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TECHNOLOGICAL PROGRESS AND INCOME DISTRIBUTION IN A RICE VILLAGE IN WEST JAVA

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ABSTRACT

Changes in Java's land tenure systems and labor contract arrangements have attracted the attention of economists and sociologists concerned about income distribution in the rural sector. In a previous paper, we reported growing poverty and inequality in a West Java village. The basic factor underlying poverty and inequality in the village was population pressure on limited land worked with stagnant technology, which caused the value of labor to decline relative to that of land. If the basic underlying cause was stagnation of technology, the opposite should occur if major advances in technology are realized. This hypothesis is tested in this paper through the study of a village in West Java where major technological advances in rice farming have occurred. Our analysis shows that real wage rate increased despite rapid population growth, and that the income share of land declined relative to those of capital and labor, as opposed to the case of the village previously studied. Improvements in agricultural technology and irrigation infrastructure are, thus, identified as effective means to prevent growing poverty and inequality.

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Technological progress and income distribution in a rice village in West Java

In a previous paper (Kikuchi et al 1980), we reported the case of a West Java village where high population pressure on land worked with stagnant technology resulted in growing poverty and inequality. If stagnation of technology was a basic factor underlying this process, the opposite should be the case with advances in technology.

This paper reports on a study of a village where significant increases in rice yield have been recorded as a result of improvements in irrigation systems and rice-growing technology. By comparing this village with the one in the previous paper, we identify the impact of technological progress on income distribution in the village community.

CHOICE OF VILLAGE AND DATA COLLECTION

The village for this study -- the North Subang village -- is within the Regency of Subang, which had been covered by the Rice Intensification Survey (Intensifikasi Padi Sawah or IPS) conducted by the Agro-Economic Survey of Indonesia. The village is in a rice monoculture area but, unlike the village of the previous study, has experienced major advances in rice production technology in the past decade. The village is about 20 km north of the South Subang village, the village studied previously (Fig. 1).

Unlike the South Subang village, which has an undulated topography surrounded by mountains, the North Subang village is on a completely flat, coastal plain. The area is served by the Jatiluhur Irrigation system, the biggest irrigation system in Java. Before the Jatiluhur System was extended in 1968, rice fields in the village were served by a local irrigation system (Macan System), which had irrigated the fields only for the wet season. Rice yields were low and unstable.

Since the Jatiluhur System extension, double-cropping of rice has become common and modern varieties have been widely used with significant increase in yield. The dynamic change in rice production technology in the North Subang village, thus, contrasts greatly with the stagnation in the South Subang village.

In this study we used the complete enumeration survey to collect basic statistics such as population and land area, and the sample survey to collect the more complicated data. We chose the smallest hamlet in the village as the study site and selected 60% of the farmer households and 40% of the non-farmer households for the sample survey in November-December 1979 (Table 1). Data for stock variables such as land and population were for November-December 1979 and the flow data for current production were for both 1978-79 wet season and 1979 dry season. In the following analysis the 1978-79 data refer to the averages for the wet and the dry seasons.

Table 1. Total and sample compositions of households in the North Subang village, 1979.

	Village total		Sample size no.	Sample ratio[a]
	No.	%		
Farmer				
Large (1.0 ha and above)	30	16	19	0.63
Small (less than 1.0 ha)	45	23	28	0.62
Total	75	39	47	0.63
Non-farmer				
Landless worker	111	58	44	0.40
Non cultivating landowner	5	3	2	0.40
Total	116	61	46	0.40
Total	191	100	93	0.49

[a]Sample size divided by village total.

Because the complete enumeration survey was not used, we were unable to obtain detailed information on interclass relationships in the village community such as those between the landlord and the tenant and the employer and the employee. We also found it difficult to obtain data from the biggest landlord (who owned nearly one-third of the *sawah* [wet riceland] in the village), who was unwilling to disclose information on sensitive issues such as the process of land accumulation. As a result, the data pertaining to agrarian structure of this village are incomplete and less reliable than those of the South Subang village. Because of these data problems, we focus our analysis on changes in rice production technology and the income-distribution implications.

DEMOGRAPHIC PATTERN AND AGRARIAN STRUCTURE

Compared with the South Subang village where there was evidence that the population pressure had reached saturation, the North Subang village had a lower population density. Total population in 1979 was 774 (375 males and 399 females) for 65 ha of sawah; the man-land ratio of 12 persons/ha of sawah in this village was favorably compared with 17 persons/ha in the South Subang village.

The information on demographic changes that we obtained was limited. The only information of significance was the average number of children per mother, by mother's age, which is shown in Table 2. The data for mothers more than 50 years old were deleted in the analysis, because time and

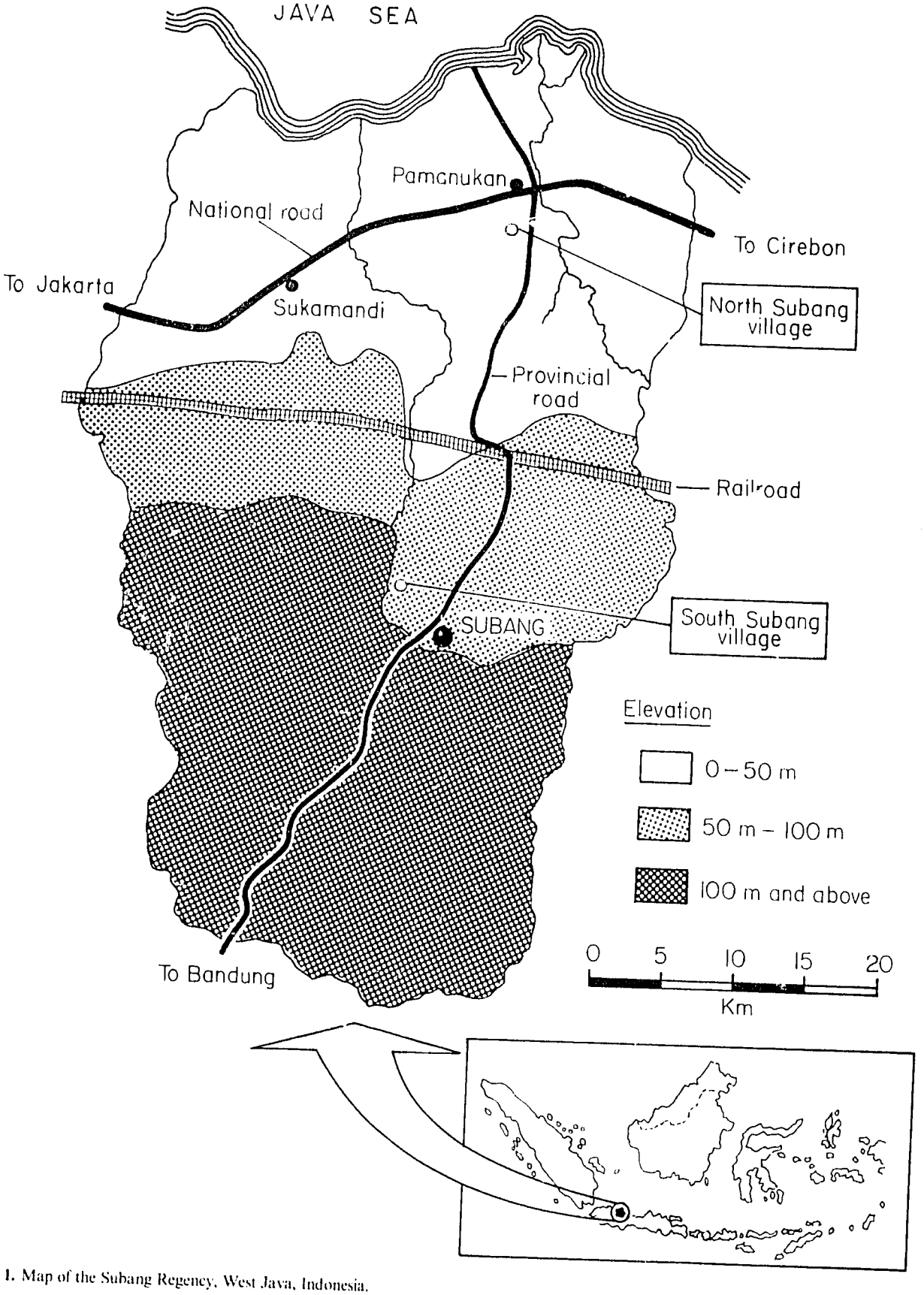

Fig. 1. Map of the Subang Regency, West Java, Indonesia.

Table 2. Average numbers of surviving children per mother, by mother's age, and the estimates of the natural rates of population growth in the South and North Subang villages, West Java, Indonesia, 1979.[a]

Mother's age	South Subang village		North Subang village	
	Children per mother (no.) *(m)*	Population growth rate[b] (% year) *(r)*	Children per mother (no.) *(m)*	Population growth rate[b] (% year) *(r)*
80 years old and above	4.80	3.0	n.a.	
60-79	3.93	2.3	n.a.	
50-59	3.49	1.9	n.a.	
40-49	2.71	1.0	3.25	1.6
36-45	2.48	0.7	3.16	1.5
30-35	1.95		2.57	
20-29	0.84		1.80	

[a]n.a. = not available; a dash (—) indicates not applicable. [b]Calculated by the formula $r = 2(1 - m)$, assuming 30 years as the period of mothers' reproductive capacity.

resource constraints did not enable us to trace grown children who moved out from parents' households, as we had in the South Subang village study.

Even though the data are limited, Table 2 shows clearly that the recent natural rate of population growth was much higher in the North than in the South Subang village. According to the old villagers, there were about 40 households in the North Subang village in 1940, which increased to 191 in 1979. Assuming no change in average family size, the rate of population growth for the past 4 decades was about 4% year. Such high rate of population increase reflects a rapid inflow of migrants to the village.

A relatively favorable man-land ratio and the rapid population growth involving the large inflow of migrants seems to be explained by the history of settlement in the village. Unlike the South Subang village which was settled many years earlier, the settlement of the North Subang village began only in the 1920s. This was so because it was more difficult to build the irrigation system at a local level in this flat, coastal plain than in the mountain-locked areas with decent undulation such as the South Subang village.

Initial settlers in the North Subang village opened a no-man's land and practiced extensive rainfed farming. Because the rice yield was only about 1.5 t/ha an operational holding of about 2 ha was required for a family's subsistence. Thus, relatively large-scale holdings in the Javanese standard were established. Rice yields in the village increased significantly when the Macan System provided irrigation for the wet season.

The intensification of rice farming due to the irrigation development brought about an increase in labor demand and a flow of migrants into the village. The new migrants settled as sharecroppers to the old settlers or as landless laborers. The same process was repeated after the extension of the Jatiluhur System, which provided irrigation for the wet and dry seasons. Class differentiation in terms of highly skewed distribution of landholdings (Table 3) and high incidence of tenancy (Table 4) was thus developed through the waves of migration.

At the same time, a stratification developed among the old settlers. Some of them acquired land from others through money lending. Farmers in need of cash pawned their land to their well-to-do neighbors. Failure to repay the amount at the end of the loan period meant losing ownership of the land. The biggest landlord in the village, for example, accumulated more than 20 ha in the village and more in other villages through money lending.

Such land transfer has been especially common in the village because the systems of mutual help and insurance within the village community have not been well developed. All the loan cases we encountered in the village were stipulated to pay interests at the rate of 50% per cropping season – a sharp contrast to the South Subang village where zero-interest loans existed among relatives and friends. The common reserves of paddy held by groups of neighboring households as a provision for sickness and other emergencies, which were found in the South Subang village, were also absent in the North Subang village. It appears that the community in the North Subang village has not yet been sufficiently solidified so as to establish such mutual help and insurance systems because of the short history of settlement [illegible] inflow of migrants. Early settlers were mainly

Table 3. Size distributions of sawah land ownership and operational landholdings in the North Subang village, 1979.

	Ownership holdings				Operational holdings			
	Households		Area		Households		Area	
	No.	%	Ha	%	No.	%	Ha	%
3.00 ha and above	2	1	27.97	43	2	1	7.81	12
2.00-3.00 ha	5	3	10.13	16	5	3	10.84	17
1.00-2.00 ha	10	5	12.83	20	23	12	26.54	40
0.50-1.00 ha	13	7	8.01	12	23	12	14.99	23
Less than 0.50 ha	23	12	5.45	9	22	11	5.38	8
0	138	72	0	0	116	61	0	0
Total	191		64.39		191		65.56	
Av. area per household (ha)			0.34 (1.21)[a]				0.34 (0.87)[b]	

[a]Av. area per owner household. [b]Av. area per farmer household.

Table 4. Distribution of sawah land plots, by tenure status, in the North Subang village, 1979.

	Plots		Area	
	No.	%	Ha	%
Owned	47	53	37.42	57
Rented				
Share tenancy	33	38	22.93	35
Pawned	8	9	5.21	8
Total	88		65.56	

Table 5. Distribution of farms, by tenure status, in the North Subang village, 1979.

Tenure status	Farms		Area		Av area per farm (ha)
	No.	%	Ha	%	
Owner operator	36	48	29.07	44	0.81
Owner share	8	11	9.83	15	1.23
Owner pawn	1	1	2.84	4	2.84
Owner share pawn	2	3	4.92	8	2.46
Share tenant	23	30	15.47	24	0.67
Pawn in	5	7	3.43	5	0.69
Total	75		65.56		0.87

Sundanese who moved to the village from surrounding districts. Many recent migrants were Javanese from the eastern edges of West Java or from Central Java. The ethnic heterogeneity seems to be one reason why the community has been loosely structured.

As a result of land accumulation by a few landowners, tenant farming became more common in the village than in the South Subang village (compare Tables 4 and 5 in this paper with Tables 3 and 4 in Kikuchi et al 1980). In the South Subang village, about 10% of sawah land was cultivated by tenants; in the North Subang village, the ratio was higher than 40%. The percentage of tenants (mostly share-croppers) of the total number of farmers was correspondingly higher for the North Subang village.

CHANGES IN RICE FARMING

The most important change in the village economy in the past two decades was the extension of the Jatiluhur Irrigation System to the village. Major laterals had been built as early as 1968 but it was not until 1972 that secondary and tertiary laterals were completed and the whole area in the village became amenable to rice double-cropping. The IPS Survey revealed that double-cropping was practiced in about one half of the sawah area in 1968-71. Our survey in 1979 revealed that the whole area was double-cropped.

The introduction of double-cropping was facilitated by the diffusion of the early-maturing and photoperiod-insensitive modern semidwarf varieties (MV). According to the IPS Survey, 5 to 10% of the rice-crop area was planted to MV in 1968-71. That increased to 100% in 1978-79. IR26, IR36, IR38, and Asahan, developed by the Central Agricultural Experiment Station at Sukamandi, were commonly used. Ani-ani used for harvesting was completely replaced by the sickle.

With the diffusion of MV, and the increased application of fertilizers, average rice yields per hectare of crop area increased from 2.5 t in 1968-71 to 3.9 t in 1978-79 in the wet season and from 2.1 t to 2.9 t in the dry season (Table 6). Considering the increase in the multiple-cropping ratio from 1.5 to 2.0, the average rice output per hectare of sawah per year should have increased 80% during the past decade.

Table 6. Changes in rice yield and rice production inputs per hectare in the North Subang village, 1968-71 to 1978-79.

	1968-71[a]	1979[b]	% change from 1968-71 to 1978-79
Rice yield (kg/ha)			
Wet season	2549	3860	51
Dry season	2134	2876	25
Multiple cropping ratio[c]	1.5	2.0	33
Fertilizer input (kg/ha)[d]			
Wet season	85	224	164
Dry season	56	194	246
Labor input (hours/ha)			
Wet: Land preparation	230	241	5
Other preharvest activities	413	475	15
Harvest and threshing[e]	n.a	258	-
Total (preharvest)	643	716	9
Dry: Land preparation	198	225	14
Other preharvest activities	431	460	5
Harvest and threshing[e]	n.a	249	-
Total (preharvest)	629	685	9
Carabao use for land preparation (days/ha)[f]	9.6	13.2	38

[a]Based on the IPS Survey for Phase I to V. [b]Based on our survey. [c]Total crop area divided by total sawah land area. [d]Urea and TSP. [e]n.a. = not available, a dash (-) indicates not applicable. [f]Data for the wet season

Dramatic improvements in irrigation and technology resulted in a major change in labor demand for rice production. Labor inputs per hectare of rice-crop area did not significantly increase for the wet and dry seasons (Table 6). Although data are not available to assess changes in labor requirements for harvesting and threshing, it appears reasonable to assume that total labor input per hectare of crop area increased by only about 10% during the past decade. A major increase in labor demand was brought about by the introduction of the double-cropping system.

Because the wet crop season in the village extends from October to April and the dry season from April to October, land preparation for one season overlaps with harvesting and threshing for the other. The labor bottleneck resulting from this overlapping of periods was solved by the increased use of carabao for land preparation in the wet season (Table 6). As a result of the substitution of animal power for human labor in land preparation, the average labor input per hectare of crop area for rice production in the village was only 955 hours, about 300 hours less than in the South Subang village (compare Table 7 in this paper with Table 8 in Kikuchi et al 1980).

Unlike in the South Subang village where the cultivation practices in the wet and dry seasons do not significantly differ, there is a clear difference between the wet-season and the dry-season land preparation in the North Subang village. Land preparation in the wet season is mostly animal plowing and harrowing supplemented by manual hoeing and harrowing; dry-season land preparation consists mainly of cutting straw *(babat jerami)* by men. In terms of labor requirement per hectare, however, there is no significant difference between land preparation in the wet season and that in the dry (see Appendix tables A and B).

Despite efforts to save labor, the increase in labor demand due to the diffusion of double-cropping should have exceeded that of supply as manifested by the rise in real wage rates (Table 8). Such a situation in the North Subang village represents a sharp contrast to the case of the South Subang village in which population pressure under a stagnant technology resulted in the decline in real wage rates, which induced the substitution of human labor for animal power.

Table 7. Labor input for rice production per hectare by task, in the North Subang village. Averages for the 1978-79 wet season and 1979 dry season.

	Large farmer		Small farmer		Av	
	Hours	%	Hours	%	Hours	%
Land preparation						
Family	55	25	103	40	69	30
Hired	167	75	155	60	164	70
Total	222		258		233	
Transplanting						
Family	7	4	22	13	11	7
Hired	158	96	151	87	156	93
Total	165		173		167	
Weeding						
Family	22	12	106	53	46	24
Hired	168	88	94	47	146	76
Total	190		200		192	
Harvesting and threshing						
Family	8	3	14	5	10	4
Hired	241	97	251	95	244	96
Total	249		265		254	
Others						
Family	73	63	78	85	75	69
Hired	43	37	14	15	34	31
Total	116		92		109	
Total						
Family	165	18	323	33	211	22
Hired	777	82	665	67	744	78
Total	942		988		955	

CONSEQUENCES OF TECHNOLOGICAL PROGRESS

A significant progress in technology -- broadly defined as an upward shift in production function -- was realized in the North Subang village as a result of development in irrigation systems and introduction of MV.

Table 8. Changes in input prices for rice production in the North Subang village, 1968-71 and 1978-79.[a]

	1968-71[b]	1978-79[c]	% change from 1968-71 to 1978-79
Paddy price (Rp kg)	19.3	67.5	250
Nominal input price			
Fertilizer price (Rp kg)[d]	28.0	70.0	150
Labor wage rate (Rp day)[e]	153	775	407
Carabao rental rate (Rp day)[f]	170	950	459
Real input price[g]			
Fertilizer price (kg kg)	1.5	1.0	-33
Labor wage rate (kg day)	7.9	11.5	46
Carabao rental rate (kg day)	8.8	14.1	60

[a]Av for the wet and dry seasons. Rp627.25 US$1 (as of January 1980). [b]Based on the IPS Survey for Phase I to V. Av for the wet and dry seasons. [c]Based on our survey. Av for 1978-79 wet season and 1979 dry season. [d]Urea and TSP. [e]Wage for land preparation assuming 8 hours work per day. Includes meals. [f]Data for the wet season. [g]Nominal price divided by paddy price.

Changes in rice harvesting systems

As in the South Subang village, the traditional form of rice harvesting contract in the North Subang village was the purely open *bawon* system in which everyone can participate in harvesting and receive an output share. However, unlike in the South Subang village, the harvesting system in this village did not change toward the direction of strengthening the limitation on participation. Farmers continued to use the purely open bawon system, although they reduced the share rate for harvesting workers (Table 9). Some of the farmers tried to introduce the *ceblokan* system in the 1960s, about the same time it was initially introduced in the South Subang village. However, they soon shifted back to the bawon system.

Table 9. Changes in rice harvesting system in the North Subang village (% of farmer adopters)

	Bawon (purely open)						Ceblokan[a]	Total
	1/5	1/6	1/7	1/8	1/9	1/10		
1940s	100							100
1950s	77	23						100
1960-64	57	30					13	100
1965-68	56	34	6	4				100
1969-70		53	23	17	7			100
1971-72		35	23	21	12	9		100
1973-74		23	23	27	11	16		100
1975-76		2	18	36	11	33		100
1977-78			16	32	9	43		100
1979			11	28	7	54		100

[a]A system with 1/5 bawon share and with transplanting and pulling seedlings as obligatory works.

One reason why the ceblokan, a system of more strict control, was not developed seems to be the loose community structure of the village. Because the village was settled recently by many new migrants of different ethnic groups, the identity of villagers as members of an organic community has not been strongly established. Loose community ties in the village are reflected in the absence of mutual help and insurance schemes among small neighborhood groups. Such a social climate would not have been conducive to the development of harvesting arrangements that limit participation to villagers only or to a specific group of villagers under the guise of patron-client relationship.

Another basic factor underlying the continuation of the open bawon system seems to be the labor shortage in the harvest months, which coincide with land preparation for the next crop in the double-cropping system.

Although the open bawon system sustained, the output share for harvesters declined successively from one-fifth to one-tenth (Table 9). However, this decline in the share rate does not mean a decline in the wage rate of harvesters under the condition of rising yields per hectare. The imputed wage rates for bawon harvesting and threshing were found roughly in equilibrium with the market wage rates for land preparation for the overlapping periods (Table 10). Such

Table 10. Imputed wage rate for bawon harvesting and threshing in the North Subang village, 1978-79.

	Wet season (1/10)[a]	Dry season (1/10)[a]
Paddy yield (kg/ha)[b]	4,177	3,396
Bawon share (kg/ha)	418	340
(1) Imputed value (Rp/ha)	27,588	23,460
Labor input for harvesting and threshing		
(2) (hours/ha)	257	266
Imputed wage rate (1)/(2) (Rp/hour)	107	88
Market wage rate (Rp/hour)	100[c]	94[d]

[a]Output share rate for bawon harvesters. [b]Av yield per ha for the fields for which the share rate of 1/10 was applied. [c]Wage rate of land preparation for the dry season. [d]Wage rate of land preparation for the wet season.

results seem to suggest that the bawon share rate was reduced in response to rising yield so as to equate the implicit wage rate for harvesting with the marginal productivity of labor for both harvesting and land preparation. It seems reasonable to assume that the harvesting wage rate implicit in the bawon share increased in line with the rise in wage rates for land preparation in the course of technological progress.

The same equilibrium between marginal labor cost and return could have been achieved by an alternative method, e.g. by ceblokan in which additional obligatory works are required for harvesting workers to be employed for the same output-share rate. Why was the reduction of the bawon share rate used in the village to restore equilibrium, instead of adopting the ceblokan system as in the South Subang village? We believe the answer lies in the difference in the community structure.

Changes in income distribution

In both the North and South Subang villages, labor used for rice production increased. However, the increased application of labor in the South Subang village was accompanied by a decline in the labor wage rate relative to the rental rate of draft animals, which implied a substitution of labor for capital along a fixed production function. In the North Subang village, on the other hand, the increased labor input was accompanied by a rise in the real wage rate, which should have been the result of a shift in the production function. How was such difference reflected in changes in income distribution?

Changes in the average factor shares of rice output per hectare in the North Subang village from 1968-71 to 1978-79 were estimated (Table 11). During the period the average yield per hectare for the wet and dry seasons increased by 40% (Table 6. See also Appendix Table C). Despite such rapid increase in output, the relative share of labor stayed almost constant. Meanwhile, the shares of both current inputs and capital increased. As a result, the share of operators' surplus declined in the case of owner farmers.

In the case of tenant farmers, operators' surplus was almost zero and land rent paid to landlords was equivalent to owner farmers' surplus, implying that the operators' surplus of owner farmers consisted mainly of the return to their land. Thus, the results in Table 11 are consistent with the hypothesis that the technological progress in this village was biased toward land-saving and capital-using and was more or less neutral with respect to use of labor. Such results for the North Subang village represent a sharp contrast to the case of the South Subang village where the share of land increased sharply at the expense of the share of labor (Kikuchi et al 1980, Table 16).

The data in Table 11 are rearranged in Table 12 to show how the income (value added) from rice production per hectare was distributed between farmers and hired laborers. Farmers' income consists of operators' surplus and returns to family labor and capital. Laborers' income consists of wage earnings on farms. Both farmers and laborers recorded significant gains in their absolute incomes, but their relative shares remained largely unchanged. Again, such results contrast with those of the South Subang village study where the income of laborers did not show a significant increase and their relative income share declined (Kikuchi et al 1980, Table 17).

Table 11. Changes in factor payments and factor shares in rice production per hectare of crop area in the North Subang village, 1968-71 and 1978-79.[a]

	Factor payment (kg/ha)			Factor share (%)		
	1968-71[b]	1978-79[c]		1968-71[b]	1978-79	
	Owner	Owner	Tenant[d]	Owner	Owner	Tenant[d]
Paddy output	2342	3203	3272	100.0	100.0	100.0
Factor payment[e]						
Current input[f]	152	300	280	6.5	9.4	8.5
Capital[g]	47	154	154	2.0	4.8	4.7
Labor	947	1322	1295	40.4	41.3	39.6
Family	117	252	357	5.0	7.9	10.9
Hired	830	1070	938	35.4	33.4	28.7
Land	0	0	1496	0.0	0.0	45.7
Operator's surplus	1196	1427	48	51.1	44.5	1.5

[a]Av for the wet and dry seasons. [b]Based on the IPS Survey for Phase II to V. [c]Based on our survey. [d]Data for share tenants. [e]Factor payments converted to paddy equivalents by the factor-product price ratios. [f]Seeds, fertilizers, and chemicals. [g]Animal and machine rental and irrigation fee.

Table 12. Changes in shares of income from rice production per hectare of crop area in the North Subang village, 1968-71 and 1978-79.[a]

	Income in paddy (kg/ha)		Income share (%)	
	1968-71	1978-79	1968-71	1978-79
Value added[b]	2191	2903	100.0	100.0
Farmer				
Family labor	117	252	5.3	8.7
Capital	47	154	2.2	5.2
Operator's surplus	1197	1427	54.6	49.2
Total	1361	1833	62.1	63.1
Hired labor				
Preharvest activities	467	686	21.3	23.7
Harvest and postharvest activities	363	384	16.6	13.2
Total	830	1070	37.9	36.9

[a]Data rearranged from Table 11 for owner-operated farms. [b]Output value less current input cost.

CONCLUSION

A comparison of the South Subang village of our previous paper and the North Subang village of this paper sheds light on the net effect of technological change on income distribution.

In the South Subang village, population pressure had long reached its limit and the population growth decelerated but labor force continued to increase; technology was stagnant because MV effective in the environmental condition of this specific area were not available; fertilizer application increased not because of the new technology but because of low fertilizer prices subsidized under the BIMAS Program. Gains in rice yields were not so significant; increase in labor

force against limited land resources under stagnant technology resulted in the decrease in economic return to labor; the real wage rate for land preparation declined, inducing the substitution of hand hoeing with animal plowing and; labor's income share declined relative to land's share.

The dismal process of growing poverty and inequality of the South Subang village approximates the classical model of Ricardo. As the growth of population presses hard on limited land resources under constant technology, cultivation frontiers are expanded to more marginal land and greater amounts of labor applied per unit of cultivated land; the cost of food production increases and food prices rise; in the long run, laborers' income will be lowered to a subsistence minimum barely sufficient to maintain stationary population and all the surpluses will be captured by landlords in the form of increased land rent. This was exactly what occurred in the South Subang village.

In the North Subang village, the Ricardian force of population pressure was counteracted by technological progress; the improvement in the irrigation system together with the diffusion of MV not only increased the average rice yield per hectare but also contributed to a dramatic expansion in the area double-cropped; labor demand increased and the real wage rate rose significantly, despite the large inflow of migrant laborers and farmers' effort to substitute animal power for human labor; the relative income share of labor rose relative to that of land and the income of hired laborers increased absolutely if not relatively.

The comparative analysis of the two village cases has shown clearly that contrary to a popular belief, growing poverty and inequality will be an inexorable fate of Asian village economies if the efforts to generate technological progress, together with the efforts for agrarian reform and other rural development programs, remain insufficient to overcome the decreasing return to labor due to the growing population pressure on land.

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APPENDIX: LABOR INPUTS FOR RICE PRODUCTION PER HECTARE, BY SEASON, AND CHANGES IN FACTOR PAYMENTS IN RICE PRODUCTION BY SEASON

Table A. Labor inputs for rice production per hectare, by task, in the North Subang village, 1978-79 wet season.

	Large farmer		Small farmer		Av	
	Hours	%	Hours	%	Hours	%
Land preparation						
Family	78	37	117	38	90	37
Hired	134	63	190	62	151	63
Total	212		307		241	
Transplanting						
Family	6	4	23	13	11	7
Hired	155	96	149	87	153	93
Total	161		172		164	
Weeding						
Family	26	13	107	54	50	25
Hired	181	87	91	46	154	75
Total	207		198		204	
Harvesting and threshing						
Family	6	2	13	5	8	3
Hired	245	98	262	95	250	97
Total	251		275		258	
Others						
Family	67	59	79	85	71	66
Hired	46	41	14	15	36	34
Total	113		93		107	
Total						
Family	183	19	339	32	230	24
Hired	761	81	706	68	744	76
Total	944		1045		974	

Table B. Labor inputs for rice production per hectare, by task, in the North Subang village, 1979 dry season.

	Large farmer		Small farmer		Av	
	Hours	%	Hours	%	Hours	%
Land preparation						
Family	32	14	89	43	49	22
Hired	200	86	119	57	176	78
Total	232		208		225	
Transplanting						
Family	7	4	20	12	11	7
Hired	160	96	152	88	158	93
Total	167		172		169	
Weeding						
Family	18	10	105	52	44	24
Hired	154	90	98	48	137	76
Total	172		203		181	
Harvesting and threshing						
Family	9	4	15	6	11	4
Hired	237	96	240	94	238	96
Total	246		255		249	
Others						
Family	78	66	77	85	78	71
Hired	40	34	14	15	32	29
Total	118		91		110	
Total						
Family	144	15	306	33	193	21
Hired	791	85	623	67	741	79
Total	935		929		934	

Table C. Changes in factor payments in rice production, by season, in the North Subang village, 1968-71 to 1978-79.

	1968-71[a]		1978-79[b]			
			Wet		Dry	
	Wet Owner	Dry Owner	Owner	Tenant[c]	Owner	Tenant[c]
			--------kg/ha--------			
Rice output	2549	2134	3895	3771	2511	2773
Factor payments:[d]						
Current input[e]	167	136	341	284	259	275
Fixed capital[f]	85	9	255	259	52	49
Labor	958	935	1369	1383	1275	1207
Family	113	120	265	396	240	318
Hired	845	815	1104	987	1035	889
Land	0	0	0	1824	0	1166
Operator's surplus	1339	1054	1930	21	925	76

[a]Based on the IPS Survey for Phase I to V. [b]Based on our survey. [c]Data for share-tenants. [d]Factor payments converted to paddy equivalents by the factor-product price ratios. [e]Seeds, fertilizers, and chemicals. [f]Animal and sprayer rental paid and/or imputed and irrigation fee.

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