Over-occupied Agriculture in Japan

Sohei MARUTA
(*Agricultural Economics*)

1. Introduction

This paper aims at analysing the agricultural real income and productivity in order to examine a disguised equilibrium situation, which is a real form of the over-occupied agricultural community in Japan. Especially, the concept of such a family farming as expresses sharply a low marginal productivity of labor, will be exactly defined and extended, and the relation of the over-occupation to monetary capital will be made clear.

2. Inquiry in the disguised equilibrium

Disguised equilibrium is stated as follows. " A ruling form of farmers is an independent farmer after the agricultural land reform, where we have reached a common concept that a disguised equilibrium comes into existence, which is the situation to stand at the position, having simultaneously both the real income parity and the disparity of productivity from the point of view of a whole economy."(1) We could verify the disparity of productivity

Table 1-1. Nominal average yearly agricultural income and average yearly cash earnings of regular workers in manufacturing industries (In yen)

		1949	'50	'51	'52	'53	'54	'55	'56
Agriculture per household	(a)	115,419	147,355	185,020	198,639	201,234	212,940	255,584	231,024
Manufac-turing. Total regular workers	(b)	90,192	109,596	140,496	162,192	183,864	195,696	200,604	220,176
Male regular workers	(c)			173,040	201,108	229,776	243,048	250,668	277,872
Regular production workers	(d)				143,748	162,144	172,020	175,116	191,628

Source : (a), *Farm Household Economy Survey*. (b), (c) and (d), Annual sum of *the Monthly Wages Survey* data.

Table 1-2. Real income above mentioned

	'49	'50	'51	'52	'53	'54	'55	'56
(a)			185,020	193,983	191,105	196,620	235,996	210,596
(b)	97,822	127,586	140,496	154,469	164,311	165,088	200,336	177,868
(c)			173,040	191,531	205,340	204,071	212,791	234,689
(d)				136,903	144,901	144,433	148,655	161,848

The deflator of (a) is the general price index of household commodities in agricultural community. (Average April 1951~March 1952= 100)
The one of (b), (c) and (d) is the consumer price index. (Average 1951= 100)

(1) K. ŌKAWA : *Economic Analysis of Agriculture, Tokyo,* 1955, pp. 126.

Table 2-1. Nominal hourly income of agriculture and manufacturing industries

(In yen/hour)

		1950	'51	'52	'53	'54	'55	'56
Agriculture	(a)	*27	*38	39	41	45	54	49
Total regular workers	(b)	48	61	70	78	83	84	90
Regular production workers	(c)			62	69	73	74	78
Temporary & daily workers	(d)			40	41	43	43	45
Male agricultural wages	(e)	23	24	28	29	32	33	35
(a)/(b)×100	(%)	*56	*62	56	53	54	64	54
(a)/(c)×100				63	59	62	73	63
(a)/(d)×100				98	100	105	126	109
(e)/(b)×100		48	39	40	37	39	39	39
(e)/(c)×100				45	42	44	45	45
(e)/(d)×100				70	71	74	77	78

(a) is average yearly agricultural income of the whole country divided by hours of family workers, but * mark divided by days engaged, multiplied by nine hours.
(e) is the results of *the Price and Wage Survey in Rural Village* divided by nine hours.
(b), (c) are average earnings of *the Monthly Wage Survey* divided by monthly average working hours and (d) a daily wage done by eight hours.

Table 2-2. Real hourly income

(In yen/hour)

		1950	'51	'52	'53	'54	'55	'56
(a)			38	38	39	42	50	45
(b)		56	61	67	70	70	71	76
(c)				59	62	61	63	66
(d)				38	37	36	37	38
(e)			24	27	28	30	30	32
(a)/(b)	(%)		62	57	56	60	70	59
(a)/(c)				64	63	69	79	68
(a)/(d)				100	105	117	135	118
(e)/(b)			39	40	40	43	42	42
(e)/(c)				46	45	49	48	48
(e)/(d)				71	76	83	81	84

Deflator of (a) and (e) is the general price index of household commodities in agricultural community. (Average April 1951~March 1952=100)
Deflator of (b), (c) and (d) is the consumer price index. (Average 1952=100)

if some factual assumptions are laid down, but could not obtain the necessity of real income parity. Accordingly, the latter requires a concrete confirmation, while the former becomes clear if it is inductively analyzed in the sense of a test of a hypothesis.

Now, first of all, we begin to examine whether real income is equal or not, for it is easy to conceive this by an objective indicator. We are going to compare agricultural income with the labor earnings of manufacturing industries as the representative of non-agriculture for comparison. On Table 1-1 and 1-2, annual agricultural income per farm

household in the whole of Japan is about equal to yearly male earnings of regular workers in manufacturing industries but the latter has been somewhat higher for nominal amount since 1952 and for real amount since 1953. The reason why the earnings of total regular workers were taken as a comparison is that they are the averaged income of both industrial laborers and managerial, clerical and technical workers, while agricultural income also involves such functional incomes, and the earnings of production workers are mentioned for reference.

Now, since the number of agricultural occupiers is 2.65 per household in 1955, the income per head is less than one half. Further exactly calculated amounts per hour are illustrated on Table 2. The levels of agricultural income are nominaly about 50 to 60 percent compared with manufacturing ones, while real amounts about 60 per cent level. An hourly wage rate of production workers within total regular workers is lower than the latter by about 10%, therefore that approaches to the level of agricultural income per hour. Further an hourly wage rate of temporary and daily workers is more lowered, which is in parity with agricultural income per hour as a rule, and has been relatively going down since 1953.

Now, the earnings of manufacturing workers except managerial ones are almost the functional income of labor, namely wage-earnings, whereas agricultural income may include, besides labor income, capital return, owned land one and the difference between economic rent and controlled paid rent if a tenant land or lease would be used that is the so-called mixed income. Comparing the mixed income with male agricultural wages on Table 2, the former is higher by about 30% of itself, the very higher part of which is regarded as non-labor income as far as it is assumed that agricultural wages are equal to valued marginal productivity of labor under perfect competition.

On the other hand, if an hourly wage rate of manufacturing industries is similarly assumed to be under perfect competition, it seems as if agriculture was over-occupied due to the difference between agricultural wages and that, for it is our definition of an over-occupied situation that the marginal productivity of labor in an industry is constantly lower than the one in the other industry. However, manufacturing industries have a temporary and daily worker's wage rate besides a regular worker's one and the latter is usually influenced by the organized labor union, while the former workers are not almost organized, therefore it is ready for them to be discharged at any time. Accordingly, their wages rate may express directly a monopsonistic price of labor under mentioned, I suppose. On the other hand, the wage rate of regular workers is regarded as the level raised more or less higher than the one of non-regular workers, owing to the organized power of labor union. However, it admits of no hasty conclusion as to whether it is above the equilibrium level

Table 3. Average monthly cash earnings of regular workers by industry (In yen)

	Total	Mining	Manufac-turing industry	Whole sale & retail trade	Finance & insurance	Transportation, communicaion & other public utilities	Real estate	Construc-tion
Earnings	18,624	18,488	16,717	17,963	25,132	21,812	21,941	14,609
Index (%)	100	99	90	96	135	117	118	78

Source: *Monthly Wages Survey*, 1955.

Table 4-1. Average monthly earnings of regular workers by size of persons engaged in the manufacturing industry (In yen)

Size of persons engaged	Not less than 1000	999~500	499~200	199~100	99~30	29~10	9~4	less than 3
Monthly earnings	23,039	18,247	15,989	13,616	11,681	10,183	9,193	* 8,500
Index (%)	100	79	69	59	51	44	40	* 37
Total persons engaged by size	804,492	375,316	566,960	450,769	1,029,620	1,187,623	549,161	552,987

Source: *Census of Manufactures.*
* Two items are estimated by curve-fitting of a free hand method.

Table 4-2. Hourly agricultural income by size of agricultural income (In yen)

Size of yearly agricultural income	Not less than 700,000 yen	~ 500,000	~ 400,000	~ 300,000	~ 250,000	~ 200,000	~ 150,000	~ 100,000	~ 0	Not more than 0	Average
Hourly agricultural income	115	79	65	55	49	45	46	36	30	—17	53
Index (%)	100	69	56	48	43	39	40	31	26	—15	46

Source: New reports of the *Farm Household Economy Survey*, 1955.

under perfect competition or under it, because the answer depends on the supply elasticity of labor.

The level of an hourly agricultural wage rate is about 70 to 80 percent compared with a temporary and daily wage rate of manufacturing the difference between them decreasing to a certain extent, but it does not vanish completely.

Now, manufacturing industries is only the one within non-agriculture among which its wage level is lowest after construction as follows on Table 3. Accordingly, a weighted average wage rate of non-agriculture as a whole may be raised as a rule therefore wage differentials may become larger.

On the other hand, however, wage differentials by size of establishment is dominant, therefore we can see wage differentials of about 60 percent between the size of not less than 1000 persons and the one of 4 to 9 persons in the same manufacturing industries on Table 4-1. At the same time, agricultural income shows a dominant difference by income size on Table 4-2. As size standard and income period unit are different, they cannot be directly compared with each other, but it will be estimated with ease that the hourly agricultural income of upper classes makes equal to the hourly wage rate of manufacturing establishments by median sizes, for the former on Table 4-2 is over the latter average hourly rate on Table 4-2.

It is further important that Statistics of the *Monthly Wages Survey*, which is the source of manufacturing industries data, is sample means out of establishments by size not less than 30 workers as statistical population. The proportion of relatively larger establishments in such a range accounts only for 2 percent of all private and local government ones, 3,284,610, 98 percent of which and government and public corporations 24,258 are omitted. The proportion of persons engaged within the limits, however, adds up to 39 percent who get relatively higher earnings, while the rest, about 60 percent are to get lower ones. The

hourly wage rate of these very small establishments out of wage statistics might make further lower, for, besides the lower wage level, working hours per head are perhaps increased as it is often hard to keep the labor standards law. Although it is somewhat adventurous, we attempt the curve fitting of a wage level by size through a free hand method (Fig. 1), which may estimate the wage level of omitted class less than four workers engaged and after that when we get a weighted mean level of total persons engaged in all establishments, we can estimate that the wage level falls into about 80 percent level of hourly average earnings rate in 1955. Accordingly, its level approaches somewhat into one of agricultural income.

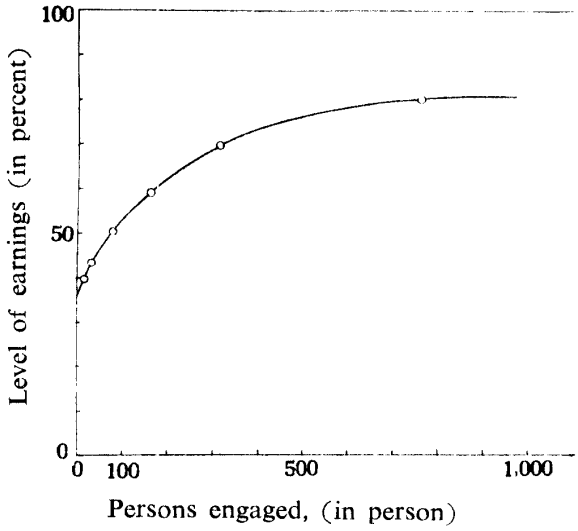

Fig. 1. The Level of earnings by size of persons engaged in the manufacturing industry

However, since the results of *Farm Household Economy Survey* are also inclined to upper classes through an inadequate sampling design, it falls into 73 percent level when average cultivated land per farm household is corrected by size from the result of *Special Basic Survey of Agriculture* in Feb. 1, 1955 taken as a first step. The correction of agricultural income through size of cultivated land assumes that the former is proportionate to the latter. But except the year of a disaster it is not proportioned to the other as a rule and, as size becomes smaller, income increases more than proportion and especially the class less than five tan of lands, the smallest class, is dominant for the trend. Accordingly, a true average value of agricultural income is estimated to be more than the figure corrected by cultivated land. Then after by means of Y. TSUMURA's method, agricultural incomes by size of cultivated land have been over again weighted through the number of farm households by size at Special Basic Survey of Agriculture of 1955, we could get a corrected figure of 81 percent level. Thus as this figure is almost equal to the corrected estimates of the earnings in manufacturing industries, it was verified that the different extent between them did not vary.

So far as an inquiry of worker's earninge is concerned, it is certain that agriculture is over occupied. On the other hand, the parity between yearly earnings per household and also even in hour unit the parity between agricultural income and temporary worker's wage rate impress us as the disguised equilibrium. However, so far we have seen merely wage differentials and the parity of income. Our concept of over-occupation is on the hypothesis that there is the structure of productivity in the origin and the latter could be conceived by taking the marginal productivity of labor as structural parametres. But it is unwarrantable that these coincide with factor prices. And also while it seems as if hourly agricultural income was equal to a temporary wage rate of manufacturing industries, we cannot make the composition of mixed income clear. If economic land rent and capital return are only a little, labor income accounts for bulk, therefore it goes near to true equilibrium, and on the contrary if those account for large proportion, it becomes to disparity, accordingly disguised equilibrium. Regarding agricultural wages as labor income of farmers and their families free from care, the latter accounts for about 80 percent of agricultural income, but

it is merely color blindness of a formal theory that the marginal productivity of family workers is indifferent to one of hired workers. We proceed to analyse productivity hereafter and to dig down the assumptions hitherto.

3. Analysis of productivity

As previously stated, the extent of over-occupation can be derived by the difference between the marginal productivity of labor in an industry and one of the other, on the occasion of which wage rates are often used as measures in place of marginal value productivity of labor. Such a substitute is allowed only when both the markets of produces and those of productive factors in at once agriculture and non-agriculture are perfect. Those supposition had been sufficient the late eighteenth century to the midnineteenth in the advanced countries but before World War I in Japan. In the real world where we are now living, markets of supply for consumer's goods have been already imperfect, whereas one of demand for intermediate goods and services above all are also imperfect in piles. On the other hand, markets of labor within agriculture seem to be perfect if they are isolated in themselves, while the markets of farm products for raw material between processing industries and farms are almost imperfect and the function of agricultural marketing in itself, as a rule, is imperfect, too. Moreover, besides such an imperfect equilibrium of capitalist economy, a limping economy of rapid progress like Japan is haunted with historic imperfection or relics, i.e., it is often paradoxically true for modern form in markets of products and labor at first sight to keep various characteristics prior to capitalist economy. Apart from historic character, such a classical possibility as marginal productivity of labor multiplied by a price of product may be equal to a wage rate can not be realized due to an imperfect equilibrium, but it has been modified in such a way that marginal value of products, namely marginal revenue, is as good as marginal value expense, therefore a wage rate comes to diverge from the marginal value productivity of labor. Accordingly, it is needed whether a wage rate be corrected by a degree of imperfection, i.e., one of monopoly or otherwise in order to obtain the true marginal productivity, which is a parametre necessary for the phenomenal definition for over-occupation. The former method needs elasticities of demand for products to each industry as well as elasticities of supply for labor, but we could hardly obtain every elasticity with ease, nor particularly of agricultural labor, therefore conversely we try to look for marginal productivity itself, with which the wage rate is compared in order to estimate a degree of imperfection. Needless to say, not a wage rate but marginal productivity of labor can be got from the production function.

If we select as an object an area, where conditions appear to be most sharply over-occupied, sub-causes operating to an object would be relatively weakened, whilst main causes would be comparatively made strong and clear. Thus in comparing the average hourly productivity of labor among nine agricultural districts in Japan Southern Sea District is the lowest of them and that Kagoshima Prefecture is the lowest within the district, vying with one another in the lowest of an agricultural wage rate by prefecture, too and being the largest for the proportion of farm population. On the other hand, as illustrated on Table 5, agricultural income per working hour is somewhat less than fifty percent of a wage rate of manufacturing regular workers, agricultural wages thirty to forty percent level of the latter, and both the differences themselves from the latter are about ten percent bigger than one of the general level of the whole country. Consequently, it is expected for the

Table 5. Hourly agricultural income and hourly manufacturing wage rate in Kagoshima Prefecture (In yen)

		1950	'51	'52	'53	'54	'55
Agricultural income per hour.	A		*23	27	32	34	37
Agricultural wage rate of temporary workers	B	*17	*16	*18	*19	*22	*23
Manufacturing wage rate of regular workers	C	37	43	56	68	72	
A/C × 100			53	48	47	47	
B/C × 100		46	36	32	28	31	

Source: A, B: *Kagoshima Agriculture & Forestry Statistics*, 1955.
C : *The Monthly Wages Survey.*
Mark: * : Daily values were divided by 9.4 hours per day.

over-occupied degree to be higher. If so, it would be highly possible that the parity of real income might be thwarted. Accordingly, it seems to be fitted for the actual proof analysis of both productivity and occupation structure.

Data and variates·····The statistical year of manufacturing industries in Kagoshima Prefecture was taken in 1955, which can be regarded as the standard year of economic activities.

Observation values of both gross output and circulating capital goods were obtained from the individual cards of *the Manufactures Census*; ones of man-hours from ones of the *Monthly Wages Survey*. Numbers of horse-power were used as a substitute of fixed capital, since we could not get stock data of the latter, while depreciated amounts were not almost filled up on individual cards of census.

The sample size of establishments is sixty-six, the statistical population of which is the number of establishments by size not less than 20 regular workers engaged in the prefecture. A sampling design was made by a certain stratified randorn method but it is not left as it was made at the first design through avoidance owing to both a shortage of some motive power data and bankruptcy in the year.

The same statistical year as a manufacturing is desired for agriculture, too, but since a typhoon struck Kagoshima Prefecture, 1955, we avoided it, selecting 1953, in which 138 individual cards of *Farm Household Economy Survey* and 58 ones of *Rice-crop Production Cost Survey* were used, and then either of them is stratified into two groups, i.e, the one which used the hired labour and the other operated only by family labour as mentioned later.

Outputs are computed in terms of gross revenue from farming, for we shall not aim at only a farm management research but productivity as well as income distribution.

Inputs are as follows, i.e., first man-hours of family workers into farming in the year, second man-hours including temporary daily & seasonal hired labour and permanent yearly one, third man-hours of communal labour exchanged (including an odd job), fourth total acreage under crop, fifth the beginning value of fixed capital equipment and sixth used amounts of circulating capital goods.

The reasons why the labor of family workers is separated from either hired labor or communal labor are that firstly farm income per hour and an agricultural wage rate are different, and that it is necessary to test such a hypothesis as over-occupation may appear most sharply into family labor. The reasons why the third category of input, communal

labor was separated from hired labor are that accepted man power is not exchanged with money or in kind but with the earlier or later labor of this family itself, and communal labor ruling within a village has a similar characteristics with family labor, in which wage-earners can not be separated from employers. Since we have not yet been able to make the function of communal labor under regulation of so-called joint community so clear, it was separated to study as a factor providing for productivity. Fourth, the acreage of arable land is adapted for a variate from the proper nature of a production function if arable land is almost homogeneous, but since arable land with a different rate of utilization has the varying production function, total planted acreage was taken in order to reduce it to the same dimension. Of course we could not at all vanish the difference between paddy field and upland. Fifth, stock values in the beginning of the year were aggregated for fixed capital goods, because if value of flow is taken, the amount of fixed cadital goods may be likely to be under- or over-estimated, since we could not exactly enumerate the life of those goods. Another question is evaluation of such goods as an operator's dwelling, which is used for farming as well as living: if all value of stock for it was accounted for, it would look to be over-invested on the surface, for even the part of living use is regarded as farming one. Then we bundled it with another fixed goods after multiplying all evaluated value of a house by proportion of farming use in order to compute net value used only for farming use. Such a way was applied to animal- and plant-assets as well as buildings.

Type of a function·····We used a power function, so-called a certain general type of Douglas' function, firstly in order to reduce a vast number of computation raised owing to many variates and a number of observations. Next, transformation of observations to logarithms tends to make the sampling error distribute normally. Third, a multiplication form includes joint correlation to make a curve-fit better. However, it is more important that power form can represent the economic implication of productive power: under linear homogeneous function, we have the case of "constant return to scale", so that it includes

Table 6. Elasticity and marginal value productivity of productive factors at agriculture and manufacturing in Kagoshima Prefecture

		Labor			Circulating capital	Fixed capital	Planted acreage
		Family	Hired	Communal			
Elasticity	Agriculture	.2196	.0277	.0026	.4206	.1492	.2457
	Manufacturing	—	.5421	—	.5288	.0801	—
t value	Agriculture	2.7386	2.5294	.1461	10.2629	2.9496	2.7871
	Manufacturing	—	4.6118	—	8.0061	1.5543	—
Level of significance	Agriculture	1.0%	2.5	80.0	.5	.5	1.0
	Manufacturing	—%	.5	—	.5	20.5	—
Marginal value productivity	Agriculture	yen/hour 9.42	yen/hour 2.36	0	yen/yen 1.69	yen/yen .199	yen/hectare 35,700
	Manufacturing	—	yen/hour 143.86	—	yen/yen .81	yen/horse power 63,361	—

	Sum of elasticity	Adjusted coefficient of determination $\bar{R}^2$	Multiple correlation R	F	Degree of freedom	Stadard error of estimates
Agriculture	1.0653	.8755	.9385	161	131	.1189
Manufacturing	1.1510	.7982	.8986	86	62	.2100

both increasing labor productivity and diminishing capital productivity, advancing highly for composition of capital, while it does diminishing returns, increasing only an individual factor.

Results·····A coefficient of determination adjusted by a sample size is 88 percent in agriculture, while 80 percent in a manufacturing industry, both proportions of which are significant at the 0.5 percent level of significance, therefore it is highly possible to explain the variance of output through such variables as mentioned above. Every coefficients are illustrated in Table 6.

Marginal productivity of labor for a manufacturing industry is 144 yen per hour while a nominal hourly wage rate actually paid is about 50 yen on the average. (Although in row B, Table 5, a wage rate in 1954 was 72 yen it was the average one in establishments by size not less than 30 persons engaged, whereas the present value is the mean by size not less than 20 persons. The proportion of the number of establishments even within this size is only 2.5 percent of every one in Kagoshima Prefecture, whilst one of persons engaged occupies 30 percent.) First of all, here we can see those divergences between a wage rate and marginal value productivity, the latter of which is three times larger than the former. Even if we take the lower limit of the confidence interval for a regression coefficient, which is significant at 25 percent level of significance, an estimate of this is 108 yen, so that even this is twice as large as the wage rate. This divergence from the wage rate may not be due to the imperfect competition of selling products. The reason is as follows. Although we can not obtain the elasticity of demand for products to the industry, circulating capital goods which is complementary with labor, correlates by plus 0.6 with labor, whilst its marginal value productivity is 0.8 yen/yen, therefore the difference between 0.8 and unity of equilibrium level can be seen at a significance level of 10 percent (the upper limit of confidence interval is 0.93 yen/yen at 10 percent level of significance), but it cannot be done at one of 5 percent. Thus circulating capital goods may be employed to an optimal quantity or somewhat even over-employed. On the other hand, the market price of motive power per unit horse power as the representative of fixed capital is about ten thousand yen, whilst its marginal value productivity is sixty thousand yen, that is to say, marginal efficiency of capital is very high, too. That is due to the lack of capital equipment itself like motive power: this industry does not raise excess capacity nor reduction of operation. Accordingly, we can ignore the seller's monopolistic condition, unless large elasticity of demand for products to the industry can be obtained. Provided that the reason why a wage rate goes down to less than one half level of marginal value productivity, is not due to a seller's monopoly or oligopoly, we could mention a buyer's monopsony or oligopsony for labor and another institutional causes. In order to verify that mentioned, it is required for the elasticity of labor supply to the industry to be less than unity, but it is difficult to substantiate this hypothesis, being possible only to reason.

Within such a relatively small area as our prefecture, where agriculture surrounds the manufacturing industry, the former is supplying labor force to the latter, taking sometimes the form of living out. Both an wage rate and marginal value productivity of labor in agriculture are lower than one half of the manufacturing ones as follows later, therefore there exists really the so-called involuntary occupation. In such case, elasticity of supply for labor could not be infinite as far as a manufacturing wage rate and agricultural one are concerned. Thus we intend to derive a rough estimate from the next equation.

$$w = p\frac{\partial Y}{\partial A} - \frac{1}{E}w$$

Here w: Wage rate, p: Price of product, $\partial Y/\partial A$: Marginal productivity, E: Elasticity of supply for labor.

Assuming a wage rate to be 50 yen/hour on the average, in case of marginal value productivity of 144,

$$50 = 144 - \frac{1}{E}50$$

$$\therefore \quad E = .53$$

in case of 108,

$$50 = 108 - \frac{1}{E}50$$

$$\therefore \quad E = .87.$$

Thus elasticity of supply for labor is estimated less than unity. If it is pure monopsony, a coefficient of elasticity is to fall from 0.19 to 0.87 at 90 percent of confidence probability. But it could not immediately draw the conclusion that the wage rate of monopsonistic equilibrium turns up. Because, although statistical population is limited in establishments of 20 persons or more especially large modern factories like a pulp manufacturing or the tobacco monopoly corporation, whose output per man hour is predominantly high, are omitted, and the proportion of the modern economic system like either joint-stock company or a cooperative association is limited only to about 30 percent, while family businesses and individual enterprises by size from 20 to 30 persons engaged are of the majority, where workers cannot get together a strong union, therefore from the pre-capitalistic relation between laborer and capitalist it may be possible for a wage rate to go lower than the level of monopsonistic equilibrium. In other words the difference between marginal value productivity and a wage rate is not only exhausted to explain through monopsony of labor, but also by the institutional causes outside the pure economy. Accordingly, elasticity of supply for labor may be somewhat bigger at the level of monopsonistic equilibrium.

If non-economic causes would not operate anything about wage determination, the wage rate of regular workers might arrive at the level of monopsonistic equilibrium through the organized power of a labor union or even a little higher than it. However, a wage rate of temporary & daily workers, the supply elasticity of whom may show the lower limit, is so lower than the wage rate of regular workers, and that may be called apparent wage labor into which non-economic factors steal.

Examining the standard industry so far, we could illustrate that a wage rate tends to deviate lower than marginal value productivity mainly through monopsony of labor. Consequently the difference of wage rates between agriculture and non-agriculture reduces smaller than the one of productivities by themselves, and accordingly the extent of over-occupation in agriculture may be likely to be underestimated in case of the comparison between each wage rate. Thus we need pursue productivity itself, not a wage rate.

Results in agriculture……How many are marginal productivities in agriculture compared with such standard ones as mentioned above? First of all, it is the hired labor in agriculture that is to be mainly compared with, and the result is only 2 yen, which is also further less than an agricultural hourly wage rate, 23 yen. The relation between marginal productivity and a wage rate seems curious in contrast with one of the manufacturing industry. Here is a question on statistical technics. There are those 45 farms surveyed among all the 138 ones, which don't employ hired labor. Drawing the scatter diagram between hired labor and output, we got a correlation map in Fig. 2, which was broken at a left low corner of it on a vertical axis, therefore the breaking made the coefficient of

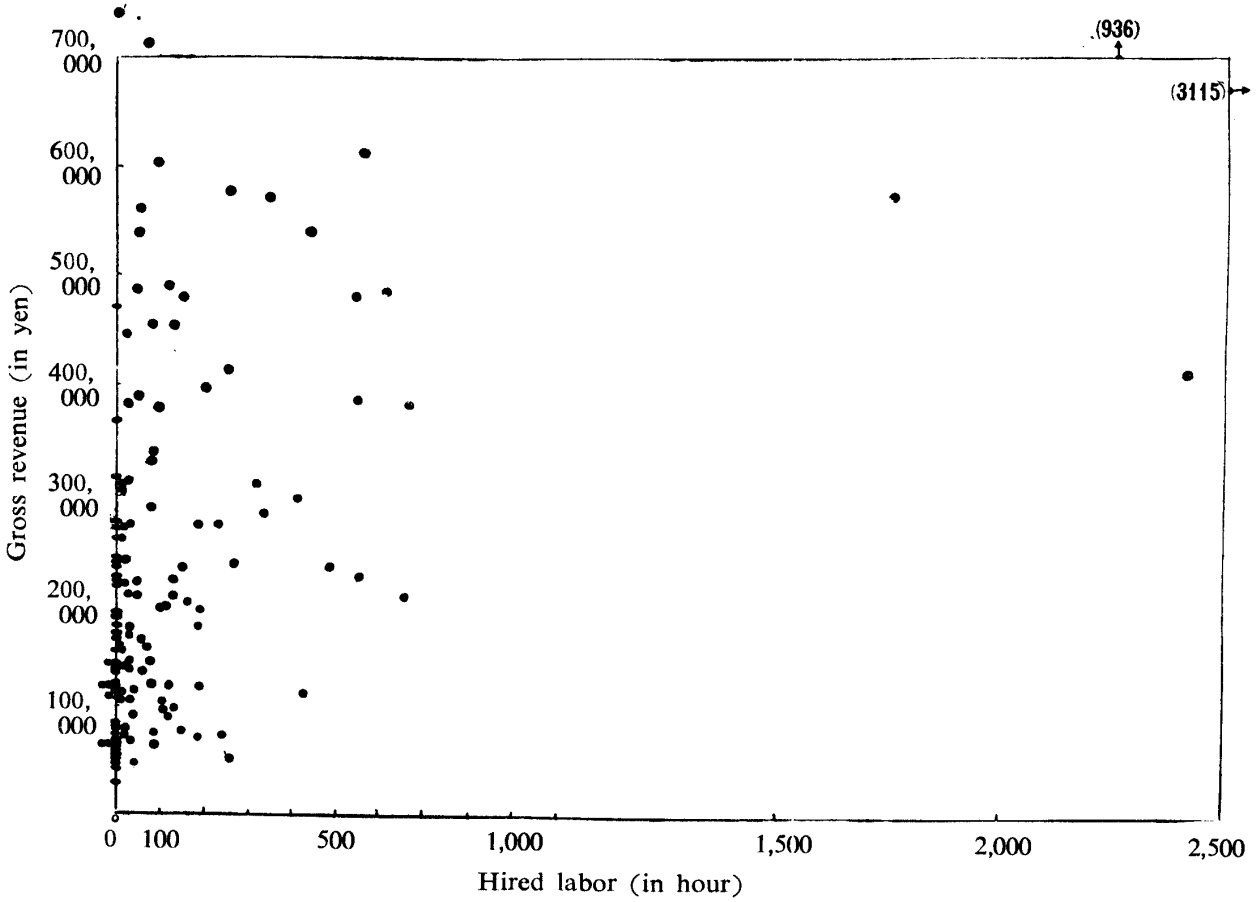

Fig. 2. The relation of gross revenue to hired labor.

correlation smaller. Consequently, elasticity of production to hired labor, that is to say, regression coefficient, became smaller than an expected value. Thus marginal productivity, which is the elasticity multiplied by average output, was made abnormally low: it means a sort of weighted mean for coefficients of farms both with hired labor and without it. Such an average of the whole group including those heterogeneous farms has almost no meaning. So in order to avoid the correlation with a broken corner, we stratified every farms surveyed into those two groups, the one with hired labor, the other without it. Then pursuing the marginal value productivity of hired labor for the former group, 61 yen/hour was obtained, which is less than one half of it in the manufacturing industry, while that is slightly higher than the wage rate, 50 yen in the manufacturing. Thus it is good to compare each marginal productivity itself between either industry with each other, while if we compared marginal productivity on the one industry with a rate of wages on the other one or did by mutual wage rate, the conclusion might be sometimes inversely drawn.

Now here is a clear fact that an agricultural wage rate, 23 yen, does not keep equilibrium with the marginal value productivity, 61 yen, diverging significantly higher than the former. Why is such a deviation raised? The reasons are as follows. Both the present state control for rice marketing and the joint marketing of farm products through agricultural cooperatives that form plausible imperfect markets seemingly at first sight, aim merely at

Table 7. Elasticity and marginal value productivity of productive factors at farms with hired labor and ones without it in Kagoshima Prefecture

		Labor			Circulating capital	Fixed capital	Planted acreage
		Family	Hired	Communal			
Elasticity	Farms with Hired labor	.3080	.0260	.0028	.3927	.1067	.2349
	Farms without Hired labor	—.0313	—	.0533	.4779	.1666	.3434
t Value	Farms with it	3.3369	1.1854	.1423	7.1011	1.4455	2.0994
	Farms without it	—.0868	—	.4720	5.8466	2.6728	.9377
Level of significance	Farms with it	1%	25	80	.5	20	5
	Farms without it	90%	—	70	.5	2	40
Marginal value productivity	Farms with it	yen/hour 15.29	61.32	—6.16	yen/yen 1.58	yen/yen 0.15	yen/hectare 36,100
	Farms without it	—.99	—	94.28	1.91	.20	44.397

	R^2	R	Degree of freedom	Standard error of estimates
Farms with hired labor	.839	.868	87	.1199
Farms without it	.721	.975	39	.1574

Source: *The Farm Household Economy Survey*, Individual cards, 1953.

price-supporting or-claim and do not restraint of supply. If so, they do not cut a wage rate, but they make marginal value productivity of labor merely keep, so that they don't influence the elasticity of demand faced to an individual farm.

On the other hand, monopsonistic behavior of farmers to farm workers would not be supposed for formality's sake. Then farm prices are pressed by a buyer's monopsonistic power against farm products mainly from non-agriculture and in its turn influence marginal value productivity of productive factors, but that would not make a deviation from a farm wage rate raise so far as it presses only value productivity but not a wage rate. What then?

At the less-developed area in Japan, a farm hired laborer is not a complete wage worker under modern employment relationship, but in many cases he has the character of work-payment: it has not been completly released from the ruling of rural community, because curious to say, even after Land Reform poor peasant farmers have been often paying in kind or work for a tenant land and even for their own land to their old master, landlord. I intend to call them a disguised owner farmer. Also the composition of capital in agriculture is low in those areas, so that a shortage of labor is dominantly raised at the peak of the farming season, especially both at the rice-planting season and a defensive one of damage by blight and noxious insects, and in these working process the ruling of rural community subsists. It is possible enough for the divergence between a wage rate and marginal value productivity to be based on the economic sociological causes.

So far we aimed to study the comparison between marginal value productivities for agriculture and the manufacturing, and to examine each wage rate with them. Consequently we could verify the existence of over-occupation in agriculture. Now in addition to these, it is remarkable that marginal value productivity of farm family labor apart from farm hired labor is lower than the latter one, indicating 16 yen, and that we are so interesting

in that one of the group without hired labor especially is lower than one with hired labor, being regarded as zero. From these facts family workers were found to be predominantly over-occupied at first sight. Professor NURKSE's hypothesis that the marginal productivity of labor is zero in disguised unemployed at under-developed countries, is valid even in the Japanese agriculture, above all, completely in the family farms without hired labor. However, it does not always mean the same hypothesis that the results are the same: converses are not always true. I shall mention another hypothesis later at the fifth section.

Be the matter what it may, marginal value productivities of both hired labor and family labor in agriculture are lower than one of the manufacturing. The reason why it does has been already clarified to some extent by K. ŌKAWA as follows. "When capital coefficient in agriculture is higher than one of non-agriculture under the major premises that the rates of returns for capital level and equilibrate among industries under capitalist economy, the rate of relative share to labor in agriculture becomes lower than in non-agriculture, and moreover introducing those real condition which agricultural wages is so low in general, it may be possible for equilibrium of capital to come into existence in the real world. However, under private ownership system of land, agricultural wages may further decrease, since large land coefficient comes to intervene in addition to capital coefficient, whilst equilibrium of capital is simultaneously pressed hard, so that the rate of capital's returns in agriculture is not to become equal with one of non-agriculture. Then the schedule itself of marginal productivity for capital tends to shift downwards, so that capital has a dislike to agriculture."

However, two actual conditions are assumed in this process of reasoning, i.e., higher capital coefficient in agriculture and so low agricultural wages. Let it go unchallenged, so we may again fall into the same steps as Marxian law of advancing highly for composition of capital and one of austerity. But we have already obtained two historical facts, that is to say, smaller growth rate of agricultural income or net products and relatively higher rate

Table 8. Elasticity and marginal value productivity of a waterfield rice crop produciion in Kagoshima Prefecture

		Labor		Circulating capital	Fixed capital	Planted acreage
		Family	Hired			
Elasticity	Farms with Hired labor	.331	.171	.196	—.037	.373
	Farms without it	—.297	—	—.064	—.002	1.215
t value	Farms twith it	2.2272	2.6037	6.4288	—.3661	2.7702
	Farms without it	—1.2881	—	—.4539	—.0304	5.8525
Level of significance	Farms with it	2.5%	1	1	40	1
	Farms without it	25%	—	70	0	1
Marginal value productivity	Farms with it	yen/hour 47.7	yen/hour 111.7	yen/yen .95	yen/yen —.7	yen/hectare 81,090
	Farms without it	—31.9	—	—.28	—.00	276,840

	$\bar{R}^2$	Standard error of estimate	Degeree of freedom
Farms with it	.697	.164	47
Farms without it	.942	.063	10

Source: Individual cards for the *Survey on Production Cost of Rice in Kagoshima Prefecture.*

of saving. Accordingly, we can logically draw it through Harrod's formula that capital coefficient in agriculture becomes higher.(2)

But there remains a further question why labor productivity in agriculture is low. I suppose this remaining unsolved was due to the fact that K. ŌKAWA forgot the condition of the relative price of products: according to my opinion, the differential of labor productivity is due to this price condition, so that I intend to testify it.

Since we used as data the *Farm Household Economy Survey* in order to get marginal productivity of productive factors, output at farms is constructed through accumulated value of every farm products, therefore it also envolves different farm prices. Now the rice price among these farm prices is supported under state control, and accordingly, relatively higher. Then computing labor productivity of this particular crop, we obtained higher marginal productivity than one of any other crop in Table 8.

4. Analysis of mixed income

Although it has been hitherto assumed that marginal value productivity of family labor maintains equilibrium with one of hired labor, such new facts were found out as the former is significantly lower than the latter. Accordingly, we can not evaluate family labor through a wage rate of farm hired labor, and also cannot regard as returns to both capital and

(2) K. ŌKAWA; op. cit., pp. 104 ff.

He starts from the premise of the equal rates of capital returns among every industries as follows.

$$\frac{Y_1-N_1w_1}{K_1}=\frac{Y_2-N_2w_2}{K_2} \quad \cdots\cdots(1)$$

Here Y=Net production, N=Labor force, w=Wage rate, K=Stock of capital goods, 1=Non-agriculture, 2=Agriculture.

$$\frac{1-N_1w_1/Y_1}{1-N_2w_2/Y_2}=\frac{K_1/Y_1}{K_2/Y_2}, \qquad \text{Substituting } \frac{Nw}{Y}=r,\ K/Y=c$$

Then

$$\frac{1-r_1}{1-r_2}=\frac{c_1}{c_2}.$$

If actual condition, $c_1<c_2$, is introduced, we can draw $r_1>r_2$

So $$\frac{N_1w_1}{Y_1}>\frac{N_2w_2}{Y_2}$$

Again introducing an actual condition, $\frac{Y_1}{N_1}>\frac{Y_2}{N_2}$.

So $w_1>w_2$ and that w_2 must be small enough.

Moreover, under private ownership of land, since land coefficient is added to capital coefficient in agriculture, w_2 must become further lower in order to keep the equilibrium of capital but there is the physiological lower limit.

Accordingly, it becomes difficult to keep the first equation, for $B_2=L_2/Y_2$ is to be added to K_2, therefore the right side of equation (1) becomes small. Thus equilibrium of capital breaks.

On the other hand,

$$G_C=s \quad \cdots\cdots(2)$$

In Japan, these terms are as follows,

$$G_2<G_1 \qquad s_2>s_1$$

$$\therefore\ c_2>c_1$$

However, until this point, we cannot yet draw logically the next relation,

$$\frac{Y_2}{N_2}<\frac{Y_1}{N_1}$$

land, residuals of an agricultural wage rate subtracted from hourly agricultural income that are mixed ones composed of returns to family labor, farm capital and farm land, as mentioned on Section 2.

Then from that fact-finding, we make haste to assume as the first approximation that the lower marginal value productivity of family labor coincides with something about equilibrium value. So following in the wake of a traditional way, we try to analyse agricultural income under disguised equilibrium again.

Assuming to be a linear homogeneous production function, provided that markets of both products and productive factors are perfect, the elasticity coefficients of production to productive factors, from which each marginal productivity was derived, can describe the ratios of the relative share from EULER'S theorem, as is commonly known.(3)

Table 9. Proportion of operating cost and the relative share by production elasticity coefficient in agriculture

		Gross income	Family labor	Hired labor	Land	Circulating capital	Fixed capital
Actual income & cost	A	238,644 yen		4,093	1,064	57,810	20,911
Percentage	B	100.0%		1.7	.4	24.2	8.7
Production elasticity	C	1.065	.22	.028	.246	.421	.147
c/1.065 × 100	D	100.0%	20.6	2.6	23.1	39.5	14.0

On the other hand, we computed the proportion of each operating cost to gross agricultural output from the source of *Farm Household Economy Survey* in order to check up them with the above elasticities in Table 9. Comparing row B with row D in Table 8, any elasticity coefficient of hired labor, land, circulating capital goods and fixed capital goods is bigger than the ratio of each operating cost. This difference between them, that is, $(2.6+23.1+39.5+14.0)-(1.7+0.4+24.2+8.7)=44.2$, is included in the ratio of agricultural income 65.0, therefore the relative share of family labor including communal labor is 20.8 percent in it. After all about one-third of agricultural income (20.8/65.0=32.0) may be of the true income to family labor; the other one-third (23.1−0.4/65.0=35.0) returns to land; the last one-third ((39.5+14.0)−(24.2+8.7)/65.0=32.0) returns to capital.

However, it is originally merely under perfect competition that the elasticity of produc-

(3)
A production function is

$$P=F(A, K, B, \cdots\cdots) \quad \cdots\cdots(1)$$

Here P=Output, A=Labor, K=Capital, B=Land and so on. The linear homogeneous relationship is

$$mP=F(mA, mK, mB, \cdots\cdots) \quad \cdots\cdots(2)$$

Here m is a multiple. Then

$$P=A\frac{\partial P}{\partial A}+K\frac{\partial P}{\partial K}+B\frac{\partial P}{\partial B}+\cdots\cdots \quad \cdots\cdots(3)$$

$$1=\frac{\partial P/\partial A}{P/A}+\frac{\partial P/\partial K}{P/K}+\frac{\partial P/\partial B}{P/B}+\cdots\cdots \quad \cdots\cdots(4)$$

Each term on the right side of equation (4) demonstrates the proportion of a relative share into labor, capital, land and so on under the above conditions. The sum of the proportion of a relative share is 1.065, being indifferent from unity.

tion can just describe the relative share. Otherwise, it can do no longer such a great problem as the relative share without that condition. For instance, it is curious that there arises nothing or the debt of a relative share in case elasticity of output to input shows zero or minus value. Because even if elasticity or marginal productivity does quite so, the relative share may be significantly plus, since this is amounts integrating marginal productivity.

Then although we may suppose something like V. N. MURTI & V. K. SASTRY's model[4] introducing the degree of monopoly and monopsony, this, after all, aims at the profit maximum for monopolist or monopsonist, therefore it is merely a self-justification, falling into dead-lane. For the problem of a relative share, we are to wait a more completeness of economics itself.

Now for the sake of the first statistical approximation, we regard coefficients of partial determination as the proportion of relative share, as follows on Table 10.

Table 10. Population partial determination coefficient

	Multiple determination C.	Labor			Circulating capital	Fixed capital	Planted acreage	$S^{-2}/\sigma_0{}^2$
		Family	Hired	Communal				
Coefficient A	.8755	.0541	.0465	.0002	.4434	.0622	.0559	.1254
A × 100	87.6	5.4	4.7	.0	44.5	6.2	5.6	12.5

5. Family Labor

As illustrated on Section 3, marginal value productivity of family labor is lower than one of farm hired labor, and also the level of communal labor exchanged with each other in the rural community is near the former level. The communal labor is peculiar to low productivity in the less developed stage of economy and we would like to call it the extended family after P. T. BAUER.[5] The difference of productivity or income between agriculture and non-agriculture is explained by the theory of over-occupation, but the difference among the labor of different forms within agriculture cannot be done. It assumes that labor among them can be completely substituted with one another and thus the marginal productivities of them are indifferent. There are, however, clear difference among them, which is significant at the confidence probability of 99 percent. That is due to the character of family labor. Let us state the logical explanation and its result now. Since family labor has physically the same technical function with hired labor, both of them have been made into a bundle and immediately were dealt with in the same way even for the concept of value because both were not separated into labor and labor power. There are, indeed some exceptions to this. Some have investigated family labor owing to applying the overhead cost principle, and those were for the sake of the price analysis. Now, from the nature of our matter, we shall pursue the aspect of productivity for that.

The so-called family labor power is not pure laborers nor a pure employer. From the point of view of the set theory, that is not an independent set, but the dependent one between

(4) V. N. MURTI and V. K. SASTRY: "*Production function for indian industry*," *Econometrica*, **25** (1957), pp. 206 ff.

(5) P. T. BAUER & B. S. YAMEY: *The Economics of Under-developed Countries* (*Cambridge*, 1957), pp. 64 ff.

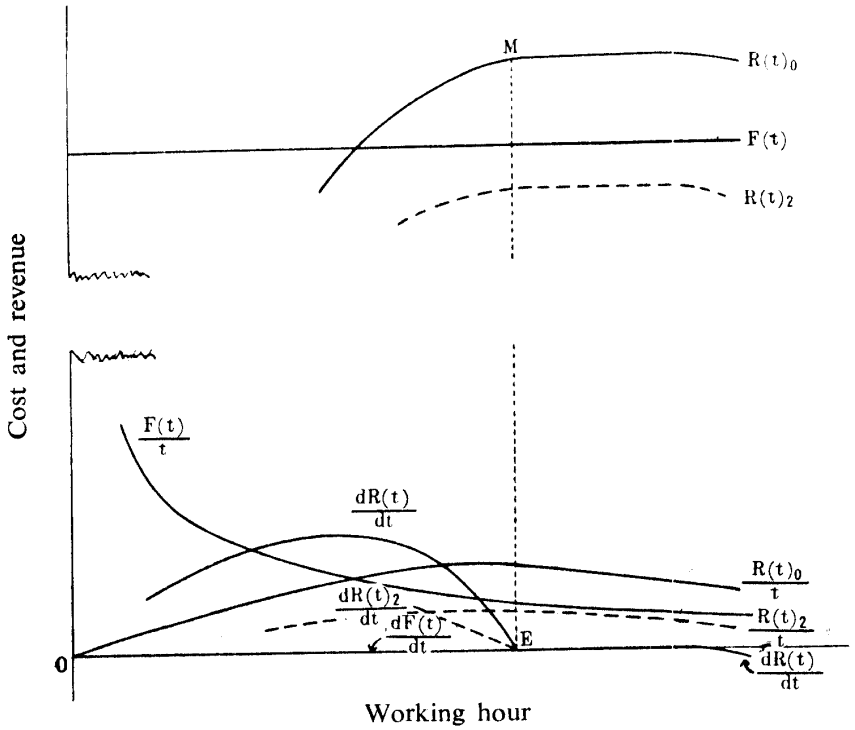

Fig. 3. Net revenue and cost curve in relation to family labor
$R(t)_0$: Total net revenue, $F(t)$: Total fixed cost,
$R(t)_1$: Total net revenue after prices go down.

them. Especially, although the supply of family labor power is not elastic in the short run, it tends to be so in the long run. Accordingly, we can regard its income as the quasi-rent in the former period and on the other hand as cost in the latter period. Now we can proceed to explain our result of the productivity analysis.

If the members of a farm household do not vary in the short run, they require a constant living cost in order to keep the life of them, whether they do the farming activity or not. Accordingly, the living cost of a farm household may be usually regarded as overhead cost on the cost schedule of products. Now we transform the cost schedule for them into one for the productive factor, i.e., family labor in our case, and illustrate the relation between family labor and its total family living cost in Fig. 3. Assuming the latter to be constant, average living cost per hour begins to go down rapidly at first, before weakening in tempo, while marginal living cost in relation to working hours is zero from beginning to end, so that it coincides with the axis of abscissa.[6]

The shapes of these cost curves are so similar to usual ones for products in an utterly different dimension. Now such shapes of our curves were introduced with logic, but also

(6) $F(t) = \text{Constant}$,.....Total living cost function t: working hours
Then average cost is

$$\frac{F(t)}{t} = \frac{C}{t}$$

Marginal cost for working hours is

$$\frac{dF(t)}{dt} = \frac{dC}{dt} = 0$$

were demonstrated from our statistical results that output and working hours are highly correlated with each other.(7)

On the other hand, drawing the relation between family labor and total net revenue, the latter of which is the one excluding costs of co-operative factors except hired labor, the curve of the total net revenue has a maximum point or a range owing to the law of diminishing return.

For the present we will make no particular assumptions about the shape of this revenue curve besides that. The marginal net revenue curve intersects with the axis of abscissa at Fig. 3 just under the maximum point of the total curve. This intersection to the horizontal axis means the equilibrium with marginal cost (marginal living cost), and family labor is used to the very point, because the difference between total net revenue and total cost, namely quasi-rent, goes to maximum, being clear on the graph, too.(8)

If a total curve may not begin to decrease immediately from a maximum point and may hold constant for a while at least, the marginal revenue curve will go along on the axis of abscissa in the same way as marginal cost. Thus we get a range of equilibrium but not a point.

Since the slope of a tangent to this maximum point or a range equals the price of working hours, namely a wage rate, the price of family labor is sure to be zero. Thus on account of the factor price being zero, the total net revenue within the maximum range means the surplus revenue which accrues to the family. Thus there are some logical grounds to rely upon for no cost of family labor.

For simplification so far, total living cost was assumed to be constant, but when demand for labor is highly strengthened in a large scale farm or at the limited seasons, such as planting of young rice-plants or harvesting, primary living cost would mainly increase, and marginal living cost, too, but the latter may be small. Under these conditions, as illustrated in Fig. 4, a total net revenue curve will shift to the upper right hand, therefore marginal net revenue curve will also do in the same way, and the equilibrium point of it with the marginal cost will add above nill, and consequently working hours needed may not be determined just under the maximum point of the total revenue curve, but a little less than it. Namely, if both total living cost curve and total net revenue curve are fixed in relation to family labor, we could find out the quantity of input for family labor under the above special conditions.

Assuming that the productive function of hired labor is the same with one of family labor, and that also the quantity of family labor is limited to OT, so that this marginal

(7) Correlation coefficients between family labor and gross revenue:

All farms	$r = .711$
Farms with hired labor	$r = .789$
Farms without it	$r = .593$

(8) $R(t) - C = Q(t)$ ·····Profit or quasi-rent function

The condition of profit maximum is as follows:

$$\frac{dQ(t)}{dt} = 0$$

Therefore

$$\frac{dQ(t)}{dt} = \frac{dR(t)}{dt} - \frac{dC}{dt} = \frac{dR(t)}{dt} = 0$$

Thus profit maximum is equal to total net revenue maximum to family labor.

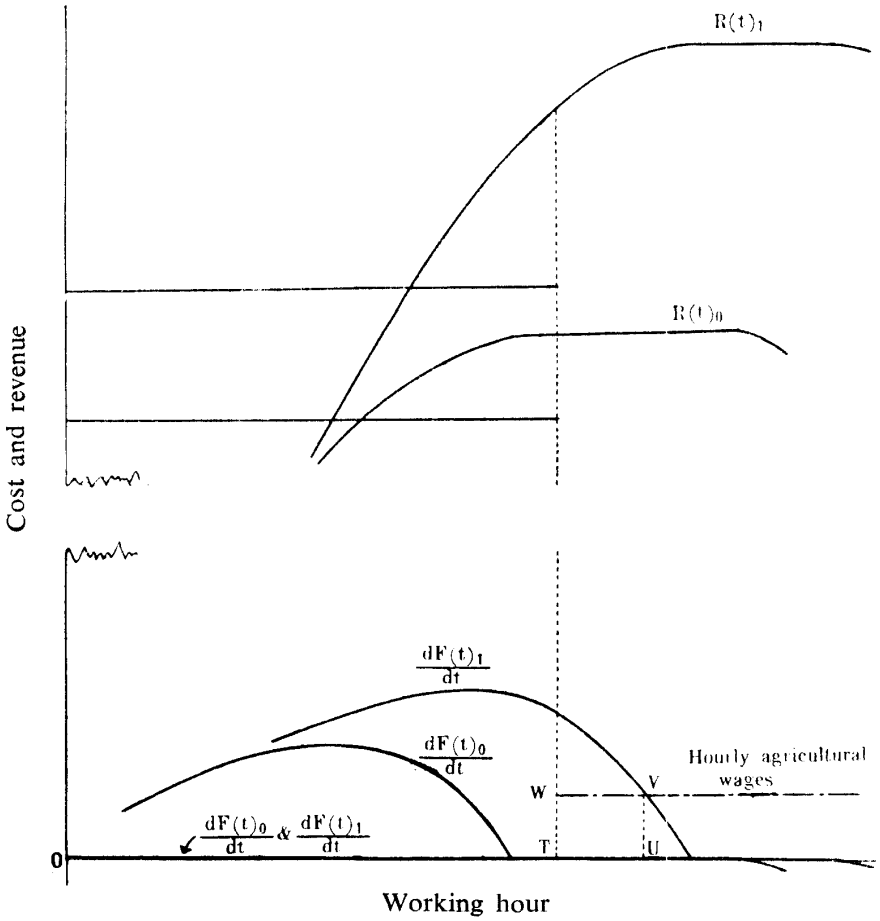

Fig. 4. Net revenue and cost curves during the busiest farming seasons or for large scale farms

revenue is higher than a wage rate, farmers will employ hired labor, which will be used to the equilibrium point of the marginal revenue and a wage rate. Since family labor can be, usually, substituted for hired labor, the marginal revenue of the former will equilibrate with a wage rate.

Our factual result of farms with hired labor on Section 3, however, is against it. The reason is that the marginal revenue productivities of family labor are different by the season of planting and our result means certain weighted averages among those varying ones in the whole season of production, which may include most ones of zero or near it. Accordingly, our result was so less than agricultural wages, while the one of hired labor was further higher than wages owing to averaging the marginal revenues of the busiest farming season of peak demand for labor.

When there raise scissors prices for farm products in the descent phase of a business cycle or even under a secular trend, a total net revenue curve itself shifts downwards, even the maximum point of which goes down to lower than total living cost. Unless the family workers have any better job opportunity, they will go on their own operation or rather must, in so far as total net revenue does not vanish. Because if family workers stop working, they can not obtain any net revenue, whilst, going on operation, this is more than nothing,

namely less total loss. At the same time, however, a standard of living must be cut down, and inferior consumption goods are substituted for superior ones. Moreover, if the total net revenue goes down lower than the minimum physiological margin, peasants must give unripe crop-fields as security in order to ask credit. Further exceeding marginal credit, members of a family must miserably eat their own body in forms of daughter selling to flesh traffickers in order to reduce their members to cut down total living cost.

Even in such case, peasants use their family labor to just under the new maximum point of a shifted total net revenue curve. That is as before. Consequently there may be no change for physical output without the change of price proportion among products. It may be due to this nature of family labor which accounts for a half of total operation cost, that agricultural production has been inelastic to agricultural prices.(9) And also marginal revenue productivity of small peasants' family labor is zero as before, even if agricultural prices go down.

On the other hand, large scale farms with hired labor reduce working hours to just under a new equilibrium point of the new marginal revenue and a wage rate. When prices decline further severely, they could not employ hired labor, so that marginal revenue will equilibrate to marginal cost of zero or near it.

So far it was the analysis as regards a family in the short run. Low marginal productivity in so far as family labor is concerned is sure to come from its own character, not from over-occupation at least in the short run. However, the family labor power will relate to our problem in the long run, when the capital aspect for the family becomes clearer. It is possible to sum up this problem into three points ; first, the prospective yield of a family, second, the cost of the family, and third, the rate of interest or discount.

Although the prospective yield of a family are calculated by adding together all the income from it over its whole working life, members of a family have not all the same length of life at one cross-section and prospective yields are not always the same, too. Then the only way of calculating the productivities of different prospective yields of members with different lengths of life is to compare their discounted prospective yields. This process gives us a family sum representing the present value of its prospective yield. The curve of discounted marginal revenue productivity of a member will show the demand for the member. This demand curve will slope downwards from left to right in the normal way.(10)

The supply for the members of a family will be given by their prices, that is, replacement cost, equal to the total accumulated sum invested to bringing up at a certain rate compounded yearly from birth to the beginning of production, and this varies as the level of education is different. Whilst the higher the latter becomes, the more the expense of

(9) In such case, small peasants may sometimes increase to produce, because, since there raises often the equilibrium for them as a range like Fig. 3 and their scale is so small, an average living cost curve goes down more rapid than an average net revenue curve. Now, peasants have neither marginal cost nor marginal revenue within the range ; they increase neither net revenue nor net loss within it. But they will perhaps have an illusion as if it might reduce loss to work hard, comparing average cost with averag net revenue, and intend to increase physical output. Besides those productive conditions, it is added to supply of commertial goods that peasants will substitute self-sufficient products for relatively superior commertial goods to save living cost and will be forced to sell the latter goods. The so-called forced selling may come from the above two fields, production and consumption.

(10) A. W. STONIER & D. C. HAGUE : *Economic theory* (*London*, 1957), pp. 311 ff.

education has to increase, the expective yield of members of a family will go up as a rule. The slope of that supply curve may usually be different by every farm household.

If the ratio of an excess of the demand price to the supply price was higher than the rate of interest, peasants may increase the members and *vice versa*. Accordingly the family needs interest in order to maintain the productive members of a family constant.(11)

If a family is provided for as we have seen, we could include it in the category of fixed capital goods perhaps in the long run. From this nature, the income of a family, that is in part quasi-rent in the short run and interest in the long run, account for some part of total net production for all productive factors. Now, we would like to call the ratio of the supply price of a family to total net production "family coefficient".

When small farms by family workers are dominant in agriculture, family coefficient may be added to both the preceding high capital coefficient and land coefficient; it is a family besides a private ownership system of land that breaks the balanced rates of capital returns between industries and enters into the share of capital in general. Thus money capital will hate more and more agriculture, bringing further lower agricultural wages, which is severer over-occupation. The fact that money capital dislikes also small enterprises in addition to agriculture may be that here survive family enterprises in this *old bourgeoisie* and that these intend to break the equilibrium of capital, too. But negligible land coefficient may make somewhat these relatively more profitable than agriculture with the big one.

(11) The way introducing the supply price of family members from the expense of bringing up is as follows. Assuming that $Ya_0, Ya_1, Ya_2, \cdots\cdots Ya_m$ have been expensed from birth to the present in succession at $100r$ percent compounded yearly and m is the beginning age of production, e. g., $m=15$ for old boys of the middle school, $m=18$ for high school graduates, $m=22$ for university graduates, the total sum accumulated at the beginning of production is Yy_1 where

$$y_1=\sum_{t=0}^{m} a_t(1+r)^{m-t} \quad \cdots\cdots(1)$$

r: Rate of interest
t: years from birth

Moreover, assuming that anual expenses of bringing up are variable and that we have a continuous expense function for years available to differentiate, the total sum accumulated at a time m years from birth is

$$y_2=\int_0^m f(t)e^{r(m-t)}dt \quad \cdots\cdots(2)$$

$f(t)$: Expense function of bringing up.
e: Napier's constant.

Through the partial integral,

$$y_2=\frac{e^{mr}f(0)-f(m)}{r}+\frac{e^{mr}f'(0)-f'(m)}{r^2}+\frac{e^{mr}f''(0)-f''(m)}{r^3}+\cdots \quad \cdots(3)$$

Provided that an expense function is two order, terms higher than three order will vanish.
To be exact,

$$y_2'=y_2(1+r)^s \quad \cdots\cdots(4)$$

s: Years from the beginning age of production to the present

Demand price is obtained by discounting expective yields on the contrary.

$$z_1=\sum_{t=0}^{n} b_t/(1-r)^t \quad \cdots\cdots(5)$$

b_t: Anual net revenue at a certain year, t.

Assuming that anual net revenues are variable and that the revenue function is the continuous one available to differentiate,

$$z_2=\int_0^n \Phi(t)e^{-rt}dt \quad \cdots\cdots(6)$$

$\Phi(t)$: Net revenue function

The right side may be integrated partially.

Table 11. Fixed assets of farm household and its real increase april 1951 to april 1955 by size of cultivated land under management in Nankai district
(In yen per farm household)

		Total	Under 0.5 cho	0.5~under 1 cho	1~under 1.5 cho	1.5~under 2.0	2 cho and over
Family coefficient	1955	30.47	50.19	32.83	25.72	23.90	19.08
Total fixed assets	1951	409,380	228,535	347,268	550,850	748,333	780,380
	1955	847,867	460,263	715,707	1,181,987	1,369,793	1,924,203
Its increase		402,281	212,594	338,017	579,025	570,147	1,049,379
Land assets	1951	151,618	72,905	109,932	212,611	323,084	378,343
	1955	315,937	140,741	249,676	457,714	584,418	814,241
Its increase		150,751	62,235	128,206	224,865	239,756	399,906
Building assets	1951	200,535	130,332	187,337	252,708	313,095	315,348
	1955	424,534	283,725	381,228	585,180	553,605	764,256
Its increase		184,513	126,353	159,713	273,865	198,114	369,776
Large agricultural	1951	15,535	5,490	11,744	20,297	40,860	38,729
implement assets	1955	32,196	9,124	25,116	46,540	58,100	122,253
Its increase		14,024	3,059	11,256	22,090	14,512	70,306
Tree and	1951	11,226	4,947	5,016	24,190	24,621	12,224
Shrub assets	1955	29,355	5,473	13,920	27,364	103,364	145,296
Its increase		11,780	342	5,786	2,062	51,165	86,467
Livestock assets	1951	30,466	14,861	33,239	41,044	46,673	35.736
	1955	45,845	21,200	45,767	65,189	69,306	78,157
Its increse		16,361	6,744	13,328	25,686	24,078	45,135

1. Assets values are illustrated in terms of nominal prices.
2. Real increase is deflated by the index number of price of commodities for agriculture in rural village. (Apr. 1951 ~ Mar. 1952 = 100) total fixed assets and land = 109, building = 121, implement = 119, tree and shrub = 154, livestock = 94.
3. Family coefficients are the ratio of the accumulated cost sum to total net production of every productive factor. The family cost sum is computed by footnote (11), formula (3) of zero order, because it is assumed that $f(t)$, yearly average living cost function per head within each class, has been constant. The production age is regarded as 15 years as first approximation, and being under age, we used years from birth to the present. Total net production is agricultural income including agricultural wages on both temporary and permanent basis, land rent and charge of hired animal, building and implement.

Source: *Economic survey section, statistics and survey division, ministry of Agriculture and forestry.*

Capital formation in agriculture after land reform has been raised owing to the low legal price buying land and the controlled land rent after that, rural inflation boom, agricultural prices supporting as regards some crops and the upwards shifting of production function itself due to technical innovation, but has been raised dominantly to farm households of the middle and upper classes that have relatively small family coefficient, therefore not so good to small peasant farms with big coefficient. It is illustrated in Table 11. Thus our hypothesis may be regarded as appropriate.

6. Conclusion

We could conclude so simply the essence stated above as follows. Disguised equilibrium might be nearly confirmed on a phase of income statistics, and the difference of marginal

value productivity between industries done, too. However, marginal value productivity of family labor in small family farms must be necessarily zero or near it on account of our reasoning, so that it makes an error of the second kind mixing another hypothesis that we would prove over-occupation in agriculture through a bundle of family labor together with hired one. Thus family labor including communal labor should be separated to omit from the bundle of farming labor; we have to give up NURKSE'S hypothesis for disguised unemployment that has more or less influenced even ŌKAWA as well as I. Again, however, the existence of family labor *power*, i.e., self-employment, besides the private ownership system of land may exert pressure upon the balanced rates of capital returns among industries and intend to break them, so that it will intensify more and more over-occupation. In addition to these, agricultural prices should be taken seriously in order to prove the low extent of labor productivity that is an actual condition for the sake of over-occupation.