, the increased area

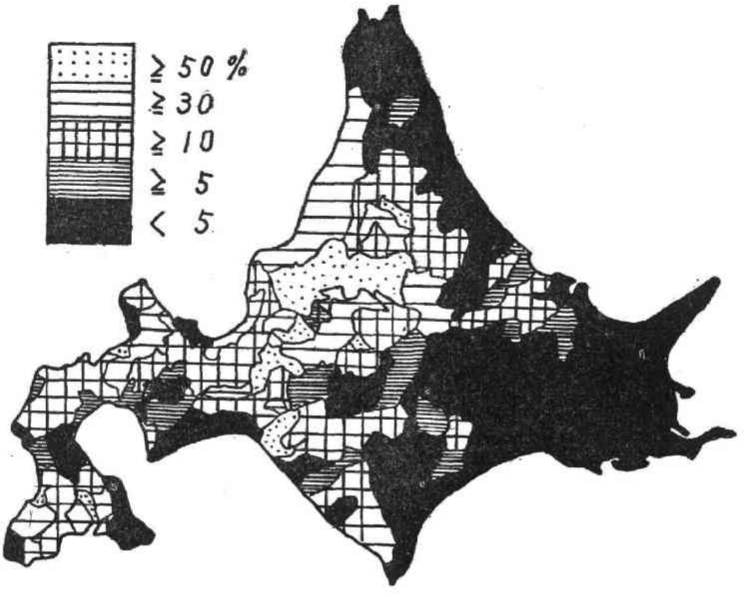

Fig. 6. Rice-field-ratio (1957)

prevails, with some decreased areas in the intermoutain districts. Particularly, the area showing over 50% is concentrated in the Ishikari Plain and Kamikawa Basin, and the region above 30% has remarkably expanded. The eastern districts, however, are the decreased area and the ratio is under 18%.

Thus, it is pointed out that there are not only the striking decrease of the acreage of rice fields, but also the remarkable retreat of the marginal land of rice culture in the eastern districts. The specialization in rice agriculture has progressed in the western districts, especially in the Ishikari Plain and Kamikawa Basin.

III. Changes in Rice Region seen from the number of Farms with Rice-Fields

The number of farmhouses with rice-fields, has increased by 29,303 in the 25

Table 1

Branch	Number of Farm cultivating Rice Field			Acreage of Planted Rice Field (ha)			Average Acreage of Rice Field per Farm (ha)		
	1934	1957	%(1957/1934)	1934	1957	%	1934	1957	difference
1 Ishikari	6991	10724	154	13942	15947	114	1.99	1.49	0.50
2 Sorachi	22172	29672	134	59572	60197	101	2.69	2.03	0.66
3 Kamikawa	22496	30516	135	58185	50260	86	2.59	1.65	0.94
4 Shiribeshi	5594	7131	127	8481	8080	95	1.52	1.13	0.39
5 Hiyama	3236	5380	166	4684	4194	90	1.45	0.78	0.67
6 Oshima	3535	5606	159	5268	5380	102	1.49	0.91	0.58
7 Iburi	3664	5259	143	6964	6333	91	1.90	1.20	0.70
8 Hidaka	2919	4688	161	5644	4284	76	1.94	0.91	1.03
9 Tokachi	3143	3444	101	7422	3725	50	2.36	1.08	1.28
10 Kushiro	168	72	43	115	24	21	0.69	0.33	0.37
11 Nemuro	3	0	0	1	0	0	—	—	—
12 Abashiri	9658	10138	105	17994	8012	44	1.86	0.79	1.07
13 Soya	32	1	3	24	0	2	0.74	0	0.74
14 Rumoi	2772	3488	126	5305	4756	90	1.95	1.36	0.59
Total	86816	116119	134	194597	171191	88	2.24	1.47	0.77

years, and half of them are in the Ishikari Plain and Kamikawa Basin. (Table I) The decreased areas are only the Kushiro and Soya districts, where the farms are few. In the Abashiri and Tokachi districts where the acreage of rice-fields greatly decreased, the number of farmhouses has changed little, being 105 and 101% respectively.

By the increase of the farmhouses with rice-fields, the rice-farm-ratio rose from 43.7% to 50.3% and the distribution of the ratio is parallel to that of absolute number of farms. According to the distribution of rice-farm-ratio in 1957, the region above 80% is distributed in the Ishikari and Kamikawa, and there are the districts with figures above 30% in rice-field-ratio, (Fig. 7) In the Abashiri and Tokachi rice agriculture regions where the acreage of rice-fields is above 200ha and the rice-field-ratio is under 18%, there is an area where many farmers (70–80% of total number of farm) raise the rice.

The average acreage of rice-fields (acreage of rice-field/number of farmhouses with rice-fields) dropped to 1.47ha in 1957 from 2.24ha in 1934. (Fig. 8) Particularly, in the Tokachi, Abashiri and Hidaka districts, it has decrease so much as 1.28, 1.07 and 1.03ha respectively. Thus in 1957, the largest area was 2,03ha of the Sorachi district and the smallest was 0.78ha of the Hiyama district. According to the distribution of the average acreage of rice-fields by Mura, the area showing the fairly great figure (1.51–3.95ha) is concentrated in the Ishikari Plain and Kamikawa Basin. In the rice agriculture region of the Abashiri, the area showing under 1 ha is prevailing, but there is an area of 1.84ha (Meman-betsu cho showing rice-farm-ratio of 44%), making an exception. In the Tokachi, the

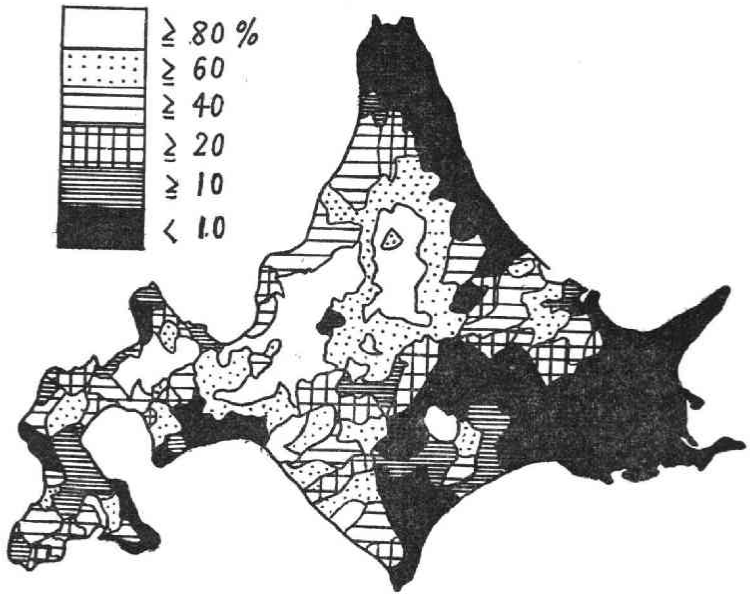

Fig. 7. Rice-farm-ratio (1957)

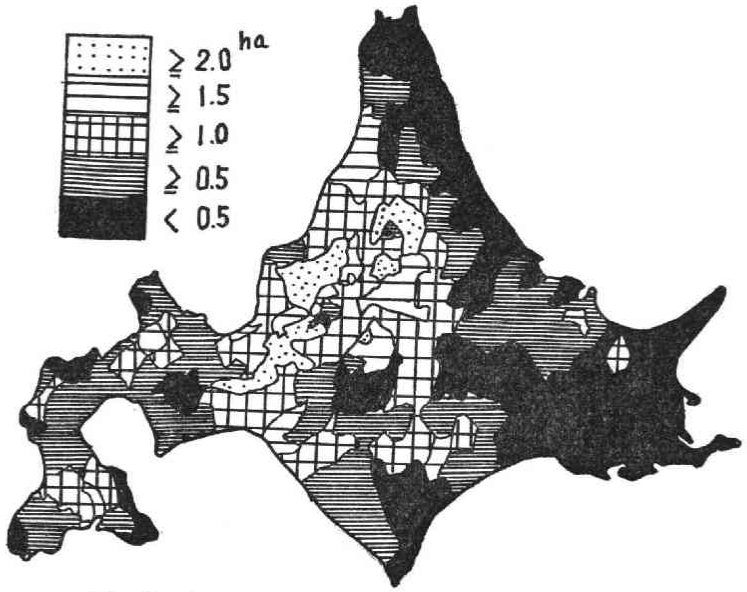

Fig. 8. Average acreage of rice field per farm (1957)

average acreage is generally greater than that in the Abashiri, and 1.68 ha in the Maku-betsu cho (with rice-farm-ratio 11%) is the largest one.

Therefore, the average acreage of rice-fields in the rice agriculture regions of the Abashiri and Tokachi is generally smaller than that in the principal region of the Ishikari and Kamikawa, but there are farms with the rice-fields larger than 1.5ha. As to the number of farms in relation with the rice-field-ratio of individual farm, the farms above 80% are dominant in the main region, but in the marginal region, the farms below 20% prevail. (Table II, Fig. 9) However, even in the marginal region of the Abashiri and Tokachi districts, the number of the farm above 80% reaches to 17–23% of total number of farms with rice fields, especially in the area showing fairly great average of the acreage of rice-fields such as the Memanbetsu and Maku-betsu cho.

The central rice agricultural region shows the higher rice-field-ratio, higher rice-farm-ratio, larger average acreage of rice-fields, and there, most of farmers who have rice-fields are using more than 80 % of their cultivated fields as the rice-fields. The region may be regarded as a special region in the rice agriculture of Hokkaido. The rice agriculture regions in the Abashiri and Tokachi districts are the secondary regions concerning rice agriculture where the farming of upland field crops are dominant. The tendency became clear prticularly during the last twenty-five years.

Table II. Number of Rice Farm (%)

Branch \ Rice-Field-Ratio	<20%	20%≦ <40%	40%≦ <60%	60%≦ <80%	80%≦	Total
	%					
1 Ishikari	**23.4**	21.6	17.2	15.9	21.9	100
2 Sorachi	12.1	9.2	10.2	19.1	**50.8**	〃
3 Kamikawa	17.2	10.3	9.4	14.7	**48.4**	〃
6 Shiribeshi	**31.4**	21.1	19.7	19.1	8.8	〃
5 Hiyama	12.6	19.3	**20.1**	19.0	10.5	〃
6 Oshima	12.3	21.4	21.7	**23.0**	21.6	〃
7 Iburi	**32.4**	14.6	12.7	16.6	28.6	〃
8 Hidaka	**35.8**	25.6	14.3	12.3	12.2	〃
9 Tokachi	**56.7**	17.4	10.5	7.9	7.6	〃
10 Kushiro	**86.1**	12.5	0	0	1.4	〃
11 Nemuro	—	—	—	—	—	〃
12 Abashiri	**55.2**	19.7	12.1	6.3	5.7	〃
13 Soya	—	—	—	—	—	〃
14 Rumoe	14.0	19.2	27.2	**28.1**	14.9	〃

IV. Changes in the Unit Yield of Rice

As previously described, the unit yield of rice has made a reamrkable increase in recent years. However, the cold-weather damage, which has greatly influenced

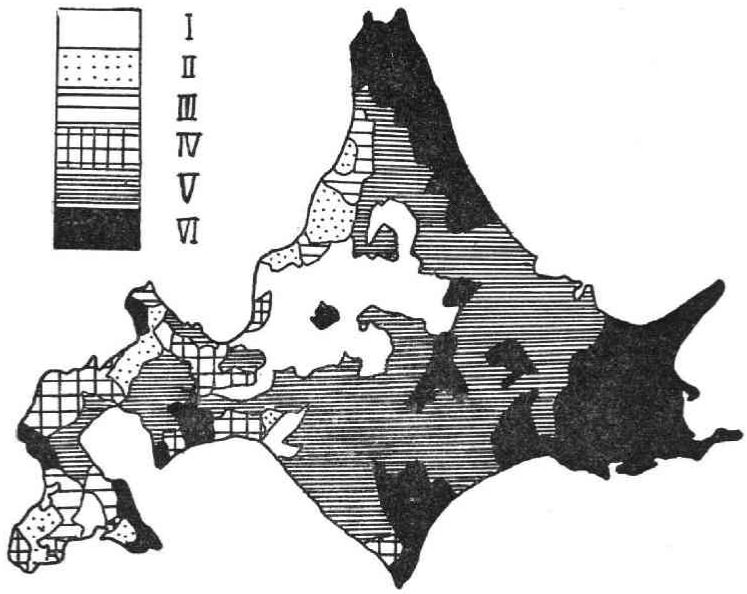

Fig. 9. Number of rice farm by rice-field-ratio (1957)

the development of the rice argiculture in Hokkaido, has not yet been conquered as late as in 1956. In Figure 10, the relation between the unit yeild, and the integration of the average monthly maximum air temperatures from June to August in the Sapporo is given for the period of 1910–1956, according to the method explained in the author's previous paper.[3] The tendency of the distribution of coordinate points in the correlation graph is seperated into two periods, the former period, 1910–1935, and the later period, 1936–1955. The trend curve of the former period has the convex point at about 70.3°C : 1.30 koku and the convex point of the later period is not so clear. The difference between the two curves is not so clear when the integrated temperature is below 70°c, but above 70°C, it comes clear. In other words, the increase of the unit yield of rice between the two periods is not clearly recognized when the accumulated temperature is below, but under the condition of high temperature, it becmes distinct.

The change from the former to the later period took place in about 1935 or 1936, and it was when the increase of rice-fields in Hokkaido became stagnant, and the peak of the acreage of rice-fields passed. This is the time when the development of the rice culture turned to the increase of the land productivity from the reclamation of new fields.

3) H. Fukui : Yearly change and its Areal difference of Cold dsaster of Rice in Northeast Japan. Sci., Rep. of Tohoku Univ. 7 Series (Geography) No. 8, 1958.

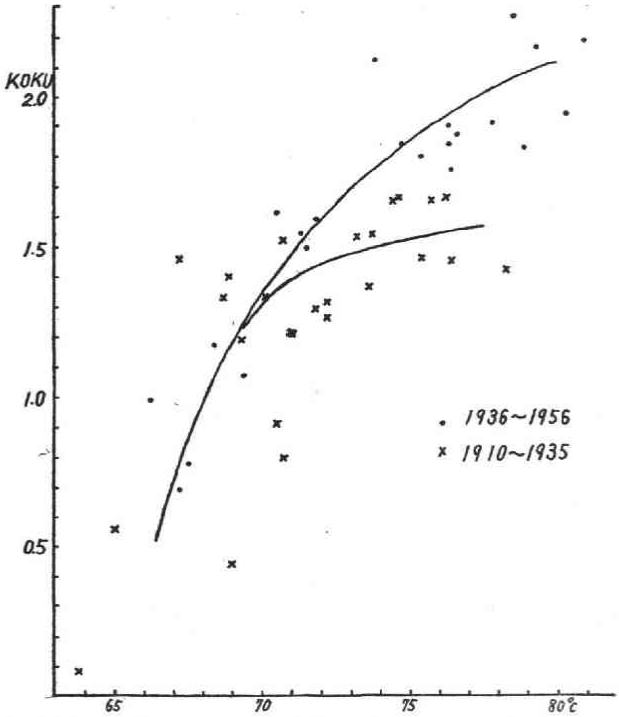

Fig. 10. Relation between unit yield and accumulated air temperaure from June to August.

Next, the change of distribution of unit yield is studied by the comparison of the distributions in 1933 (76.2°C : 1.56 koku)[4] and 1955 (78.5°C : 2.27 koku), as examples of good crop years, and by the comparison of 1931 (65.0°C : 0.52 koku) and 1956 (66.2°C : 0.99 koku) as examples of bad crop years. (Fig. 11 and 12) According to the distribution of 1933, the Kamikawa and Abashiri districts belong to the higher unit yield region with yields of 1.8–2.1 koku. However, in 1955, the higher region is in the Ishikari and Kamikawa districts with 2.2–2.6 koku and the Abashiri district with 1.7–2.1 koku rather belong to the lower region. In the bad crop years, the regional difference of unit yield is clearer rather than in good crop years. It was clearer in 1956 than in 1931. This means that the regional difference of unit yield became clear, and the rice agriculture region of the Ishikari and Kamikawa districts has established dominance as the main rice agricultural region in Hokkaido.

The increases of unit yield took place after the radical reclamation of rice-

4) Accumulated temperature of monthly mean maximum temperature from June to August in Sapporo, and average unit Yield in Hokkaido.

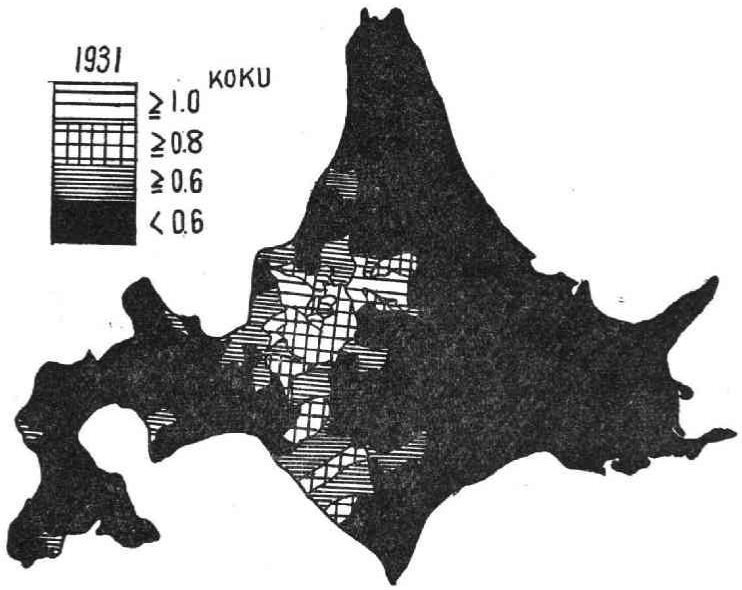

Fig. 11 (a) Unit yield of rice in bad crop year (1931). 1 koku≒150 kg

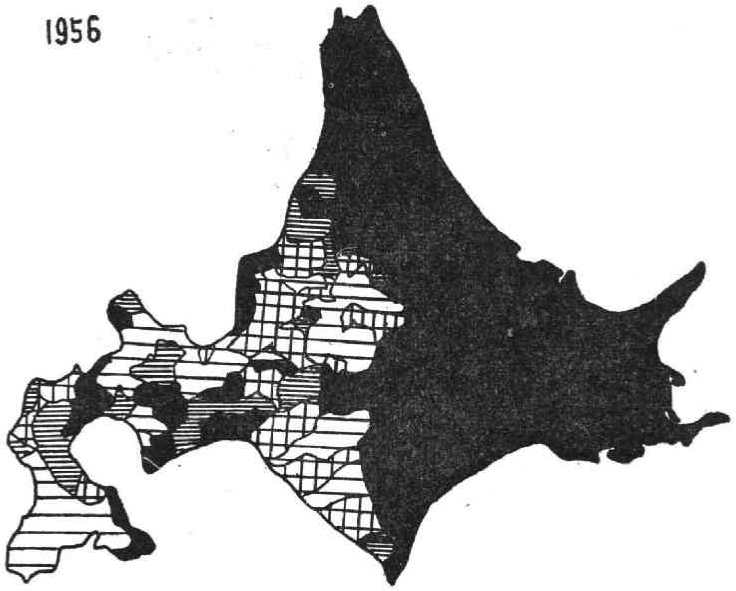

Fig. 11 (b) Unit yield of rice in bad crop year (1956)

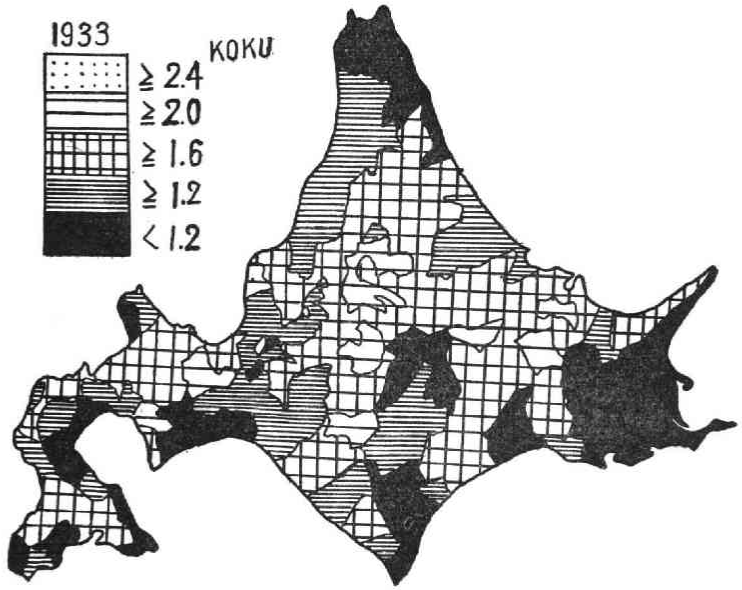

Fig. 12. (a) Unit yield of rice in good crop year (1933)

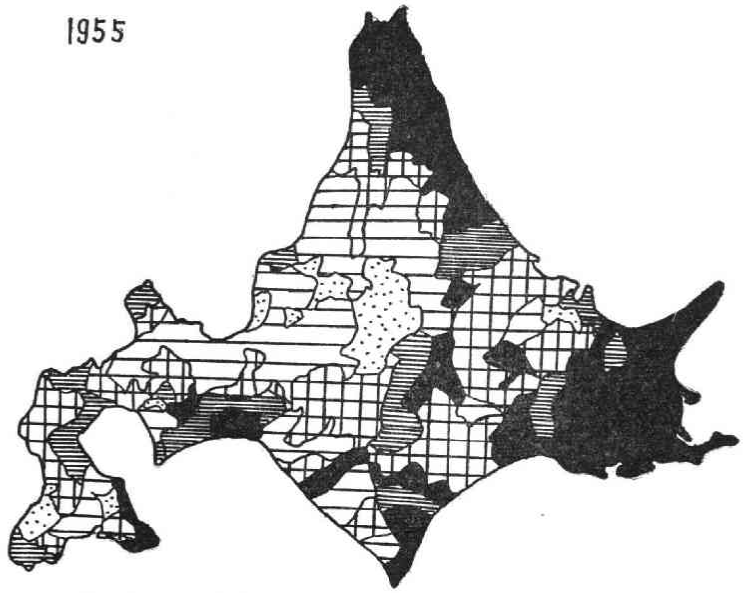

Fig. 12 (b) Unit yeild of rice in good crop year (1955)

fields, and again in recent years. But the rice agriculture in Hokkaido cannot be free from the cold weather damage. The regional difference between the eastern districts and the western districts has become more evident in recent years.

V. Conclusion

There have been the decrease in the acreage of rice-fields, and the increase in the number of rice farms in the last 25 years, while the average size of rice-fields per farm has considerably decreased. According to the increase of unit yield of rice, however, the production of rice in Hokkaido has recently exceeded the maximum production before the World War II and the yield of individual rice-farm has also increased.

These great changes have been brought about by the progress of the regional differentiation of the rice agriculture, such as the development of regions specialized in rice culture in the Ishikari and Kamikawa districts, and the retreat of the marginal region in the Abashiri and Tokachi districts. The land productivity is still influenced by the cold weather, even in the specialized region of the Ishikari and the Kamikawa.