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FARMERS' HEALTH AND AGRICULTURAL LABOR-POWER IN THE PADDY-FIELD FARMING

By

TAKESHI YAJIMA

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I. Problem

Hitherto the problem concerning farmers' health has been taken up mainly by scholars of public hygiene; but, economists, if referring to the problem, are usually satisfied with only pointing out the high birth-rate of the agricultural population or the superiority of the farmers' health in view of recruiting soldiers. We cannot deny that the investigation of the internal relation between farmers' health and agricultural labor-power or the type of farming is still unsatisfactory. This is, of course, caused by the low social standard of agricultural population or by the low social estimate of agricultural labor in our society.

Be that as it may, the strengthening of agricultural productivity and the advancement of the productivity of agricultural labor-power is now an urgent problem in our nation. Therefore, the re-examination of the health condition of farmers should be neglected no more, because the farmers' health has a big concern upon the advancement of the productivity of agricultural labor-power.

The idea of promoting the productivity of labor-power starts

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from thinking much of human labor. The democratic sense of the health problem of farmers lies in this point.

As well known, one of the features of Japanese agriculture is that farming is too intensive in labor and this is most evident in paddy-field farming.

Then, what should we do in order to enhance the productivity of Japanese agriculture? The measures may be divided into positive and negative ones. The former consist in the adoption of better agricultutal technics, the improvement of labor organization, and, above all, the reform of land system, while in the negative ways the mere strengthening of labor intensity might be taken into consideration. However, the latter measures cannot be carried out without deteriorating farmers' health.

In this study we intend to find out the type of the farmers' health in the paddy-field area and also to know what layer of farmers are most apt to become victims of over-work. Then we will go on to the investigation of the internal relation between the farmers' health and the type of farming. And finally we will also study some counter-measures which should be taken at this critical juncture.

II. General Review–chiefly heving death-rate in view

To begin with, as an introduction to our study, we will give a general view upon the population movement in Japan, chiefly having her death-rate in view.

As for the population status in ancient Japan we have no reliable material to refer to; but as the result of the investigation of many scholars it was revealed that there was not any remarkable population increase during 300 years under the Tokugawa Government. According to SUISUKE KOMIYAMA, Japan had 26 million population in 1727; while in 1852 it had still 27 million only; that is, the increase of less than one million in 130 years. During this period the population went up and down irregularly between 25 and 27 million people. In short we may conclude safely that population increase was not quick, but rather at a standstill before Meiji era.

The reason why the population did not increase substancially in Tokugawa era is that they had often famine, and also that artificial abortion and infanticide were prevalent among people. For instance, in Nambu clan they had bad crops and famines seventy

four times during 256 years between 1614 and 1870, once every three and half years. Above all, famines in Genroku, Horeki, Temmei, and Tempo eras caused a tremendous damage upon the population, more than 10 % of the people having died of starvation each time. Artificial abortion and infanticide were also almost a custom among people. Midwives called "Chujo-ryu" engaging in premature artificial abortion made a thriving business. But the fee for the operation being rather expensive, sometimes costing more than five ryo, (the ryo corresponding to the yen) people resorted more to infanticide, and there were not a few localities where the first son only could survive. This all happened beause of low productivity of agriculture, above all the unstabilty of rice cultivation against natural disaster.

Speaking of death-rate we cannot find any remarkable improvement during Tokugawa era and throughout Meiji period. In Tokugawa era it is surmised that the death-rate was moving between 20 and 27 per thousand population; while in Meiji era 19.1 per thousand in 1873, 20.0 in 1874, 18.7 in '75, 17.4 in '76 respectively, that is a little below that of Tokugawa, but since 1889 it went up over 20, reaching 23.1 in 1893, and moved between 20 and 23 until the end of Taishô era. Entering Showa period it was a little bettered, coming down below 20, but of course not so remarkable, as might be expected.

On the other hand the population increase since Meiji restoration is quite remarkable. According to the census in 1940 the total population in Japan was 73, 141, 308; that is, more than two times as much as 34,806,000 in 1872; in other words, it doubled in less than 70 years. This owes to the rapid industrial development since Meiji restoration as well as to no excessively high death-rate caused by famine and other natural disasters which occured so often in Tokugawa era. Of course the stoppage of artificial abortion and infanticide may have no small influence upon the increase of population. However, the population increase is not because of the high agricultural productivity, but rather because of the industrial development in urban districts. The thriving industry in the urban area absorbed the surplus population from the rural area. For instance, 72.2% of the population increased in two years from 1936 to' 38 were absorbed in the six biggest industrial prefectures as shown in the following table.

Population increase in the six biggest industrial prefectures

	1909-1913		1914-1919		1934-1936		1936-1938	
	Real number	%	Real number	%	Real number	%	Real number	%
Whole nation	147,628	100.0	575,842	100.0	932,355	100.0	622,734	100.0
Six biggest Industrial prefectures	99,755	67.6	323,207	56.0	580,387	62.3	450,095	72.2
Tokyo	14,906	10.1	68,596	11.9	165,672	17.8	179,925	28.8
Kanagawa	9,409	6.4	35,815	6.2	48,071	5.2	60,382	9.7
Fukuoka	4,939	3.3	22,553	3.9	48.386	5.2	28,461	4.6
Osaka	30,743	20.8	90,070	15.6	155.975	16.7	84,238	13.5
Hyogo	31,905	21.6	55,416	9.6	69.014	7.4	37,878	6.1
Aichi	7,855	5.3	50,757	8.8	93.269	10.0	59,211	9.5

The same tendency is also shown by the result of the national population census held every five years; the urban population increased year after year and in 1940 37.7% of the total population is living in cities comparing with 18.0% in 1920.

Year	Whole nation	Urban Districts	Rural Districts	Ratio of the urban population to the total population
1920	55,963,053	10,096,758	45,866,295	18,0
1925	59,736,822	12,896,850	46,839,972	21,6
1930	64,450,005	15,444,300	49,005,705	24,0
1935	69,254,148	22,666,307	46,587,841	32,7
1940	73,114,308	27.577.539	45,536,769	37,7

In short, despite of the high birth-rate in the rural area, its population did not increase within its area because of the low productivity of Japanese agriculture.

Be that as it may, the reason why the high mortality is not yet improved in Japan lies in that there are still many victims of T. B. and the high mortality of babies; to wit, in 1935 19.1 out of 10,000 people died of T. B.; while in England 7.2, in Italy 8.9, in Germany 7.4, in U. S. A. 5.5, in Holland 5.2, in Belgium 7.4, in Denmark 5.2, respectively. As for baby mortality, 10.7 out of 100 births died before the second birth day in 1935 in Japan, while in

England, Germany, Italy, France, U. S. A. and Holland only 5.6, 6.9, 5.6, and 4.0 respectively in the same year. Moreover, it is worthy of note that this high mortality is most remarkable among rural population as shown in the following table.

T. B. Mortality

Year	Urban Districts		Rural District	
	Real number	Out of 10.000 population	Real number	Out of 10.000 porulation
1932	271,391	13.78	903,953	19.40
1933	325,039	15.79	868,948	18.63
1934	345,235	16.00	889,449	19.09
1935	333,630	14.74	828,306	17.77
1936	356,231	15.14	874,047	18.70

Baby Mortality

Year	Urban District		Rural District	
	Real number	Out of 100 births	Real number	Out of 100 births
1932	36,327	10.6	220,178	12.0
1933	44,095	10.8	213,156	12.5
1934	43,542	11.0	211,521	12.8
1935	40,416	9.1	193,290	12.1
1936	43,282	9.6	202,075	12.2

Taking 1936 as an example, 18.70 out of 1,000 population died of T. B. in rural districts, while in urban districts, only 15.14 died of the same disease. As for baby mortality in rural districts, 12.2 out of 100 births died before the second birthday against 9.6 in urban districts. Thus the rural districts have a big concern upon the high mortality of the Japanese population as a whole and, especially, the high mortality of people in the paddy-field area is quite worthy of note.

Generally speaking, the prefectures where farmers are mostly engaged in rice cultivation are taking the leading rank in the high death-rate. Taking the census in 1938, Ishikawa, Toyama, and Fukui prefectures where over 80% of the cultivated land is used as paddy-fields have the highest death-rate among all prefectures, it being

23.42, 22.79 and 22.16 per 1,000 population respectively; while the prefectures where either a big city is located or farmers are more engaged in up-land crop cultivation show rather a low mortality. They are Tokyo, Osaka, Kanagawa, Kyoto, Hokkaido, Miyazaki, or Nagano, whose death-rate is 13.53, 13.94, 15.57, 15.94, 16.14, 16.61, and 16.66 respectively. The figure is lowest among all prefectures.

Death rate (per 1,000 population)

Prefecture	1938	Prefecture	1937	Prefecture	1936
Ishikawa	23.42	Ishikawa	23.70	Ishikawa	24.77
Toyama	22.79	Toyama	22.93	Fukui	23.72
Fukui	22.16	Fukui	22.62	Toyama	22.07
Shimane	21.85	Oita	20.55	Aomori	22.04
Mie	20.60	Iwate	20.10	Saga	21.32
Tokushima	20.04	Tokushima	19.91	Shimane	21.32
Gifu	20.00	Shimane	19.89	Oita	20.61
	over 20.00		over 19.50	Iwate	20.25
				Gifu	20.10
	below 17.00		below 16.50		over 20.00
Tokyo	13.53	Tokyo	12.91		below 17.00
Osaka	13.94	Osaka	14.27		
Kanagawa	15.57	Kanagawa	14.74	Tokyo	12.98
Kyoto	15.94	Kyoto	15.26	Osaka	14.32
Hokkaido	16.14	Okinawa	15.87	Kanagawa	14.84
Okinawa	16.14	Shizuoka	15.92	Hokkaido	16.39
Wakayama	16.45	Wakayama	19.93	Yamanashi	16.55
Miyazaki	16.61	Yamanashi	15.95	Miyagi	16.75
Hyogo	16.65	Nagano	16.19	Wakayama	16.79
Nagano	16.66	Hyogo	16.28	Nagano	16.80
Soizuoka	16.73	Hokkaido	16.32	Gumma	16.81
		Miyazaki	16.34	Miyazaki	16.85
		Miyagi	16.43	Tochigi	16.81
		Aichi	16.46	Kyoto	16.91
Average of all prefs.	17.44	Average of all prefs.	16.95	Average of all prefs.	17.51

Prefecture	Mortality in 1937	paddy-fields (cho)	up-land crop (field cho)	% of paddy-fields in 1937
Ishikawa	23.70	55,611	16,720	76.88
Toyama	22.93	81,397	9,771	89.28
Fukui	22.62	50,458	11,444	81.51
Shimane	19.89	56,293	26,053	68.36
Tokyo	12.91	9,747	38,491	20.20
Osaka	14.27	46,205	10,370	81.67
Kanagawa	14.74	20,643	47,335	30.37
Kyoto	15.26	42,683	17,540	70.87
Hyogo	16.28	107,718	22,050	83.01
Hokkaido	16.32	204,680	778,791	20.81
Wakayama	15.93	30,716	18,828	62.00
Nagano	16.19	73,599	99,800	42.44
Miyazaki	16.34	48,343	46,343	51.06
Whole nation	16.95	3.217,929	2.880,506	52.77

The foregoing table shows the prefectures appearing three times in the highest and lowest mortality group in 1936, '37, and '38 with the percentage of paddy-field acreage in the total cultivated land in them. We learn from this table that the prefectures with much paddy-fields show higher death-rate than those having either big cities or much up-land crop area.

The high T. B. and baby mortality in the paddy-field area has also no small concern with the high mortality in general. According to the census in 1938 the highest T. B. and baby mortality is found in Ishikawa, Toyama, and Fukui prefectures; the T. B. mortality being 33.60, 24.98, and 23.57 against 20.61 which is the average for the whole nation and the baby mortality 16.41, 16.61, and 16.56 respectively against 11.44 of the general average, while each prefecture where the upland crop cultivation is thriving rather than rice cultivation has generally low T. B. and baby mortality. For instance, the T. B. mortality in Yamaguchi and Nagano is only 12.32 and 15.36, and the baby mortality 9.87 and 8.73, which is much less than the average.

Prefecture	1938		1937		1936		% of paddy-fields in 1937
	T. B.	Baby	T. B.	Baby	T. B.	Baby	
Toyama	24.98	16.61	24.09	15.88	24.09	15.05	89.28
Fukui	23.57	16.56	26.51	14.95	26.51	16.66	81.51
Ishikawa	33.60	16.41	34.40	15.54	34.89	16.91	76.88
Shiga	21.54	13.87	21.98	11.75	22.58	13.21	86.76
Hyogo	25.05	11.27	25.55	9.95	26.03	11.40	83.01
Hokkaido	27.13	10.61	26.39	10.88	26.78	11.15	20.81
Yamanashi	12.32	9.87	12.08	9.27	12.83	9.47	34.79
Nagasaki	19.35	11.28	19.84	10.37	20.98	11.37	38.63
Gumma	17.16	9.81	17.21	9.80	17.47	9.50	30.03
Nagano	15.36	8.73	15.26	8.46	15.27	9.42	51.06
Average of the whole nation	20.61	11.44	20.30	10.58	20.66	11.67	52.77

Note : Tokyo is omitted from the lowest mortality group to which it belongs, because it is an urban area, despite of it being the second lowest in the percentage of paddy-field acreage.

The foregoing table is the comparison of T. B. and baby death-rate of five prefectures having the highest percentage of paddy-field acreage with that of other five having the least percentage. We learn from this table that the prefectures with most paddy-fields have also higher T. B. and baby mortality than those with least of them only Hokkaido making an exception.

Such is the general review of the death-rate of the Japanese population. We learn from this that there is no small relation between the high death-rate and dominancy of the paddy-field farming in general. And the same case is also found in Hokkaido. That is to say, in Sorachi and Kamikawa districts where paddy-fields are most in the acreage, mortality is very high in comparison with Tokachi and Kushiro-koku where other types of farming are thriving. According to the census in 1938, for instance, in Sorachi 67, 127.4 cho out of 133, 804.5 cho of all fields under cultivation, or 50.17% of the total acreage, were used for paddy-fields; and in Kamikawa 61,625.4 cho out of 150,110.2 cho or 41.05%. In other words, these districts rank first and second in paddy-field ratio in Hokkaido. On the other hand, Tokachi and Kushiro-koku, 7,410.9 cho out of 211,635.6 cho or 3.50%, and 63.9 cho out of 28,597.4 cho or 0.22% being used

as paddy-fields respectively, they are some of the districts least in paddy-field ratio.

Such being the case, the mortality in Sorachi and Kamikawa is 17.83 and 15.70 per thousand population as against 13.41 and 13.70 of Tokachi and Kushiro-koku. We believe this is also worthy of note; although this mortality figure includes not only that of farmers, but of a goodly number of population engaged in other occupations.

Next, taking only Kamikawa District in view, we made a further examination upon the correlation between mortality and paddy-field ratio. Here the paddy-field ratio means the percentage of the paddy-field acreage as against the tatal farm land under cultivation. For that purpose we prepared the following table. And as result of computation we got +0.35 as the coefficient. This coefficient may not be so high as should be expected, but, taking into consideration that 31.22% of the total population in Kamikawa belong to the non-farming occupation and that in this case too, the mortality of non-farming population is not excluded, we must admit that this figure shows some considerable positive correlation existing between mortality and paddy-field ratio.

Correlation between Mortality and Paddy-field-ratio
(in Kamikawa District in 1938)

Village	Death-rate	Paddy-field-ratio		
	X	Y	x	y
Higashitakasu	16.57	94.45	+ 1.08	+ 49.69
Takasu	15.66	83.89	+ 0.17	+ 39.13
Etanbetsu	16.60	52.15	+ 1.11	+ 7.79
Higashi-Asahigawa	15.34	77.74	− 0.15	+ 32.98
Kagura	13.20	42.16	− 2.29	− 2.60
Kamoi	13.96	65.28	− 1.53	+ 20.52
Nagayama	14 95	91.62	− 0.54	+ 46.86
Toma	16.62	69.26	+ 1.13	+ 24.50
Pippu	14.80	81.40	− 0.69	+ 36.64
Aibetsu	13.08	61.64	− 2.41	+ 16.88
Kamikawa	15.71	35.97	+ 0.22	− 8.79
Higashikawa	18.27	74.84	+ 2.78	+ 30.08
Biei	15.05	19.58	− 0.44	− 25.18

Village	Death-rate	Paddy-field-ratio		
	X	Y	x	y
Kami-furano	16.45	22.04	+ 0.96	− 22.72
Naka-furano	19.95	56.90	+ 4.46	+ 12.14
Furano	18.63	29.62	+ 3.14	− 15.14
Yamabe	14.94	10.19	− 0.55	− 34.57
Minami-furano	13.32	1.05	− 2.17	− 43.71
Shumu-kap	13.56	26.85	− 1.93	− 17.91
Wassamu	16.99	27.25	+ 1.50	− 17.51
Kembuchi	12.40	17.75	− 3.09	− 27.01
Onnebetsu	10.76	20.92	− 4.73	− 23.84
Shibetsu	15.29	51.02	− 0.20	+ 6.26
Furen	15.69	55.05	+ 0.20	+ 10.29
Tayoro	18.73	62.12	+ 3.24	+ 17.36
Nayoro	18.91	44.17	+ 3.42	− 0.59
Soimokawa	12.56	28.41	− 2.93	− 16.35
Chiebun	19.38	51.36	+ 3.89	+ 6.60
Piuka	17.63	36.16	+ 2.14	− 8.60
Tokiwa	13.28	3.62	− 2.21	− 41.14
Nakagawa	12.58	2.29	− 2.91	− 42.47
Kami-Shibetsu	14.75	35.64	+ 0.74	− 9.12

n = 32 Av. = 15.49 Av = 44.76

Village	x^2	y^2	xy
Higashitakasu	1.17	2469.10	+ 53.69
Takasu	0.03	1531.16	+ 6.65
Etanbetsu	1.23	60.68	+ 8.65
Higashi-Asahikawa	0.02	1087.68	− 4.95
Kagura	5.24	6.76	+ 5.95
Kamoi	2.34	421.07	− 31.40
Nagayama	0.29	2195.86	− 25.30
Toma	1.28	600.25	+ 27.85
Pippu	0.48	1342.49	− 25.28
Aibetsu	5.81	284.93	− 40.68
Kamikawa	0.05	77.26	− 1.93
Higashikawa	7.73	904.81	+ 83.62

Village	x^2	y^2	xy
Biei	0.19	634.03	+ 11.08
Kami-furano	0.92	516.20	− 21.81
Naka-furano	19.89	147.38	+ 54.14
Furano	9.86	229.22	− 47.54
Yamabe	0.30	1195.08	+ 19.01
Minami-furano	4.71	1910.56	+ 94.85
Shumu-kap	3.72	320.77	+ 34.57
Wassamu	2.25	306.60	− 26.27
Kembuchi	9.55	729.54	+ 83.46
Onnebetsu	22.37	568,35	+ 112.76
Shibetsu	0.04	39.19	− 1.25
Furen	0.04	105.88	+ 2.06
Tayoro	10.50	301.37	+ 56.25
Nayoro	11.70	0.35	− 2.02
Shimokawa	8.58	267.32	+ 47.91
Chiebun	15.13	43.56	+ 25.67
Piuka	4.58	73.96	− 18.40
Tokiwa	4.88	1692.50	+ 90.92
Nakagawa	8.47	1803.70	+ 123.59
Kami-shibetsu	0.55	83.17	− 6.75
	163.90	21950.78	+ 934.01
	$\delta x = 2.26$	$\delta y = 26.19$	− 253.58
			680.43

$$r = \frac{\Sigma xy}{n\delta x\delta y} = \frac{680.43}{32 \times 2.26 \times 26.19} = +0.35$$

Remarks: $F_0 = r_2(N-2)/(1-r_2)$, $n_2 = 1$, $n_2 = N - 2$

$r = 0.35$ $N = 32$

Therefore, $F_0 = \frac{0.35^2}{1 - 0.35^2}(32 - 2) = 4.2$

However, according to Fischer's Table, $F = 4.17$, i.e. $F_0 > F$.

Hence, the assumption of $\rho = 0$, i. e. non-correlation between paddy-fields-rate and mortality-rate, should be abondened with the probable error of 0.05.

Be that as it may, in order to make more clear the feature of the farmer's mortality in paddy-field villages, it is necessary to make a comparison of the typical paddy and upland crop field villages with each other. So taking six representative village standing highest and lowest in the paddy-field ratio from among all villages

in Kamikawa, we prepared the following table for the purpose of comparison.

Village	Population	Death	Mortality per 1,000 population	Acreage under cultivation (A)	Acreage of paddy-fields (B)	% of (B) against (A)
				cho	cho	
Higashi-Takasu	8,510	141	16,57	3,470.2	3,277.5	94.45
Nagayama	7,022	105	14.95	2,476.9	2,269.4	91.62
Takasu	9,133	143	15.66	5,317.7	4,460.9	83.89
Minami-furano	5,621	72	13.32	2,626.5	27.5	1.05
Nakagawa	6,357	80	12.58	4,072.2	93.1	2.29
Tokiwa	3,841	51	13.28	1,786.4	64.6	3.62

This table shows that the village high in paddy-field ratio is also high in mortality and vice versa. For instance, the mortality in Higashi-takasu where the paddy-field ratio reaches 94.45 marks 16.57 for mortality, while in Minami-Furano where only 1.05% of the farm land under cultivation is used for paddy-fields the mortality is only 13.32. The same thing can be observed from other villages. Now we will investigate the problem more in detail in the following chapter.

III. Farmers' health in the paddy-field village

In Hokkaido, according to the census in 1941 there are 196,335.0 cho of paddy-fields and 726,182.2 cho of fields of other crops and their areas are mostly separated from each other. Accordingly, Hokkaido is a convenient place for the comparative study of rice-husbandry and that of other crops.

It should be admitted that the farm management of paddy fields in Hokkaido is done almost in the same way as in Honshu, while other types of farm management have many remarkable features special to Hokkaido. So we are going to investigate the features of farmers' health in the paddy-field area in comparison with that of other areas. We believe the features thus found out are also mostly applicable to the paddy field area in Honshu.

Having this in view, the author made an investigation of farmers' health condition in a paddy-field village, Higashi-Takasu, District of

Kamikawa, Hokkaido, in July, 1940 and in February in 1941.

According to the census in 1939 the village had a population of 8,430 or 1,415 households, out of which 3,184 people with 2,676 dependents or 943 households were engaged in farming on 3,470.2 cho of cultivated fields consisting of 3,277.5 cho of paddy land and 192.7 cho of upland crops. So this may be considered as one of the typical paddy-field villages in Hokkaido. And through our investigation we found out the following remarkable points in comparison with other areas.

(1). High death-rate

Firstly, we found that the death-rate was excessively high. That is to say, the average death-rate for six years, 1935–1940, is 20.4 per thousand of population, being much higher than that of the whole nation (18.1) and whole Hokkaido (16.9). Comparing the whole district of Kamikawa, which is a representative rice region in Hokkaido, with Tokachi, a representative upland crop area, we find also that the death-rate of the former is much higher than the latter, the average rate for three years, 1936–1938 being 19.6 and 14.3 respectively. However, according to the census in 1937, the density of doctors is higher in Kamikawa which has 0.30 doctors per thousand population, while in Tokachi it is only 0.28. More remarkable in the case with the comparison of Higashi-Takasu and Minami-Furano which are most and least in paddy-field ratio among all villages in Kamikawa; that is, in Minami-Furano the mortality figure is only 11.0 per thousand population in 1934,* for instance, as against 20.4 of Higashi-Takasu, notwithstanding that the doctor density in Minami-Furano is only 0.18 per thousand population.

(2). The highest death-rate in July and August

Secondly, it should be noted that the death-rate in this village was highest in July and August and lowest in November as shown in the following table, while in the whole nation it is highest in March and lowest in November the same being the case in Sapporo. And in Minami-Furano the mortality is high in Winter and low in Summer; that is reverse to Higashi-Takasu. Taking 1934's census, for instance, 12.9% of the dead in this village died in February, while in September and August only 3.3 and 4.9% respetively.

Note: *Statistics for 1935-40 are not available.

Monthly death in Higashi-Takasu (the average for 1935–40)

Month	Jan.	Feb.	March	April	May	June	July
Real number	13.7	13.3	14.0	18.5	15.3	15.8	21.0
%	7.5	7.3	7.7	10.2	8.4	8.8	11.6
Month	Aug.	Sept.	Oct.	Nov.	Dec.	Total	
Real number	19.5	13.5	12.7	11.2	13.2	181.7	
%	10.7	7.4	7.0	6.2	7.3	100.0	

Monthly death in Minami-Furano (1934)

Month	Jan.	Feb.	March	Aprii	May	June	July
Real number	7	8	7	7	5	4	5
%	11.3	12.9	11.3	11.3	8.1	6.5	8.1
Month	Aug.	Sept.	Oct.	Nov.	Dec.	Total	
Real number	3	2	6	3	5	62	
%	4.9	3.3	9.7	4.9	8.1	100.0	

Monthly death in Sapporo (1937)

Month	Jan.	Feb.	March	April	May	June	July
Real number	329	356	371	344	327	316	340
%	8.6	9.3	9.7	9.0	8.6	8.3	8.9
Month	Aug.	Sept.	Oct.	Nov.	Dec.	Total	
Real number	350	292	263	236	292	3,816	
%	9.2	7.7	6.9	6.2	7.7	100.0	

Note: The monthly fluctuation of death-rate in Asahikawa has the same type as that of Higashi-takasu, but people from near-by villages who died in the hospitals in Asahikawa are counted in the official statistics of this city.

This difference is worthy of note, because the time of highest death-rate falls in the busiest season of the paddy-field labor.

(3). High death-rate among women

Thirdly it should be mentioned that woman's death-rate is higher than that of man. The average number of the dead among women for seven years, 1931–1937, was 87, or 12.1 per thousand of woman population, while that of man was 78 or 10.7 per thousand man population. This is one of the remarkable points, because it is reverse to the general average of the whole nation and whole Hokkaido; namely, the average death-rate of the whole nation in 1937 was 17.52 and 16.36 per thousand for man and woman respectively and for whole Hokkaido it was 16.94 and 15.66 in the same year. The case with Minami-Furano is also just the opposite to Higashi-Takasu; that is, in 1934, for instance, the man mortality of the former is 12.0 per thousand man population as against 10.0 of the woman mortality.

(4). High T. B. death-rate

Fourthly the fact that T. B. victims are excessively many among farmers should be noted. That is to say, the average number of T. B. death cases in three years, 1933–1935, was 75 per ten thousand population in Higashi-Takasu. This is much higher than the general average of the whole nation and whole Hokkaido as well as that of Sapporo which has the rate of 19, 22, and 56 per ten thousand population respectively. Taking the T. B. death-rate for one hundred death-cases, it is 12.3, which is 0.3 higher than the average of whole Hokkaido. Moreover, comparing the whole district of Kamikawa with Tokachi, we find also that the T. B. death-rate of the paddy-field area (Kamikawa) is much higher than that of the upland crop area (Tokachi), because the T. B. death-rate of the former is 18.03 per ten thousand population and 100.8 for one thousand death cases, while the latter 13.95 and 88.3. In Minami-Furano also the T. B. mortalily is very low as against Higashi-Takasu, it being only 9 per ten thousand population in 1934.

(5). High Woman T. B. death-rate

Fifthly, it should be pointed out that the T. B. death-rate is very high among women. That is, in Higashi-Takasu the T. B. death-rate among male population is 21.4 per ten thousand, while that of female population is 28.4. In the whole district of Kamikawa the T. B. death-rate among female population is also higher than that of male population, the former being 19.7 per ten thousand popu-

lation and the latter 16.5, while in whole Hokkaido more men die of T. B. than women who have the rate of 21.1, that is 1.3 less than that of men. The rate for the whole nation and Sapporo is also favourable for female population, because the average T. B. death-rate of male population for the whole nation is, according to the census in 1937, 20.9, which is 0.33 more than that of women. The same we find in Sapporo where the rate for man population is 59.92, that is, 8.19 more than that of woman population in the same year. In Minami-Furano no woman died of T. B. in 1934, howerer this may have been an extraordinary year.

(6). High infant death-rate

Sixthly it should be admitted that the high death-rate among infant population is one of the remarkable features of the paddy-field area. We found that in Higashi-Takasu the infant death-rate was 51.20 per hundred death-cases. This is much higher than the average number of the whole nation and Hokkaido whose rate 32.7 and 40.8 respectively. Generally speaking, the paddy-field area such as Kamikawa or Sorachi shows a higher infant death-rate than the upland crop area or the dairy farming area such as Hidaka or Iburi. According to the census in 1938, the death-rate of the infant under 5 in Kamikawa and Sorachi is 47.6 per 100 deaths and 46.2 respectively, while in Iburi and Hidaka it is 37.6 and 40.6. In Minami-Furano also the infant mortality is very low; it being only 32.26 per hundred deaths in 1934.

(7). High rate of abortion

Seventhly, miscarriage is also prevalent in this village (Higashi-Takasu). In general, the rate of baby miscarriage in Hokkaido is not so high as in Honshu. According to the census in 1937, however, the baby miscarriage in this village was 1.64 per 1.000 population, that is, higher than the average of the whole nation and Hokkaido which has the rate of 1.56 and 1.45 respectively. Taking the rate of baby miscarriage for 100 births, it is 4.5, which is 0.4 higher than the average of Hokkaido. As for the whole district of Kamikawa, it is 4.12 in 1938 and also higher than the rate of Tokachi which is 3.68. Therefore, we may conclude that baby miscarriage is generally more to be found in the paddy-field area than in the upland crop area.

The following table shows that baby miscarriage is most preva-

lent in February and next in May and January. It is true that baby miscarriage occurs generally most in winter, but in this village it is excessively numerous.

It is admitted that baby miscarriage is mostly caused by either overwork or sexual disease. We believe this is the same in this village. Besides, the excessive baby miscarriage in the winter season is caused by unsatisfactory house structure which cannot keep warmth inside the house. The great difference of the temperatures in Summer and Winter should be also taken into consideration. As for the reason why miscarriage is prevalent in May, it should be noted that the busiest season of rice cultivation begins in May.

Baby miscarriage in Higashi-Takasu

	Jan.	Feb.	March	April	May	June	July
1935	2	3	1	1	2	2	0
1936	2	4	0	1	6	2	1
1937	0	3	2	1	2	3	0
1938	1	3	1	1	3	1	0
1939	3	3	0	0	1	0	1
1940	2	1	1	1	0	0	3
Total	10	17	5	5	14	7	5
Total in Japan in 1937	10,605	9,663	10,086	8,618	8,432	7,921	8,661

	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1935	1	0	1	0	1	13
1936	1	0	0	1	0	18
1937	0	3	0	2	1	17
1938	1	1	0	0	2	14
1939	0	0	0	0	0	8
1940	0	1	0	2	0	11
Total	3	5	1	5	4	81
Total in Japan in 1937	9,050	9,278	9,786	9,528	9,845	111,485

(8). Many woman, baby, and infant patients

Eighthly, these unfavourable conditions as mentioned above also suggest that there are many patients among women, infants, and babies living in the paddy-field area. The following table is the

list of the patients who were given medical treatment by the village itinerant medical unit sponsored by Dr. Arima's Institute of Internal Medicine, Hokkaido Imperial University, in 1935. They dispatched two units; one for Sorachi and Kamikawa which are the typical paddy-field area in Hokkaido and the other for Tokachi and Abashiri where upland crops are dominant.

Age	Sex	1st Itinerant Medical Unit (Sorachi and Kamikawa)			2nd Itinerant Medical Unit (Tokachi and Abashiri)		
		Real number	Total	%	Real number	Total	%
1—10	male female	187 137	374	25.3	145 173	318	20.4
11—20	male female	107 146	253	17.3	155 172	327	21.0
21—30	male female	62 123	185	12.4	44 130	174	11.2
31—40	male female	56 170	226	15.2	78 128	206	13.2
41—50	male female	52 109	161	10.8	79 115	194	12.4
51—60	male female	61 121	182	12.2	91 113	204	13.1
61—	male female	59 44	103	7.2	56 73	129	8.3
Total	male female	584 900	1,484	39.3 60.7	648 904	1,552	41.7 58.3

This table tells us that woman patients are generally more numerous than man patients and especially it is remarkable in the paddy-field area. That is to say, in the upland crop area woman patients are 139.5 against 100 man patients, while in the paddy-field area there are 154.2 woman patients against 100 man patients. Besides, baby and infant patients are also more than adults and this is especially true in the paddy-field area; namely, those between one and ten years old are 25.3% of the total in the paddy-field area, while in the upland crop area they are 20.4%. Moreover, it should be noted that in the paddy-field area the rate of woman patients from 20 to 40 years of age is excessively high, that is, 19.7% of all, while in the upland crop area it is 16.6%.

So far we pointed out some remarkable features of the health condition among farming population in the paddy-field area. However, to find out the real cause of the matter is a still more important task for us. Believing that it has a close relation with

the way of farming in the paddy-field area, we are going to analyse the farming condition itself in the next chapter.

IV. Relation between Paddy-field Farming and Farmers' Health

We may, of course, point out many features of paddy-field farming. In this chapter, however, we are going to pick up only those having a close relation with farmers' health as well as agricultural labor power.

(1). Low standard of technics in the paddy-field farming

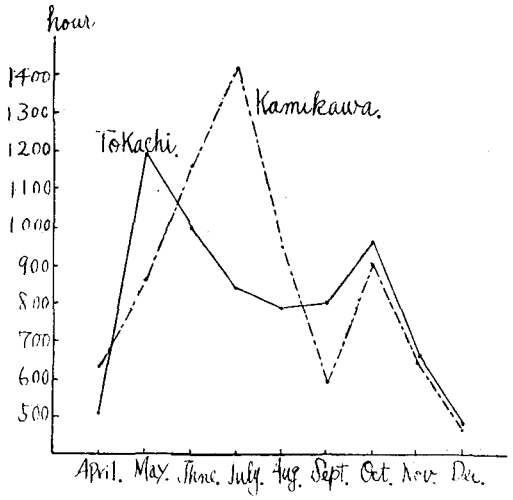
As well known, one of the salient features of Japanese agriculture lies in its high labor intensity; in other words, it is characterized by the low standard of labor saving technics, and this is especially the case in the paddy-field farming. For instance, the report of the experimental farms run under the guidance of the Hokkaido Agricultural Experiment Station gives an illustration. That is, in Kamikawa hours of labor done by horse power are only 6.5% of that done by man power and in Tokachi it is 11.4%, about two times as much as in Kamikawa. This shows how the paddy-field farming is intensive in human labor.

Another illustration is given by the survey of production cost of rice and beans which are the main farm product in Kamikawa and Tokachi respectively. In Kamikawa, the labor cost amounts to 58% of the total cost of rice production, while in Tokachi it is 41 and 47% of the total cost of field beans and soy beans production. This shows also that the production of rice is more intensive in human labor than that of upland crops.

According to the same report, the labor done by man power per cho for crop husbandry is 1061.6 hours in Kamikawa, while in Tokachi it is only 274.0 hours; the former being four times more intensive in labor than the latter.

Therefore the farmers in the paddy-field area are more apt to become victims of over-work. This is especially true in the paddy-field area in Hokkaido, because it is admitted that the diseases prevalent in the rural district in Hokkaido are mostly caused by overwork.

(2). Uneven monthly distribution of labor



Besides, the farm management in the paddy-field area is characterized by the uneven distribution of monthly labor. As shown in the following table and figure, the labor done by human power amounts annualy to 7,629 hours in Kamikawa, ranging from 474.9 hours in the slackest month of December to 1,442.6 hours in the busiest month of July, while in Tokachi labor is least in December and most in May, each being 489.2 and 1,195.1 hours. Thus in the paddy-field area labor is more unevenly distributed among the months and the busiest month falls in the hottest and most humid season. Therefore, it is no wonder that there are more T. B. patients and more deaths in July and August in the paddy-field area than in every other month.

Monthly distribution of human labor (including family labor and hired labor permanent and temporary)

	April	May	June	July	Aug.	Sept.	Oct.
							hours
Tokachi	507.2	1,195.1	1,016.6	836.6	789.9	796.5	961.8
Kamikawa	629.6	862.9	1,157.9	1,422.6	945.8	586.9	902.7

	Nov.	Dec.	Total
Tokachi	663.9	489.2	7,226.8 hours
Kamikawa	645.5	474.9	7,628.8

(3). Intensive woman labor

Thirdly, that labor in the paddy-field area done by women is more than that done by men should be noted. According to the census of Oct. 1, 1939, the population in the rural district of Kami-

kawa is 275,794, of which male population is 137,300 and female 137,494; that is to say, the latter being more than the former, while in Tokachi the total population is 174,033, which consits of 87,655 male and 86,378 female population; in this case man population being bigger. Moreover, since the outbreak of the war there has been a remarkable tendency of the woman population in the paddy-field area to increase more and more. Our survey in Higashi-Takasu revealed us that the woman population engaged in farming increased from 48.3% to 50.5% in five years, 1935-1939. However, such a tendency means a crisis of women's health. The intensified mobilization of women's labor power is apt to sacrifice women's time necessary for cooking, sewing, child nursing as well as their time for rest. Therefore their overwork does not only threaten their own health, but also the young generation under their care.

(4). Much sidework

It is a well-known fact that the sidework outside of the farm plays an important rôle in financially supporting the farm management in the paddy-field area. One of the reasons lies in the uneven monthly distribution of farming labor in the rice cultivation. It must be admitted that much sidework is one of the common features in the paddy-field area. In Kamikawa the time spent for sidework amounts to 601.3 hours a year, while in Tokachi it is only 330.9 hours, that is, about half less than the former. In addition, in the paddy-field area farmers are apt to seek their subsidiary work in transportation, trade, or factories in cities. In Higashi-Takasu also we found that farmers were getting their side jobs in the nearby city, Aasahikawa. This is, however, a serious problem in view of social hygiene, because it often becomes a cause of importing many kinds of diseases, especially T. B. into the rural district.

(5). Irrational diet

Fifthly, it should be also noted that in the paddy-field area farmers' diet is more simple in variety and worse in quality than in the upland crop area. According to the survey done about the farm management experiment farms of the Hokkaido Agricultural Experiment Station, a farmer's diet in Kamikawa District consists of polished rice, vegetables, and seventeen other foodstuffs, amounting to 204.43 yen a year in all, while in Tokachi polished rice, cow milk,

millet, and twenty four other foodstuffs, 213.14 yen in total. Besides, in Kamikawa polished rice and vegetables occupy 78.4% of the total diet, while in Tokachi polished rice, cow milk, and millet are making 86.1% and, taking polished rice and vegetables, they are only 40.4%. So it must be admitted that the diet in the upland crop area is more rational than that in the paddy-field area. So far in the villages near the sea-coast the rate of recruited soldiers passing health examination has been high. This is considered to be because of their rational diet having much fish.

Thus we see that in the paddy-field area farmers take only a little bit of food of animal nature and that their diet consists mainly of polished rice and vegetables lacking variety of food. Accordingly their malnutrition weakens the resisting power against illness. Above all, too much eating of polished rice, causing oversupply of carbon hydrate, has no small concern with baby miscarriage. Moreover, eating much vegetable-food not well cooked is causing many sufferings of ascariasis or various other parasitic diseases among farmers. The survey of rural hygiene made by the Bureau of Public Health, Home Ministry, tells us that 72.9% of village inhabitants are inflicted by these parasites. This is only one of the features characterising Japanese agriculture where paddy-field farming is dominant.

Adolf Reichwein, pointint out the high death-rate and its non-decreasing tendency inspite of the rapid increase of Japanese population since Meiji Restoration, mentions as its cause the following facts: manuring paddy-fields with night soil and unbalanced diet with too much rice. (cf. A. Reichwein, Bevölkerungsdruck in Ostasien-Archiv für Sozialwissenschaft und Sozialpolitik Okt. 1932). In view of the dominancy of rice cultivation in Japan, his opinion is worthy of note.

(6). Relation with high temperature in Summer and much rainfall

Generally speaking, the paddy-field area is also charaterized by high temperature in Summer and much rainfall. For instance, in Asahikawa which is situated at the center of Kamikawa, August is hottest, and the average temperature goes up to 26.5 C, while in Obihiro which is the center of Tokachi it is 25.2 C. As for rainfall, it is equally more in Asahikawa than in Obihiro, each being 1,078.7

mm and 961.6 mm. In Honshu too, Ishikawa Prefecture (Kanazawa) and Fukui Pref. (Fukui) which are representative paddy-field areas, have rather high temperature and much rainfall, the highest average temperature and quantity of rainfall being, 34.1 C, 36.3 C and 2,856.3 mm, 2,735.1 mm respectively; while, in Kanagawa Pref. (Yokohama) and Shizuoka Pref. (Mishima) where paddy-field farming is not so dominant, they are 33.5 C, 33.2 C and 1,324.3 mm, 1,691.4 mm, the latter being much lower and less.

Such being the case, there are not a few authors who insist upon the positive relation between mortality and climatic conditions. According to KAZUKI MORI's study, for instance, the quantity of rainfall and death-rate has a slight positive correlation. (cf. K. MORI. Studies on Population Statistics —Jinko-tokeiron—, 1935 p. 310). In other words, death-rate is somewhat high in regions having much rainfall. Moreover, he suggests almost the same relation between high temperature and death-rate. (cf. ibid. p. 310)

Such a view may sound reasonable at first glance, but, in truth, the high humidity and high temperature is not an absolute factor determining high mortality. Even according to Mori's study, the correlation coefficient between death-rate and rainfall or high temperature is only + 0.1 and + 0.04. This is known also through the fact that the urban district is enjoying comparatively low mortality compared with the rural district, despite their being under the same climatic conditions; for instance, the average mortality in the city of Asahikawa was only 14,58 per thousand population for the period 1935–40, while in Higashi-Takasu, a neighboring village of Asahikawa, the mortality was much higher, being 20,42 in the same period. The same is the case with Ishikawa and Fukui prefectures where the mortality in the cities is much lower than that in the villages. Therefore, the point is that the high humidity and high temperature are apt to cause a bad influence upon the mortality through the paddy-field farming. In other words, high humidity and high temperature do not necessarily mean an absolute setback for health preservation as far as we take proper counter measures against these adverse climatic conditions—through the rationalization of paddy-field farming as well as proper housing and the like sanitary setups. Practically, irrational way of labor and malnutririon accompanying so often paddy-field farming is making the matter worse. However, we don't mean to advocate an absolute banishment

of rice cultivation from these areas, but rather to emphasize the importance of improving the way of paddy-field farming.

Be that as it may, we should admit that the climatic condition charcterizing the paddy-field farming in Japan, that is to say, high temperature and high humidity is not favourable to farmers' health as far as present conditions are concerned. Besides, we must not lose sight of the severe coldness in Winter which is inflicting sufferings upon the farmers in the paddy-field area in Hokkaido. In Asahikawa the lowest average temperature in January is − 16.1 C which is 42.6 C lower than the highest average temperature in the same place. Despite of such a low temperature, the farmers' house in the paddy-field area in Hokkaido is the same as in southern regions, just the same style and construction of houses having been transplanted from the south, with the importation of rice plant. Therefore, it is entirely unsatisfactory for the northern climate, causing bad effect upon farmers' health.

V. Counter-measures

Thus the type of farming of paddy-fields has many points to be warned about, especially against the health of women and above all against young women having high concieving capacity. The shortage of farming labor caused by the war turned in a heavy burden upon women. Besides, the intensity of farming labor is much higher than other kinds of work; that is, it is estimated that farming labor is two or three times more toiling than the average of other labors, and more than three times harder than the spinning labor which is one of the representative labors of women in Japan. They are really exposed to the danger of overwork.

As we mentioned already, the strenghening of agricultural productivity must start from high evaluation of agricultural labor power. If human life is a value in, and of, itself, man is not to be regarded as a means for the production of wealth, but as an end for which wealth is produced. However, in Japan farmers have only been regarded, under the hitherto semi-feudalistic system, as a means for the production of wealth.

This idea resulted in laying too much emphasis upon securing as large a product per acre as possible even when sacrificing farmers' health. But, as T. N. CARVER says, the aim of rational industrial

management and statesmanship is, or always should be, to secure as large a product per man as possible, and not necessarily as large a product per acre as possible. In fact, a large product per acre is desirable only when it means a large product per man, and never otherwise (cf. T. N. CARVER: Principles of Rural Economics, 1911 p. 175). Such a soundly democratic principle of farm management must be also the basis for protecting farmers' health. In other words, the measures to secure the high productivity of agricultural labor-power are at the same time the measures for better farmers' health. Now we are going to study them more in detail.

(1). Mechanization of paddy-field farming

As we mentioned already, the paddy-field farming in Japan is still way behind in the mechanization and it depends mainly upon the "naked" labor. The uneven seasonal distribution of farming labor has a close relation with the poor mechanization of paddy-field farming. Therefore, it is an urgent problem to mechnize the process of the busiest part of farming labor first of all. The busiest season occurs generally in July, that is, in the weeding season, and weeding is now mostly done by hand or with primitive hand tools. In view of such an unpractical way of doing the business, there is no wonder that farmers are apt to become victims of overwork. So it is high time that we encourage the utilization of more efficient weeding machines among farmers. For instance, the efficiency of an animal-draught weeding machine is much higher than that of a hand tool. That is, with a claw-like hand tool (Ganzume) they can only weed one tan a day, and with a rotary hand tool three tan, but with a machine driven by horse power they can weed easily 15 to 20 tan a day.

However, in order to mechanize the weeding and also reaping process, the distance between furrows and also plant stocks must be changed. According to the routinary system, rice is planted in rows 7.5 inches apart and each rice plant stock also 7.5 inches apart. But, this is too narrow for the utilization of the weeding machine between rows. However, by widening the row distance to 1–1.5 feet and at the same time narrowing the plant distance to 2.5–5 inches we may easily utilize the weeding machine with more yield and less disease-damage for the plants. In this case rice plant varieties having strong tillering capacity and also with strong stalks

are preferable. So, in Hokkaido, the Kyoei, Eiko, or Tomoenishiki varieties are most recommendable for this purpose.

So far it was an admitted view that the mechanization of Japanese agriculture has been hampered mostly because of the natural and technical character of "the water" (irrigation). However, recent research works revealed us that even rice plant can grow well on the up-land fields just as on the paddy-fields so far as the soil contains 70% of moisture during the first half of its growth period, and, if it be changed into paddy-fields in the latter half period, the rice-yield is quite as high as before. So, now "the water', is not an absolute obstacle against the mechanization of rice-cultivation.

As for the transplantation of rice seedlings which has been taken as another factor hampering the mechanization, it has been revealed also through recent research works that the transplantation is not necessarily an indispensable physiological and ecological prerequisite for rice cultivation, but rather a means deviced to combat against the growth of weeds, occurrence of rice-plant pests, and that they may rationalize seedling-density. Therefore, as far as another means against wild grass, rice-plant pest, and for the rationalisation of seedling density is taken, the direct seedling of rice plant is more rational than the transplantation of seedlings.

Taking this into consideration, the way to the mechanisation of rice cultivation is technically wide open. So, getting rid of the trouble caused by irrigating water and transplanlation of rice seedlings, machinery can be used more in many works, not only in ploughing, but also seeding, harrowing, weeding, and reaping as well.

It is true that machines are more expensive than simple hand tools, but their high efficieny will cover the cost. Moreover, they don't have to keep one set for each household. At present any machine is not utilized to its fullest efficency. For instance, according to KINICHI YOSHIOKA, the highest efficiency of an ordinary threshing machine driven by a petroleum engine can be realized when worked with twenty man power and for five tan of rice fields. (cf. K. YOSHIOKA, On Japanese Agricultural Labor—Nihon-nogyo-rôdô-ron—1939. p. 202) Let us take another example, a horse power cultivator (weeding machine). It has a capacity of cultivating 20 tan of paddy-fields a day. On the other hand 35% out of the total labor demanded for rice husbandry in Hokkaido consists of cultivation

and weeding, so, taking farmer's working days 170 days a year, cultivation needs about 60 days working. Accordingly a horse power cultivator will be able to cultivate 1,200 tan of paddy-fields, if used to its full capacity. However, it is not, in reality, used so efficiently as should be, because farmers run their farm on a seperate small tract and, having a cultivator on each farm, labor is carried out independently from each other. Practically they don't have to keep one set of farm machinery for each house hold. Organizing a cooperative work team, they may not only economize number of farm machinery, but also utilize them to the fullest capacity. The same principle will work efficiently for any kind of works of rice cultivation.

Besides, it should be mentioned that the scattered allocation of land tracts as well as their smallness is hampering the mechanization of farming. It might be true that the paddy-fields should be parcelled into small units in order to ease the filling of water in the fields, but there is no reason that they should be so small as 0.5 or I tan. It is rather the result of the primitive hand-tool cultivation, not to mention the effects of social relation. As for the scattered allocation it is generally admitted that the farm land was scattered in small tracts on purpose that damages caused by natural calamities might be evened. But this is groundless, because paddy-fields belonging to a landowner or well-to-do owner farmer are generally unified into a large tract. The truth is that the scattered farm land tract appeared already in ancient times, intensifing its scatteredness more and more through frequent changes of land ownership, and so has survived until today. In Europe the agricultural development in the modern sense could take place in reality when scattered small farm land tracts were consolidated into a unified farm. But, in our nation the case is quite different. The scatterd allocation of land tracts as well as their smallness, which is nothing but a legacy of the feudalistic social relation and its corresponding primitive way of farming, are still hampering the development of agriculture in Japan. In this sense we should not lose sight of the importance of the land reform as well as land allocation arrangement in relation with the mechanization of farming. This point we will discuss later.

(2). Diversified farming

The irrational seasonal labor distribution in the paddy-field

farming depends also upon the strong tendency for mono-cultivation. Generally speaking, in view of the long time stabilization of farm economics, the mono-cultivation, that is, one crop farming is not recommendable to the small size farming as found in Japan. So, through the adoption of diversified farming, the shortcoming should be rectified. As well known, the seasonal labor-demands of various crops are quite different from each other, and the yearly fluctuation of good and bad yield is sometimes reverse among different crops. So the adoption of such a crop whose labor demand is reverse and whose yield is stable as against that of rice crop, into the farm management should be more encouraged.

As mentioned before, the busiest season of rice cultivation falls in July and October demanding 22.0% and 16.3% of the total labor; while that of winter wheat and barley falls in August and September demanding each 36.1% and 45.0% of the total labor. In other words, the busiest seasons do not coincide with each other among these crops. The same is the case with forage crops, because their busiest seasons fall in August and September taking 43.5% and 18.5% of the total labor. Besides it should be noted that the cultivation of forage crop itself is not so intensive in labor as rice, only 2 man-day per tan as against 13 man-day of rice husbandry.

Labor distribution (in Hokkaido)

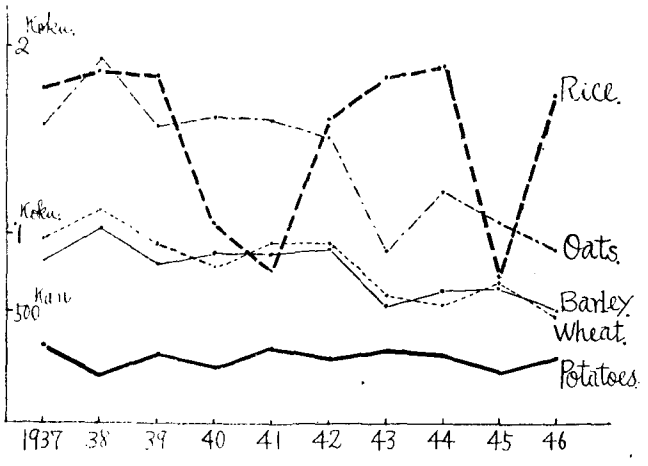
	Jan.	Feb.	March	April	May	June
Rice	—	—	—	5.1%	14.8%	15.1%
Winter Wheat (barley)	—	—	—	3.3	5.2	1.0
Spring Wheat (barley)	—	—	—	9.0	13.0	6.0
Oats	—	—	0.1	7.1	15.1	8.9
Indian corn	—	—	—	2.5	19.5	21.1
Potatoes	—	—	—	5.0	19.0	5.0
Forage crops	—	—	—	4.3	2.7	5.2

	July	Aug.	Sept.	Oct.	Nov.	Dec.
Rice	22.0%	5.8%	5.6%	16.3%	12.7	2.6%
Winter Wheat (barley)	2.3	36.1	45.0	4.3	1.7	1.1
Spring Wheat (barley)	2.0	25.0	15.0	15.0	10.0	5.0
Oats	3.6	15.0	28.6	11.6	7.9	2.1
Indian corn	19.1	2.5	0.6	17.6	13.1	4.0
Potatoes	12.0	4.0	5.0	33.0	13.0	4.0
Forage crops	13.3	43.5	18.5	5.5	7.0	—

As for the yearly fluctuation of crop-yield, that of rice is very unstable, while that of barley, wheat, oats, or potatoes is rather stable and moves sometimes reverse to that of rice-crop. For instance, taking ten years from 1937 to 1946, we see remarkable ups and downs of annual rice-yield. The difference between good and bad crop is quite big. In 1945 we had the worst crop, getting only 0.691 Koku per tan, that is, about one third as much as the foregoing year, a year of bumper crop, while bariey, wheat, oats, or potatoes, did not show so big a yearly difference of yield as rice. even in 1945 their yield was not so bad as rice. In 1941 we had also bad crop of rice, but the yield of these other crops was quite favorable. On the other hand, in 1946, the year of bumper crop of rice, we had a comparatively poor yield of these crops. (cf. the following table and figure.)

Crop yield per tan (in Hokkaido)

Crop	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946
Rice	koku 1.799	1.875	1.843	1.068	0.771	1.611	1.830	1.895	0.691	1.748
Barley	koku 0.819	1.036	0.813	0.871	0.866	0.904	0.525	0.629	0.661	0.500
Wheat	koku 0.978	1.131	0.929	0.793	0.950	0.845	0.600	0.538	0.669	0.495
Oats	koku 1.589	1.928	1.573	1.617	1.607	1.507	0.897	1.237	1.074	0.904
Potatoes	kan 352	225	313	251	317	290	310	292	214	298



Generally speaking, in Hokkaido, barley, rye, wheat, oats, indian corn, peas, potatoes, rape seed, flax stalk, peppermint herb, and sugar beet are stable crops, but rice, soy-beans, Italian millet, barn yard grass (hie), millet, buckwheat, and field beans are rather unstable in yield. (cf. T. WATANABE & M. ARAMATA, Good and Bad Crop Relation of Leading Agricultural Products in Hokkaido — Hokkaido ni okeru kakushu shuyo Nosakubutsu no Hokyo kankei —, Journal of Sapporo Society of Agricultural and Forestry Science, No. 125, July 1935). Therefore, we should take these crops into consideration when diversifying the paddy-field farming in Hokkaido.

Besides, we should not lose sight of the importance of animal-breeding such as cattle, pigs, sheep, goats, rabbits, or chickens mixed with rice cultivation, because the labor demanded by these livestocks does not only even the seasonal distribution of labor as a whole, but also it furnishes a way of economic utilization of surplus labor in the slack winter season. Moreover, supplying meat, milk, and eggs, they will give the farmers a chance to better their daily diet, not to mention their importance as suppliers of compost and as a source of cash income. If these foods of animal source, especially milk and butter, be taken more into farmers' daily diet, they will work as an effective bulwark against T. B. rampancy.

As for cash income, the farm economics survey by the Hokkaido Agricultural Association tells us that the farm management diversified with livestock raising is getting more income, good or bad crop year alike, than the other types of farming; sometimes three times as much as the latter. It therefore has also more resisting power against business depression and bad crop. For instance, taking 1930, which was a depression year, the farm management diversified with upland crops, cow, horse, pig, and chicken, got 919 yen of net income as against 431 yen of the management with rice cultivation only. In 1931 and 32, bad crop years, the former got 468 yen and 903 yen as against 242 yen and 313 yen of the latter as shown in the following table.

Net Income per household

Farm management	1928	1929	1930	1931	1932
	yen	yen	yen	yen	yen
1. Upland crops only	③ 459 (26)	④ 446 (23)	⑤ 266 (26)	④ 487 (39)	③ 558 (62)
2. Upland crops and rice	④ 1,030 (58)	③ 704 (37)	⑪ 638 (62)	⑯ 335 (27)	④ 520 (58)
3. Rice crop only	③ 885 (50)	④ 835 (43)	⑤ 431 (42)	⑤ 242 (19)	④ 313 (35)
4. Upland crops and cows	④ 979 (55)	⑤ 993 (52)	⑥ 1,023 (100)	⑤ 448 (36)	⑤ 639 (71)
5. Upland crops, cow, horse, pig, chicken	④ 1,631 (92)	③ 1,017 (53)	③ 1,010 (98)	④ 1,261 (100)	⑤ 858 (95)
6. Rice, upland crops, cow, horse, pig, chicken	③ 1,197 (67)	③ 1,041 (54)	③ 919 (90)	⑦ 468 (37)	⑤ 903 (100)
7. Rice crop, cow, horse, pig, chicken	③ 1,708 (96)	③ 1,927 (100)	② 930 (100)	② 469 (37)	④ 468 (52)
8. Upland crops and horticulture	② 1,780 (100)	② 857 (44)	② 557 (54)	① 241 (19)	③ 728 (81)

Remarks: 1. Number in the circle is the number of households surveyed.
2. Number in the brackets is the index taking the highest income 100.

At the same time, the rational rotation system of rice fields is worth consideration. For instance the rotation of rice crop with oats and clover will promise a good result. With this we can expect increased rice yield despite of less labor-input because of increased fertility of the fields. In addition, with oats and clover we can raise a cow whose milk will increase the total amount of calories produced from the lot.

In this case the rotation goes like this: the first year, oats and red clover; the second year, red clover; the third, fourth, and fifth year, rice crop; two tan out of one cho every year for each crop. And, in the second year a cow should be kept, because in Hokkaido the average acreage of forage crops necessary for keeping a cow is estimated four tan. So, the former rice acreage will be decreased to three-fifth, but the increased fertility of soil can cover the decrease of rice acreage, because, according to an experiment done at the Hokkaido Agricultural Experiment Station, red clover increases rice yield 83% and stable manure for 32%, that is equivalent to the increase of 4.86 tan of acrage ($2 \text{ tan} \times 0.83 + 10 \text{ tan} \times 0.32$). Therefore the net increase of rice acreage may be equivalent to $4.86 \text{ tan} - 4 \text{ tan} = 0.86 \text{ tan}$. So taking rice yield per tan 1.6

koku and milk production of a cow 20 koku a year, the balance sheet of calory production as a whole may be as follows.

	1st year	2nd year	3rd year
In- and decrease of rice acreage	tan − 2	tan − 4	tan + 0.86
In- and decrease of rice yield	koku − 3.2	koku − 6.4	koku + 1.36
In- and decrease of calory production rice	Cal − 1.653.760	Cal − 3.307.520	Cal + 711.117
cow milk	——	+ 2.560.400	+ 2.560.400
Net indrease	− 1.653.760	− 747.120	+ 3.271.517

Thus we can, in the third year, not only recover the decrease of calory production in the first and second year, but also get more calory as a whole.

In this way we can also economize farm labor as a whole. In Hokkaido the labor-demand per tan for rice production is estimated 115.8 man hours, while that of red clover, oats, and that for a cow is 21.0, 47.9, and 314.0 man hours respectively. Therefore by decreasing 4 tan of paddy-fields 514.4 hours will be saved, but converted fields and livestock demanding another 72.7 and 314.0 hours instead, the balance sheet of labor input will result in the economy of 127.7 man hours as shown in the following table.

Item	Year	1st year	2nd year
A	Decrease of paddy-field acreage	tan − 2	tan − 4
B	Labor hour for paddy-fields	− 267.2 hours	− 514.4 hours
C	Labor hour for converted up-land fields	+ 72.7	+ 72.7
D	Labor hour for livestock	——	+ 314.0
E	C + D	+ 72.7	+ 386.7
F	B − E	− 174.5	− 127.7

Moreover the rotation of rice fields can, to a considerable extent, economize labor for weeding which is a big cause of the high labor intensity in paddy-field farming. Especially on the paddy-

fields where rice seed is sown directly on the ground, weeds grow more and much quicker than on the fields with transplanted seedlings. According to an experiment done at the Nagayama Farm Management Experiment Farm, red clover fields grew less weed when converted into paddy land.

Recently it has been reported that some paddy-field farmers are engaged in cultivation of greens such as cucumbers, changing a part of paddy fields into upland fields. It is true that vegetable cultivation promises high cash income in these days, but, it is not always recommendable in view of labor economics, because the busiest season of some vegetable cultivation such as cucumber conincides with that of rice cultivation, not to mention that the cultivation of greens is generally very intensive in labor. For instance the cultivation of cucumber demands 45.0 man day labor per tan against 13.5 man day of rice cultivation and 31.0% of the whole work for cucumber-cultivation is done in June and 19.0% in July. Other kinds of vegetables are also almost the same in this point as shown in the following table. Among them burdock, Chinese yam, Chinese cabbage, Sinapis sp., Welsh onion, onion, cucumber, eggplant, and tomato seem to come most in competition with rice cultivation in regard to monthly lobor distribution, while fodder crops are much better in this point. Besides, vegetable cultivation cannot be rationally rotated with rice crop; in other words, they cannot preserve the fertitity of soil, nor increase calory production as a whole.

Monthly Labor Distribution

	Labor Demand per tan	Jan.	Feb.	March	April	May	June
Rice	13.5 man days	—	—	—	5.1%	14.8%	15.1%
Raddish	11.0	—	—	—	—	—	2.0
Turnip	10.0	—	—	—	—	—	—
Carrot	13.1	—	—	—	14.0	14.0	20.0
Burdok	19.4	—	—	—	1.0	1.0	17.0
Chinese yam	25.0	—	—	—	1.0	1.0	17.0
Cabbage	18.7	—	—	1.9	3.5	3.5	19.3
Chinese cabbage	10.1	—	—	—	—	—	—
Spinach	9.5	—	—	10.0	20.0	20.0	10.0
Sinapis sp. (Tsukena)	9.5	—	—	—	—	—	—

	Labor Demand par tan	Jan.	Feb.	Mach	April	May	June
Welsh onion	30.0 man days	—	—	8.0%	7.0%	13.0%	21.0%
Onion	21.3	—	—	1.0	14.0	9.0	13.0
Cucumber	45.0	—	1.0	3.0	13.0	17.0	31.0
Egg-plant	39.7	—	—	6.8	5.6	1.5	38.3
Pumpkin	10.6	—	—	3.0	6.0	31.0	29.0
Tomato	33.3	—	—	13.7	11.4	3.6	18.0
	Labor Demand per tan	July	Aug.	Sep.	Oct.	Nov.	Dec.
Rice	13.5 man days	22.0%	5.8%	5.6%	16.3%	12.7%	2.6%
Raddish	11.0	17.0	35.0	15.0	23.0	8.0	—
Turnip	10.0	20.0	35.0	15.0	22.0	8.0	—
Carrot	13.1	12.0	2.0	13.0	15.0	—	—
Buadock	19.4	10.0	7.0	32.0	10.0	13.0	—
Chinese yam	25.0	10.0	7.0	32.0	10.0	13.0	—
Cabbage	18.7	16.2	12.4	8.3	11.6	4.7	—
Chinese cabbage	10.1	34 0	25.0	23.0	10.0	8.0	—
Spinach	9.5	—	—	20.0	10.0	10.0	—
Spinapis sp.	9.5	25.0	30.0	25.0	15.0	5.0	—
Welsh onion	30.0	5.0	7.0	13.0	26.0	—	—
Onion	21.3	19.0	8.0	15.0	14.0	7.0	—
Cucumber	45.0	19.0	16.0	—	—	—	—
Egg-plant	39.7	14.3	19.5	12.0	2.0	—	—
Pumpkin	10.6	6.0	3.0	14.0	8.0	—	—
Tomato	33.3	29.3	24.0	—	—	—	—

As for rice cultivation itself, the mixed cultivation of different varieties of rice and the combination of direct sowing and transplantation of seedlings from the upland hot-bed or ordinary paddy bed will play an important role in adjusting the seasonal distribution of labor, because their seasonal labor demands are somewhat different from each other.

In 1936 at the Shibetsu Farm Management Experiment Farm of Hokkaido Prefectural Government, 22.6 tan out of 262 tan of paddy-fields were sown directly with rice seed, but 3.6 tan were planted with seedlings from the hot bed; while in 1938 17 tan out of 26.2 tan were sown directly and the other 9.2 tan with transplanted seedlings. Thus the fields with transplanted seedlings were

increased from 13.8% to 35.1% of the total acreage. As the result, labor hour in July, the busiest month, was reduced from 980.5 hours to 679 hours though labor hours in May increased from 734 hours to 800 hours because of the transplantation of seedlings. So in total, yearly labor hours were also somewhat decreased from 3,874.0 hours to 3,839.4 hours.

An experiment at the Setana Experiment Farm also shows the same result. At Setana in 1934 25.8 tan out of 30.8 tan of paddy-fields or 83.8% of the total acreage were sown directly with rice seeds and the other 5 tan or 16.2% of the total acreage were planted with ordinary seedlings, while in 1938 the acreage with rice seed was changed to 17.5 tan or 30.4% and that of ordinary seedlings to 10.6 tan or 34.9%, and besides them, 2.3 tan or 7.6% of the lot were planted with seedlings from the hot bed. As the result the total labor was decreased from 3,151.9 hours to 2,961.6 hours and labor in July was reduced from 699.9 hours to 486.2 hours, while labor in June increased from 360.2 hours to 586.0 hours.

Thus through a proper combination of paddy-fields with seed or seedlings, they succeeded in not only the decrease of the total labor hour, but also in evening monthly labor distribution.

From these experiments we learn that about 30% of the acreage planted with seedlings are desirable in view of the economy of labor.

For the economy of paddy-field labor, land amelioration plays also an important role. According to the result of farm management experiment at Shibetsu and Setana by the Hokkaido Agricultural Experiment Station, labor hours for cultivation of paddy-fields were reduced to 80 or 85% as before land improvement. Improved soil lightens the work to no small extent.

Arrangement of the size and location of paddy-field lots is also very important for the same purpose. Take a farm whose paddy-field lots are not consisting of so tiny parcelled tracts, but mostly of tracts of 0.8 to 1 tan located in good order, and compare this with another farm whose lots are quite tiny and located in bad order, we learn that labor hours per tan for the latter amount sometimes to twice as much as the former. Therefore the size of unit lots should not be too small and each lot also should be located in good order.

(3). Day nursery (crèche) and co-operative cooking.

As we mentioned already, woman labor-hand now plays an indispensable rôle in running paddy-field farming. However, the women are already overburdened with other home work. According to the census in 1940 made by the Imperial Agricultural Association (Teikoku-nokoi), domestic work occupied about 30% of the total labor hours of the farmer as shown in the following table.

Labor Breakdown (Distribution)

	Owner farmer	Owner-tenant	Tenant
Farming	56.04 %	55.33 %	52.91 %
Side work	5.65	8.86	10.43
Domestic work	32.22	29.82	30.56
Others	6.09	5.99	6.10
Total	100.00	100.00	100.00

It means that they are, because of too much work, not only sacrificing their own health, but also that of the coming generation who are now under their care.

The high baby mortality in Japan has also no small relation with woman's over-work as mentioned before. They cannot spare enough time to look after their babies. Besides, the fact that over 30% of babies die of inborn weakness before their second birth day is evidently caused by the over-work and unsatisfactory caring of mother's health during her pregnancy.

Therefore they should be liberated from field work as much as possible. But, in view of the present status of the farming in Japan, it may sound impracticable. Admitting this, we are going to propose as the next best that co-operative setup such as a day nursery and collective kitchen should be encouraged that their burden may be alleviated. Through the co-operative cooking system we can not only economize the expenses for diet, but also can reduce the expenses for medicine. It is chiefly because of the rationalization of diet. According to an experience in Yamagata Prefecture where since 1935 514 families have carried out co-operative cooking under the guidance of the Prefectural Government, they have succeded in the reduction of medical expenses: for medical treatment by 50.32%, for commercial drugs by 24.05% and for hospital medicine

by 44.96% per man. Another example is also given by the result of the co-operative cooking at Makita, Mayama, Gumma Prefecture. Comparing the result in 1938 with that of the preceeding year, that is, before and after the co-operation, the number of days spent for medical treatment was reduced by 2.6 days or 31% per caput, and the expenses for drugs and medical treatment by 36.2% in 1938 and 45.3% in 1939. Among illnesses, infectious diseases, nervous breakdown, diseases of respiratory and digestive organs were considerably decreased.

(4). Sanitation

In the light of public hygiene, their way of living is full of defects. For instance, the farmer's house has mostly only a few windows, making the inside very dark, and in winter when farmers stay mostly indoor, they usually shut all doors and windows. Moreover the house is mostly built facing east or west which is not so good for taking sunshine. Their bed room usually has no window and in the darkness bed-stuffs are laid on the floor without cleaning day and night as they are. So they are supplying T. B. bacillus as the best haunt. Thus, not only the house structure is full of defects, but also the way of using it or dwelling in it is quite irrational.

According to KANEKO KUMAGAI's thesis, 8,662 houses out of 11,307 investigated in Hokkaido, Akita, Chiba, Fukui, Gifu, Nara, Okayama, Ehime, Kumamoto Prefectures, that is, 77% of the total were found unsatisfactory, needing improvement more or less from the standpoint of hygiene, (cf. K. KUMAGAI, Urgent Necessity of Improving Dwelling-houses in Rural Districts—Noson-jûtaku-kaizen-no kyumu —Health Education—Hoken-Kyoiku— Vol. 5), And these defects are most prevalent in the prefectures containing many paddy-fields as Akita and Fukui, where 95 and 93% of farmers' houses were found short of should-be conditions.

The case is the same with their food. It is true that the rural area is enjoying now a much better food-situation and the nutritious conditions of the children in the rural area are considerably bettered, as is reported, but avitaminose among rural children is still remarkable.

The increase of beriberi patients among farmers, which was revealed through the recent survey by the Welfare Ministry, shows

that taking of polished rice has increased among them. They live mostly on polished rice and greens only. This is the cause of vitamin B_1 deficit.

The vitamin B_2 deficit is also remarkable among farmers, because they take seldom food of animal origin. Even today ulcer around the mouth corners is found more among rural children than in cities. This is nothing but a result of B_2 deficit.

Strange as it may sound, sufferers of the vitamin A deficit are also found more among rural children. As well known, vitamin A is supplied from fresh greens. However, when we look into their way of cooking, we can easily find at least a part of the reasons. As they are too busy, they usually take, at lunch time, soy-bean soup which was left over from breakfast and at supper time also they are reluctant to cook fresh side dishes. So, they, being amidst fresh greens, there occurs vitamin-A deficit among them so often.

Thus, notwithstanding farmers are generally taking more calories than city-dwellers, they are still suffering from partial undernourishment.

The clothing is by no means better than their housing and diet. For instance, it is almost a custom among farmers to put on many dirty under-wears in winter time. But, such a way of clothing is not only against proper sanitation, but also decreases the efficiency of labor checking brisk movement of the body. Moreover, many underwears do not mean warmth preservation. A warm light coat with a few underwears is much better for that purpose. However, they are doing just the reverse; that is, a thin, but heavy coat with many thick underwears. It makes them less adaptable to the changes of temperature. So they are apt to take cold, which often results in a serious disease.

We believe such a condition takes place in no small part because of their low cultural standard, above all of the lack of proper knowledge concerning hygiene among them. In other words, they do neither care much about ventilation, insolation, warmth-preservation of the house in Winter, nor diet and clothing. For instance, in some localities, there is still prevailing a queer custom among farmer's wives to refrain themselve from taking nutritious food before and after baby delivery, taking rice gruel and salt only. This shows nothing but their ignorance. What bad effect it will give to the babies and themselves needs not a detailed comment.

No wonder that there are so many disease victims and high mortality. Therefore, first of all they should be taught at least an elemental knowledge of sanitation and also given proper guidance for that purpose.

We advise that they should have a rural hygiene expert in each paddy-field area that they may get sanitary advices and be taken care of, whenever necessary. At the same time, we lay much emphasis upon the necessity of the seasonal group health-examination and of the T. B. preventive measures such as B. C. G. injection.

V. Conclusion

Thus far we have seen the deplorable health condition among the paddy-field farmers and its back-ground too. We have also pointed out some urgent counter-measures. However, this task is not always an easy one. There are many things standing in the way. The first thing to be mentioned here is the land system.

So far the land distribution has been worse in the paddy-field region than in the up-land crop area. The big absentee landowner was found more in the paddy-field area.

Generally speaking, tenant farmers are not so productive as owner operators. Taking for instance the 1939's rice production cost census by the Imperial Agricultural Association, we find that the tenant farmer produced 2.636 koku of rice per tan at the cost of ¥ 36.95 per koku, while the owner operator produced 2.614 koku at the cost of ¥ 31.83 per koku. Thus, tenant farmers are not so efficient in the manegement as owner farmers. Ambition, hope, initiative are also lacking among tenant farmers. This is one of the reasons why tenant farming is hampering the progress of agriculture. The tenant will not improve the farm. For the improvements he makes go to the landowner. The owner will not make improvements because it does not pay him to do. Moreover, the tenant seeks to get as much out of the soil as possible. The soil is exhausted, crops are not rotated.

The rent was more expensive for the paddy-fields than for the up-land fields, over the half of the yield being paid in kind. This made also the price of paddy-field lots excessively high. The high rent, accordingly the high price of farm land prevents naturally the possibility of investment of functional capital such as livestock

or farm machinery. In other words, 80% of the management capital were invested as land capital, leaving only a scanty room for functional capital. Moreover, the share rent in kind which was predominant in the paddy-fields played an adverse rôle upon the progress of farm economics of tenant farmers. The cash tenant gets all the advantage of his own superior cultivation, whereas the share tenant gets only a share of that advantage. That is to say, after the cash tenant has produced enough to pay his rent, every additional yen which he can make the farm produce goes into his own pocket, whereas, no matter how much the share tenant adds to the product, he gets only a share of the increase.

Owing to such conditions and also to the over-population caused by the deformed development of capitalism in Japan, the farming became only intensive in labor. Besides, the farm land was divided into small tracts and the avereage acreage of the unit farm became so tiny.

However, fortunately the Farm Land Reform Law came into effect on the 1. April 1945 (The revised one on the 22. Nov. 1946) as a basis for the democratization of Japanese agriculture. The program of this law may be classified into the three main parts: (1) the changing of tenant farmers into owner operators, (2) the changing of high share rent in kind into cheap cash rent, and (3) the maximum limitation of farm land acreage which can be held by the land owner.

Vis-a-vis the deplorable conditions in the Japanese land-system, we are sure that this law will break the present deadlock standing in the way of the development of the Japanese agriculture. We should admit that the owner farmer setup policy proclaimed in the law will contribute to no small extent to the enhancement of the agricultural productivity in Japan, and also the reduction and transformation of rent will give an opportunity to tenant farmers to increase the functional capital in the farm management, through which they may enhance the agricultural productivity.

However, there is still much probability that the farm management will be run on a parcelled land tract with as intensive labor as ever. It is true that the average acreage which should be alloted to the owner operator was increased, e. g. in Hokkaido from 32.4 tan of 1946 to 200 tan including pasture land, but land-holding and management are a different question. So if farmers be left alone

under the present population pressure, the farm management is apt to be crippled.

As mentioned already, one of the main trouble is that the farm management is not only run on a tract so small in size, but also so poorly equipped with capital goods; in other words, the farmers are so much poverty-stricken that any reorganization of the management by themselves seems almost impossible, because it needs badly another in-put of cash and materials for that purpose. Moreover, the smallness of its size itself makes the mechanization of farming very hard.

As G. KRAFFT pointed out, even such a simple machine as a team plough needs 30 ha of land for the realization of its fullest efficiency. (cf. G. KRAFFT, Die Betriebslehre, 1912, S. 70) Accordingly the adoption of a new machine into a small size farm often results in the mere increase of cost of production. Taking this into consideration, we can easily understand how the mechanization of farming is a difficult task as far as the present status remains. So now it is really high time for the farmers to realize that they cannot do anything without co-operation for each other. They are too powerless and poor to stand separately from each other.

Hewever, it is usually the owner farmer that cares for organzing co-operative undertakings. He wants to keep down his costs. He wants to market through his own agencies. The tenant is not a co-operative. Why should he be? If he makes his farm yield more, it is only an excuse on the part of the landowner for an increase in rent. In this sense the owner farmer setup policy proclaimed by the Farm Land Reform Law will make a foundation for the co-operation among farmers.

On the other hand, the Agricultural Co-operative Association Law came into effect on 15. Dec. 1947 as another corner stone of the democratization of Japanese agriculture. According to this law, the co-operative association should be organized as an organization of, by, and for the operating farmers themselves that they may enhance the agricultural productivity as well as elevate their social and economic position by their own efforts (cf. Art. 1. the Agricultural Co-operative Association Law). And for that purpose it presupposes as its field of business not only co-operative marketing, buying, and processing of agricultural products, but also co-operative field work and many other so-called cultural works of social welfare.

(cf. Art. 10, ACAL) Therefore, the new co-operative association should be utilized to the fullest extent as the best means of the reorganization of farm management and the betterment of farmer's health. The Agricultural Co-operative Association Law and the Farm Land Reform Law must go side by side. With the fullest functioning of the co-operative association the realization of the contents of the Land Reform Law is indispensable. The point is that farmers should take advantage of these laws to the fullest extent. However, no matter how epochmaking these laws are, they will not work efficiently, unless farmers themselves are active in functioning.

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