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The Merger Effects of Japanese Agricultural Cooperatives as Small and Medium-sized Financial Institutions

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Introduction

Agricultural cooperatives in Japan are cooperative organizations for their members which seek mutual benefits based upon the cooperative principle. They are divided into two parts, unit cooperatives and federations. The former are further subdivided into two types. One is general cooperatives, which play the role of financial institutions, and the other is ordinary cooperatives which do not lend. Both types engage in other business such as sericulture, livestock, dairy, poultry raising, pasture management, and a variety of other agricultural activities.

The federations have divisional activities such as credit, economy, marketing, purchasing, mutual relief welfare, transportation. Cooperatives operate similar businesses in each prefecture.

Sectorial net profit and loss statements for agricultural cooperatives showed profits for the credit and mutual relief divisions. However, the sales, buying, storage and process divisions reported losses in 1988.¹⁾

The Headquarters for Merger Subsidy of Agricultural Cooperatives stresses the necessity of mergers as a means of establishing a management basis to deal with competition, to maintain sound business practices and to obtain with diversification and promote professionalism.

There were 13,314 agricultural cooperatives at the end of March, 1950 in Japan. The number decreased every year to 12,050 at the end of March 1960.²⁾ After the passage of the Law on Merger Subsidy for Agricultural Cooperatives in 1961, the number

decreased drastically to 3,685 in 1989 with 2,771 mergers. This is shown in Table 1. This law was revised seven times³⁾ and caused a decrease in the number of agricultural cooperatives by 30.6%. However, there were only from 11 to 22 mergers in 1979, 1983, 1984 and 1985 when the law was not used.

There are only case studies of mergers in agricultural cooperatives in Japan⁴⁾ and no systematic empirical studies are conducted so far.

In Section I, previous research related to mergers in agricultural cooperatives are discussed. Section II explains the data used to measure the performance of mergers as well as the approach used for the analysis.

In Section III, the performance of mergers by using the relative financial ratios, namely, the direct differences in the financial variables between merging and paired non-merging agricultural cooperatives is examined.

I Studies related on Mergers of Agricultural Cooperatives

Recently, there have been several studies on economies of scale for agricultural cooperatives in Japan. Hasebe (1979) examined the economies of scale of agricultural cooperatives based on data from business reports of agricultural cooperatives in Hokkaido. He measured cost functions by using gross income (operating income - operating direct cost) as the independent variable and operating cost, personnel expenses and non-personnel expenses as dependent variables. He found economies of scale in the credit divisions and buying divisions in one area out of four, and in the mutual aid divisions, sales divisions and overall divisions in two areas.

Woo (1988) analyzed economies of scale in credit business and mutual aid business of 222 agricultural cooperatives and the sales and buying businesses of 164 cooperatives in 1982 in Hokkaido. In the credit businesses, he found economies of scale by the using amount of savings at the end of month and gross profit for independent variables and total cost for dependent variables, in the mutual aid business. The same trend was observed using net profit and total profit as independent variables, and total cost and business expenses as dependent variables. However, no economies of scale was found in sales and buying division.

Iikuni (1989) estimated the cost function of Kochi Prefecture in 1986 for each division, by using sales as size variable, and operating direct costs and operating expenses as cost variables. Economies of scale were not observed in the credit and mutual aid divisions. However, it was seen in the

sales and buying divisions due to the reduction of personnel expenses. Furthermore he has simulated optimum merger combinations in agricultural cooperatives by using cost functions from his previous research. He analyzed three stages, from small to large levels, city-town-village, county (gun) and prefectural levels, and determined the optimum merger combination which results in the minimum cost among all possible combinations in city-town-village level.

He finds that one agricultural credit cooperative in each city-town-village level is optimal and the 97 cooperatives in Kochi Prefecture would be reduced to 39 by optimum merger combinations.

Kawamura (1990) calculated the trans-log and functional-log cost functions of four divisions by using operating gross profits and average salaries per male employee as independent variables, and total costs as dependent variable using the Comprehensive Statistics of Agricultural Cooperatives (1980-1987). As a result, he found that there exist specific economies of scale in the credit business.

Further, Kawamura and Murakami (1990) estimated the cost function of 73 agricultural cooperatives for four divisions with total profit, numbers of agricultural advisors and average salary per staff in Iwate Prefecture in 1988. They conclude as follows. When they simulate with an assumption that the wage ratio is the same as that of merging agricultural cooperatives, mergers in all areas are favorable. With the assumption that the wage rate is the same with that of merging agricultural cooperatives, mergers in all areas are still favorable. With the assumption that the

wage rate is the same as the highest of merging cooperatives, mergers in some areas are unfavorable.

To date, no previous quantitative studies on the performance of mergers in agricultural cooperatives in Japan have been conducted. However, there have been some case studies of mergers among Agricultural cooperatives. The National Agricultural Cooperatives Association (1989b) investigated 44 cooperatives mergers which occurred during the period, 1965 to 1986. Concerning merger performance, agricultural cooperatives responded that (I) they could reduce the burden by: 1) the interest rate of loans (21 agricultural cooperatives), and 2) enlarging the amount of loans (16 agricultural cooperatives), and that (II) they could strengthening the management base by: 1) building up the organization by increasing the number of members, and 2) strengthening their business functionality.

Shigemune (1989) obtained 645 (78.2%) responses by sending a questionnaire to 825 agricultural credit cooperatives which compose 20% (of the cooperatives in existence) in 1987. Concerning merger performance, the top five goals of average agricultural cooperatives which merged are as follows.

- 1) to become sound financially (53.3%);
- 2) fixing facilities for members (50.7%);
- 3) to strengthen the advisory system of managing farms (46.0%);
- 4) to improve management performance (32.6%);
- and
- 5) to make progress on the mechanization of office equipment (32.2%)

There are some differences of the goals of merging and non-merging agricultural cooperatives. Merging cooperatives want a highly sound financial foundation. Non-merging cooperatives

value a strong political voice in the association.

Takada (1991) examined the effects of mergers of two agricultural cooperatives by comparing their goals to the national average. He pointed out that the higher rate of increase of savings, loans, the amount of long term mutual relief, the amount of purchasing, the amount of marketing and equity after merger for merging agricultural cooperatives, Miyakonojyo agricultural cooperatives in Miyazaki Prefecture than the national average for the period of 1975 and 1987. However, the ratio of operating cost to operating profit and operating profit per full-time officer and employee for merging agricultural cooperatives are still lower than national average.

He also analyzed Kobe City West agricultural cooperatives, and found a larger increase in the ratio of long term mutual relief and equity, but a lower ratio of savings, loans, the amount of purchasing, and the amount of marketing for the period from 1966 to 1987 in comparison to the national average. Further, the ratio of operating expense to operating profit is lower and labor productivity is higher for merging agricultural cooperatives.

II The Performance of Mergers

To measure the performance of mergers in agricultural credit cooperatives, it is necessary to compare both merging and non-merging cooperatives. In most cases, mergers in agricultural cooperatives are carried out between several cooperatives rather than just two.

In Gifu Prefecture, there were a maximum of 352 cooperatives in 1950, but the number was reduced to 79 cooperatives by 1988, due to mergers, dissolution, and moving out. Appendix shows a list of 58 merging agricultural cooperatives which had 12 mergers, and corresponding non-merging cooperatives to be considered most suitable as pair after merger in Gifu prefecture.⁵⁾

Fourteen financial ratios which compare the differences in financial characteristics between merging and non-merging cooperatives were selected from Ministry of Agriculture, Forestry and Fisheries (1989). This is shown in Table 2. Three out of the 14 ratios have statistically significant differences in their means in columns (I) or (II) in Table 2. When both columns (I) and (II) have no significant differences, there were no differences before and after mergers. They are the ratio of cash and deposit to savings (3), the ratio of loan to savings (4), and the ratio of personnel expenses to operating expenses (9).

The ratio of cash and deposits to savings (3) is not statistically significantly different in its means before and after mergers as shown in Column (II) of Table 2. However, the corresponding merging agricultural cooperatives have a significant difference before and after mergers (56.24% vs.

40.11%), indicating less liquidity after mergers. This ratio is calculated by dividing savings defined as liabilities into cash and deposits defined as assets. The ratio of loans to savings improves after mergers (46.91% vs. 56.75%), indicating an improvement in financial condition. The ratio of personnel expense to operating expense increased after mergers (69.80% vs. 72.83%), indicating a negative effect of mergers. In summary, merger has rather negative effect.

Concerning the standard deviations of ratios before and after mergers, there are four ratios which Column (I) or Column (II) show as statistically significantly different. They are the net profit to total assets ratio (7), the ratio of operating expense to operating profit (8), the ratio of personnel expense to operating expense (9), and the ratio of operating profit to fixed assets (10). The ratios (7) and (10) have significant differences in Column (II); non-merging agricultural cooperatives which are 0.43% vs. 0.74% and 93.83% vs. 222.80% before and after mergers, respectively. Relatively speaking, this indicates a lowering effect on the standard derivations of these ratios by mergers. This is a stabilizing effect. However, ratio (8) is 49.28% vs. 326.14% before and after mergers for merging agricultural cooperatives, which shows a destabilizing effect. Moreover, ratio (9) is 11.04% vs. 6.73% for non-merging agricultural cooperatives indicating a destabilizing effect of mergers. To sum up, merger has neutrality on the stabilization of ratios.

Next we compare the ratios of merging and non-merging agricultural cooperatives before merger in Column (III), and

after merger in Column (IV). Merely, there are three ratios: the current ratio (1), the ratio of cash and deposits to savings (3); and the ratio of operating expense per full-time officer and employee (12).

Ratio (1) has a statistically significant difference only after mergers with means of 100.02% vs. 104.18% for merging and non-merging agricultural cooperatives as shown in Column (IV). This indicates non-merging agricultural cooperatives have higher liquidity, a favorable characteristic. Similarly, the ratios of cash and deposits to savings (3) are 40.08% vs. 51.10%, a significant difference for merging and non-merging agricultural cooperatives.

This also shows a favorable trend for non-merging agricultural cooperatives. The operating expenses per full-time officer and employee (12) are ¥2,105,000 vs. ¥1,752,000 for merging vs. non-merging agricultural cooperatives, meaning higher efficiency for non-merging agricultural cooperatives.

Therefore, the overall effect of mergers as shown by comparisons of Columns (I) and (II), and (III) and (IV) of Table 2, is negative. However, these comparisons show no effect for mergers on profitability related ratios.

Column (V) of Table 2 compares general financial ratios between merging and non-merging agricultural cooperatives. There are four ratios with statistically significant differences in their means. The fixed asset to equity ratios (2) are 77.74% vs. 118.37% for merging and non-merging agricultural cooperatives, which indicates that non-merging agricultural cooperatives have greater financial soundness.

The ratios of net profit to total assets (7) are 0.56 vs. 0.86 for merging and non-merging agricultural cooperatives, indicating higher profitability for non-merging agricultural cooperatives. The ratio of personnel expense to operating expense (9) are 71.33% vs. 67.63%. Non-merging agricultural cooperatives have a lower burden of personnel expense. The ratio of operating profit to fixed assets (10) are 110.63% vs. 178.59%, which indicates higher turnover for non-merging agricultural cooperatives. It is quite clear that the financial characteristics of non-merging agricultural cooperatives are superior to merging agricultural cooperatives.

There are not any significant trends in the size of ratio standard deviations between merging and non-merging agricultural cooperatives.

Column (VI) of Table 3 compares the financial characteristics of agricultural cooperatives before and after mergers. Ratio (3), the ratio of cash and deposits to savings, and (4), the ratio of loans to savings have a trend opposite to the size. This is shown by the ratios: 54.42% vs. 45.59%, and 47.65% vs. 55.92% before and after merger. The ratios of personnel expense to operating expense (9) are 68.01% vs. 70.93% before and after mergers. All the four productivity related ratios: (11) operating profit per full time officer and employee, (12) operating expense per full time officer and employee, (13) savings per member and (14) loans per member, are higher after mergers with a statistically significant difference in their means. This might be due to both internal and external growth.

Table 3 shows the classification and accuracy of a

discriminant analysis, which was applied to the same data used in Table 2, and corresponds to Columns (I)-(IV) of Table 1. Column (I) shows the classification accuracy of merging agricultural cooperatives, 95.83% before and after merger, which is about 5% higher than that of Column (II) which shows non-merging agricultural cooperatives, 91.67%.

The same trend is observed in Column (III) for merging and non-merging agricultural cooperatives before mergers with an accuracy 81.25% and in Column (IV) after mergers with an accuracy 90.63%. Mergers contributes to an increase in accuracy.

III Analysis by Relative Financial Ratios

The relative financial ratios of agricultural cooperatives are compiled from the difference in absolute financial ratios between merging and non-merging agricultural cooperatives as follows.

$$d_{ijk} = M_{ijk} - N_{ijk}$$

where,

d_{ijk} : relative financial ratio k ($k = 1, 2, \dots, 14$), of the i th ($i = 1, 2, \dots, 58$) agricultural cooperatives at the j th ($j = 1969, \dots, 1983$) year

M_{ijk} : financial ratio k of the i th merging agricultural cooperatives at the j th year.

N_{ijk} : Corresponding financial ratio k of the i th non-merging agricultural cooperatives at the j th year.

Table 4 compares agricultural cooperatives before and after merger for the whole year, one year, two years and three years. There are three ratios with statistically significant differences in their means. They are the ratio of cash and deposits to savings (3) with means of 3.64% vs. -11.02%, a negative effect after mergers, and operating profit per full-time officer and worker (11), (-¥112,900 vs. ¥296090) with a positive effect, and operating expense per full-time officer and employee (12) (-¥27,030 vs. ¥353,060), also with a negative effect. The two ratios with opposite effects offset each other.

Yearly comparisons of agricultural cooperatives from one year to three years, are provided in Table 4. There are no

financial ratios with significant differences in their means in the comparison of one year before and after mergers. But there are three ratios with significant differences in their standard deviations. The net profit to equity ratio (6) and the net profit to total assets ratio (7) have higher values while the ratio of personnel expense to operating expense (9) has a lower value after mergers. No clear trend is found. In comparison with data two years before and after mergers, no financial ratios with significant differences in their means are found.

Five more ratios such as (1) the current ratio, (3) the ratio of cash and deposits to savings, (11) operating profit per full-time officer and employee, (12) operating expense per full-time officer and employee and (14) loans per member are found as ratios with significant differences in their standard deviations. Except for (1) the current ratio, four other ratios have higher values after mergers.

Comparing three years before and after mergers, two ratios, (3) the ratio of cash and deposits to savings and (12) operating expense per full-time officer and employee are found as ratios with statistically significant differences in their means. This shows the same trend when compared to the fourth year.

Table 5 shows the classification accuracy of agricultural cooperatives using discriminant analysis from one to four years before and after mergers. The classification accuracy of one year before and after merger is 79.17% and 75.00% for two years, 76.39% for three years, and 84.38% for four years, the highest of all, before and after mergers. This result supports the previous tests of t and F values.

Conclusion

We find the following facts by comparing financial ratios for 58 merging and 12 non-merging agricultural cooperatives in Gifu Prefecture using t and F tests, and discriminant analysis. By comparison of merging and non-merging agricultural cooperatives, a negative merger effect is seen in four ratios: (1) the current ratio, (3) the ratio of cash and deposits to savings, (9) the ratio of personnel expense to operating expense, and (12) operating expense per full-time officer and employee. A positive effect is associated with (4) the ratio of savings to loans.

By using relative financial ratios, the difference in financial ratios of merging and non-merging agricultural cooperatives, (11) the operating profit per full-time officer and employee shows positive effect, and (3) ratio of cash and deposit to savings and (12) operating expense per full-time officer and employee have negative effect.

However, both methods do not contribute to find merger effect on profitability-related ratios.

In summary, we find negative merger effects for agricultural cooperatives in Gifu prefecture in Japan.

A general comparison of financial ratios between merging and non-merging agricultural cooperatives shows that non-merging agricultural cooperatives are superior to merging agricultural cooperatives on ratios such as (2) the fixed asset to equity ratio, (7) the net profit to total asset ratio, (9), the ratio of personnel expense to operating expense, and (10) the operating profit to fixed asset.

Takada (1989b) pointed out that bigger agricultural cooperatives have lower cost related ratios and they are more efficient than smaller agricultural cooperatives. However, even if this is true, we can not conclude that mergers contribute to improvement in management efficiency.

Corporate growth is composed of internal growth and external growth, i.e. merger. Internal growth by enlargement of the size of the organization is connected to raising management efficiency.

A nation-wide complete data base is necessarily to measure the performance of mergers among agricultural cooperatives. The currently available data is quite incomplete.⁶⁾ Even management analysis implemented by the Ministry of Agriculture, Forestry and Fisheries of the Japanese Government covers only 286 agricultural cooperatives, about 7% of all the 3,998 agricultural cooperatives in 1988. We hope for a more complete set of data and full disclosure of information by agricultural cooperatives in Japan and the Japanese Government.

Notes

- 1) See Ministry of Agriculture, Forestry and Fisheries(1990).
- 2) See above.
- 3) Kitagawa (1989) describes various policies and operations for promoting mergers of agriculture credit cooperatives for the period of October 1953 to the seventh extension of the Act for Mergers to Advance Agricultural Cooperatives by the Ministry of Agriculture, Forestry and Fisheries, and the National Agricultural Cooperatives Association of Japan.
- 4) The National Agricultural Cooperative Association, and the Agricultural Development and Training Center (1989) examine the cases of Mie and Hyogo Prefecture. Umino (1986) studied Ibaragi, Ono, etc. (1987), Tabuchi (1989), Sakashita (1990) and Watanabe (1990) study Hokkaido.
- 5) The agricultural cooperatives with 5,000 homes and over are most efficient in terms of total cost ratio and operating expense ratio. However, the smallest agricultural cooperatives with less than 500 homes are rank second out of 6 on operating expense ratio and third on total cost ratio. We can not expect so simple relationship between the size and efficiency.
- 6) We investigated three prefectures in the Tokai area, Aichi, Gifu and Mie Prefectures. In Mie Prefecture, samples including merging and non-merging agricultural cooperatives could not be selected to cover a period long enough for analysis. In Aichi Prefecture, only three agricultural cooperatives merged in 1981, 1982, 1983 and can be used as

and 1950. Thus, we only analyzed mergers in Gifu prefecture to avoid errors due to completely different years with ten years' time difference.

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Table 1 Yearly Number of Mergers in the Agricultural Cooperatives

		No. of Merger	No. of AC joined	No. of AC	Index	Period of Law
Enforcement of Agriculture Merger Subsidy	1961	137	541(6)	11,586	96.1	1961 1966
	1962	210	912(10)	10,813	89.7	
	1963	216	967(12)	10,083	83.7	
	1964	237	1,066(18)	9,135	75.8	
	1965	578	2,599(34)	7,320	60.7	
The first Amendment	1966	35	135(15)	7,209	59.8	1966 1970
	1967	58	169(3)	7,074	58.7	
	1968	218	829(8)	6,410	53.2	
	1969	99	378(7)	6,185	51.3	
Second Amendment	1970	42	162(2)	6,049	50.2	1970- 1972
	1971	102	439(5)	5,688	47.2	
Third Amendment	1972	101	393(2)	5,488	45.5	1972 1975
	1973	67	286(4)	5,198	43.1	
	1974	119	434	4,942	41.0	
Fourth Amendment	1975	60	225(5)	4,803	39.9	1975 1979
	1976	25	65	4,763	39.5	
	1977	56	160(3)	4,657	38.6	
	1978	31	101	4,583	38.0	
---	1979	11	32(1)	4,546	37.7	---
Fifth Amendment	1980	16	50(1)	4,528	37.6	1980 1983
	1981	35	85	4,473	37.1	
	1982	44	116(2)	4,373	36.3	
---	1983	22	63(1)	4,317	35.8	---
1984	17	49(1)	4,303	35.7		
1985	19	55	4,267	35.4		
Sixth Amendment	1986	24	75	4,205	34.9	1986 1989
	1987	38	126	4,072	33.8	
	1988	62	250(1)	3,898	32.3	
Seventh Amendment	1989	92	306	3,685	30.6	1989- 1992
Total	--	2,771	11,068(141)	---	---	---

National Agricultural Cooperatives' Merger Subsidizing Headquarter and National Agricultural Cooperative Association (1990)

Table 2 Comparisons of Merging and Non-Merging Agricultural Cooperatives before and after Mergers

Financial ratios	statistics	(I)		(II)		(III)	
		Merging A.C. Before Merger	After Merger	Non-Merging A.C. Before Merger	After Merger	Before Merger Merging A.C.	Non-Merging A.C.
(1) Current ratio	Means	98.75	100.02	122.67	104.22	98.74	122.67
	Standard deviations	6.94 c	2.29	158.68 c	5.44	6.94 c	158.68
(2) Fixed Assets to equity	Means	80.34	75.10	103.54	132.87	80.34 a	103.86
	Standard deviations	58.84 a	77.63	161.43 c	154.56	58.84	61.85
(3) Ratio of cash and deposit to savings	Means	56.24 c	40.11	52.60	51.10	56.24	52.66
	Standard deviations	17.53	16.34	18.78	18.74	17.53	18.78
(4) Ratio of loan to savings	Means	46.91 a	56.75	48.66	55.10	46.64	48.66
	Standard deviations	19.49	20.75	20.41	19.00	19.71	20.41
(5) Net Equity ratio	Means	2.92	3.44	3.00	3.53	2.92	3.00
	Standard deviations	0.65 c	4.47	1.40	2.18	0.65 c	1.40
(6) Net profit to equity	Means	21.62	23.40	29.78	45.52	21.62	29.78
	Standard deviations	14.01 c	20.99	43.96 c	154.14	14.01 c	43.96
(7) Net profit to Total assets	Means	0.58	0.55	0.71	1.01	0.58	0.71
	Standard deviations	0.24	0.27	0.43 c	1.74	0.24 c	0.43
(8) Ratio of operating expense to operating profit	Means	125.98	194.73	141.18	125.95	125.98	141.18
	Standard deviations	49.28 c	326.14	104.70	107.79	49.28 c	104.70
(9) Ratio of personnel expense to operating expense	Means	69.80 c	72.83	66.23	69.02	68.81 a	66.23
	Standard deviations	3.87	4.61	11.04 c	6.73	3.87 c	11.04
(10) Operating profit to fixed assets	Means	113.56	107.39	162.75	194.42	113.56 c	162.75
	Standard deviations	47.89	39.06	93.83 c	222.80	47.89 c	93.83
(11) Operating profit per full-time officer and employee	Means	958 c	2739	1071 c	2441	958.24	1071.14
	Standard deviations	396 c	929	432 c	899	396.43	431.73
(12) Operating expense per full-time officer and employee	Means	702 c	2105	729 c	1752	701.72	728.75
	Standard deviations	220 c	717	232 c	653	220.09	232.18
(13) Savings per member	Means	890 c	1860	1087 c	2226	890	1087
	Standard deviations	478 c	817	729 c	1205	478 c	729
(14) Loan per member	Means	418 c	1050	503 c	780	418	503
	Standard deviations	1334 c	632	404 c	645	344	404

1) 'a' indicates the statistically significant difference at the 5% level; 'c' at the 0.1% level.

2) Ratios are expressed in thousand yen.

Table 2 continued

Financial ratios	statistics	(IV)		(V)		(VI)	
		After Merger Merging A.C.	Non-Merging A.C.	Merging A.C.	Non-Merging A.C.	Before Merger	After Merger
(1) Current ratio	Means Standard deviations	100.02 c 2.29	104.18 5.96	99.38 5.18 c	113.42 112.08	110.01 112.36 c	102.10 4.95
(2) Fixed Assets to equity	Means Standard deviations	75.15 a 77.62 c	132.87 154.56	77.74 c 66.49 c	118.37 118.00	92.10 58.88 c	104.01 125.06
(3) Ratio of cash and deposit to savings	Means Standard deviations	40.08 c 16.33	51.10 18.74	48.16 18.71	51.85 18.68	54.42 c 18.16	45.59 18.34
(4) Ratio of loan to savings	Means Standard deviations	56.75 20.75	55.10 19.00	51.69 20.76	51.88 19.88	47.65 c 19.98	55.92 19.81
(5) Net Equity ratio	Means Standard deviations	3.43 4.47 c	3.53 2.18	3.17 3.19 c	3.26 1.84	2.96 1.08 c	3.48 3.50
(6) Net profit to equity	Means Standard deviations	23.60 21.17 c	45.51 154.14	22.61 17.88 c	37.65 113.02	25.70 32.71	34.56 107.99
(7) Net profit to Total assets	Means Standard deviations	0.55 1.01 c	0.27 1.74	0.56 a 0.25 c	0.86 1.27	0.64 0.35 c	0.78 1.26
(8) Ratio of operating expense to operating profit	Means Standard deviations	194.94 326.10 c	125.95 107.79	160.46 234.55	133.56 105.97	133.58 81.75 c	160.45 244.05
(9) Ratio of personnel expense to operating expense	Means Standard deviations	72.85 c 4.61 a	69.02 6.73	71.33 c 4.51 c	67.63 9.20	68.01 c 8.42 c	70.93 6.05
(10) Operating profit to fixed assets	Means Standard deviations	107.70 a 38.97 c	194.42 222.80	110.63 c 43.53 c	178.59 170.76	138.16 78.11 c	151.06 164.95
(11) Operating profit per full-time officer and employee	Means Standard deviations	2739 928	2443 899	1819 1142	1757 984	1015 416 c	2591 921
(12) Operating expense per full-time officer and employee	Means Standard deviations	2105 a 717	1752 653	1404 881 a	1240 709	715 c 225 c	1929 705
(13) Savings per member	Means Standard deviations	1860 817 c	2225 1205	1375 825 c	1656 1144	988 c 620 c	2043 1040
(14) Loan per member	Means Standard deviations	1049 632	1180 645	734 598	841 634	460 c 375 c	1114 639

Table 3 Classification and Accuracy of Merging and Non-Merging Agricultural Cooperatives by Discriminant Analysis

(I) Before and After of Merging A.C.				(II) Before and After of Non-Merging A.C.			
Predicted Actual	Before Merger	After Merger	Total	Predicted Actual	Before Merger	After Merger	Total
Before Merger	48	0	48	Before Merger	48	0	48
After Merger	4	44	48	After Merger	8	40	48
Total	52	44	96	Total	56	40	96
Accuracy = 95.83%				Accuracy = 91.67%			
(III) Merging and Non-Merging A.C. Before M.				(IV) Merging and Non-Merging A.C. After M.			
Predicted Actual	Merging A.C.	Non-Merging A.C.	Total	Predicted Actual	Merging A.C.	Non-Merging A.C.	Total
Merging A.C.	42	6	48	Merging A.C.	44	4	48
Non-Merging A.C.	12	36	48	Non-Merging A.C.	5	43	48
Total	54	42	96	Total	49	47	96
Accuracy = 81.25%				Accuracy = 90.63%			
(V) Merging and Non-Merging A.C.				(VI) Before and After Merger			
Predicted Actual	Merging A.C.	Non-Merging A.C.	Total	Predicted Actual	Before Merger	After Merger	Total
Merging A.C.	84	12	96	Before Merger	95	1	96
Non-Merging A.C.	26	70	96	After Merger	16	80	96
Total	110	82	192	Total	111	81	192
Accuracy = 80.21%				Accuracy = 91.15%			

Table 4 Yearly Comparison of Merging Agricultural Cooperatives by Relative Financial Ratios

Financial ratios	Statistics	four years		one year		two years		three years	
		Before Merger	After Merger	Before Merger	After Merger	Before Merger	After Merger	Before Merger	After Merger
(1) Current ratio	Means Standard deviations	-23.93 158.91 c	-4.16 5.89	0.25 4.79	-2.54 4.34	-45.69 224.75 c	-3.85 6.78	-31.66 183.47 c	-4.07 6.21
(2) Fixed Assets to equity	Means Standard deviations	-23.52 75.81 c	-57.73 24.90	-30.24 93.70	-1.29 62.88	-27.57 84.60	-19.82 70.05	-26.89 81.88 c	-58.01 157.76
(3) Ratio of cash and deposit to savings	Means Standard deviations	3.64 c 19.21	-11.02 25.21	0.35 19.14	-12.62 33.42	0.52 18.23 a	-11.17 28.46	4.44 a 20.95	-10.43 26.51
(4) Ratio of loan to savings	Means Standard deviations	-2.02 18.62 a	1.64 25.11	1.22 15.79	1.15 27.47	1.93 17.32	1.46 23.98	-2.29 19.56	1.21 24.66
(5) Net Equity ratio	Means Standard deviations	-0.08 1.37 c	-0.10 4.96	-0.33 1.57	-0.80 1.28	-0.19 1.46	-0.45 1.61	-0.16 1.42 c	-0.81 2.63
(6) Net profit to equity	Means Standard deviations	-8.15 47.84 c	-21.92 156.25	-2.22 18.00 c	-90.51 308.13	-2.41 19.90 c	-48.84 218.27	-3.69 21.39 c	-28.04 180.44
(7) Net profit to Total assets	Means Standard deviations	-0.13 0.54 c	-0.46 1.79	-0.07 0.51 c	-0.74 2.54	-0.07 0.51 c	-0.78 2.47	-0.12 0.55 c	-0.54 2.05

Table 4 Yearly Comparison of Merging Agricultural Cooperatives by Relative Financial Ratios

(8) Ratio of operating expense to operating profit	Means Standard deviations	-15.20 105.95 c	65.88 349.73	-3.70 104.95	-23.90 192.85	-11.19 97.72	12.54 148.33	-11.08 93.15 c	81.88 401.59
(9) Ratio of personnel expense to operating expense	Means Standard deviations	3.57 11.30	3.82 8.72	6.26 19.11 a	7.11 9.21	4.07 14.55 c	6.05 7.70	3.69 12.30	4.93 7.46
(10) Operating profit to fixed assets	Means Standard deviations	-49.19 91.23 c	-86.72 223.56	-35.01 98.99	-26.04 76.31	-36.95 100.96	-42.74 91.16	-45.19 96.42 c	-81.69 216.02
(11) Operating profit per full-time officer and employee	Means Standard deviations	-112.90 c 404.09 c	296.09 863.65	-122.62 531.34	-167.87 731.48	-105.86 474.59 a	25.65 781.48	-123.51 436.13 c	190.89 858.18
(12) Operating expense per full-time officer and employee	Means Standard deviations	-27.03 c 190.44 c	353.06 659.25	7.90 203.78	-25.42 378.04	-22.45 211.88 c	149.55 537.11	-27.30 c 201.37 c	258.35 581.74
(13) Savings per member	Means Standard deviations	-197.06 637.97 c	-365.26 1158.46	-255.20 841.64	-325.90 1013.27	-235.14 746.45	-326.95 1033.92	-201.72 678.02	-343.45 1083.85
(14) Loan per member	Means Standard deviations	-85.64 463.91 c	-128.82 864.60	-77.35 606.60	-144.20 835.21	-65.71 528.00 c	-129.14 823.89	-94.14 501.33 c	-137.05 844.51

1) 'a' indicates the statistically significant difference at the 5% level; 'c' at the 0.1% level.

2) Ratio are expressed in thousand yen.

Table 5 Classification and Accuracy of Merging Agricultural Cooperatives
by Relative Financial Ratios

four years			one year				
Predicted	Before Merger	After Merger	Total	Predicted	Before Merger	After Merger	Total
Actual				Actual			
Before Merger	45	3	48	Before Merger	10	2	12
After Merger	12	36	48	After Merger	3	9	12
Total	57	39	96	Total	13	11	24
Accuracy = 84.38%			Accuracy = 79.17%				
two years			three years				
Predicted	Before Merger	After Merger	Total	Predicted	Before Merger	After Merger	Total
Actual				Actual			
Before Merger	17	7	24	Before Merger	31	5	36
After Merger	5	19	24	After Merger	12	24	36
Total	22	26	48	Total	43	29	72
Accuracy = 75.00%			Accuracy = 76.39%				

Appendix A List of Merging and Non-Merging Agricultural Cooperatives

	Merging A.C. (No.)	Name after Merger	Year of establishment	Non- Merging A.C.	Administrativ branch
1972	Ajika, Oguma, Fukuju, Masaki, Egira, Hottsu, Shimonaka, Kuwahara, (8)	Hachimashi	4.2.1972	Takehana	Gifu
1972	Tonami, Taniai, Kuzuhara, Kitayama, Nishimuge, Kitamuge, Inui, (7)	Miyamacho	4.2.1972	Kaminaka	Gifu
1972	Minoshi, Suhara, Shimomaki, Kamimaki, Oyada, Aimi, Nakauchi, (7)	Minoshi	4.1.1972	Ikebe	Gifu
1972	Hachimancho, Aioi, Kuchimyogata, Nishiwara, Minamimura, Myogatomura, Waramura, (7)	Gujyo	3.1.1973	Takasumura	Seki
1972	Shirotori, Ushimichi, Hokuno, (3)	Shirotoricho	3.1.1973	Itoshiro	Seki
1972	Takayamashi, Daihachi, (2)	Takayamashi	3.1.1973	Nyukawa	Hida
1973	Naka, Nishiichiba, Inabahigashi, Inabanishi, Unuma, Kagami, Sohara, (7)	Kagamihara- shi	4.1.1974	Akanabe	Gifu
1973	Tokitu, Hida, Izumi, (3)	Tokishi- Sinyou	4.1.1974	Ichinokura	Touno
1973	Sakashitacho, Kawakamimura, Kashimomura, Tsukeychicho, Fukuokacho, (5)	Enakita	3.1.1974	Kamiasou	Touno
1973	Takehara, Nakahara, Uehara, (3)	Minami- mashita	3.1.1974	Gerocho	Hida
1974	Shimonoho, Nakanoho, Tominoho, Kaminoho, (4)	Tsuhogawa	3.31.1975	Horadomura	Seki
1977	Minamimuge, Higashimuge, (2)	Mugegawacho	3.31.1978	Itadori- mura	Seki
Total	(58)				

Gifu Prefectural Agricultural Cooperative Association (1988)