PATTERNS OF LABOR UTILIZATION AND INCOME DISTRIBUTION IN RICE DOUBLE CROPPING SYSTEMS: POLICY IMPLICATIONS

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INTRODUCTION

THE Green Revolution in Malaysia, as in other Asian countries, has generated a degree of euphoria regarding its impact upon food self-sufficiency[1] because of the anticipated output increases, higher incomes for producers, and increased absorption of surplus agricultural labor resources. The underlying rationale has been that technical requisites—adequate irrigation infrastructure, dissemination of HYV's, and complementary chemical inputs—were necessary and sufficient conditions to generate widespread adoption of HYV's by farmers hitherto culturally and technically bound to single cropping regimes.[2] The initial optimism has been tempered by the realization that an adequate institutional framework is a necessary condition to the widespread adoption of the new rice technologies.[3] One still neglected dimension is the effect of double cropping on patterns of labor utilization among different classes of farmers and the differential distributional impact of the new technologies upon them. It is the objective of this paper, therefore, to provide some preliminary insights into these two aspects with special reference to the Sawah Sempadan area of Tanjong Karang, Selangor. The policy implications of the research findings are also analyzed in the concluding part of this paper.

The preliminary results of the project were first presented by L. J. Fredericks and B. W. Dissanayake at the Conference on Strategic Factors in Rural Development in East and South East Asia, Manila, 1976. This paper was presented to the Fourth Malaysian Economic Convention Agenda for the Nation IV: Public Policies for Re-structuring Society held in Kuala Lumpur, May 19–21, 1976.

[1] It is interesting to note that Malaysia has scaled up its rice self-sufficiency ratio from 90 per cent to 100 per cent. While this change was in part prompted by the rice "crisis" of 1972/73, it reflects the belief of policy-makers that output can be increased sufficiently to meet domestic demand.

[2] The FAO in computing estimates of post 1967 rice production increases in Asian countries attributes this to the following factors: 45 per cent to intensified irrigation; 25 per cent to increased fertilizer use; 15–25 per cent to the genetic potential of the new *padi* varieties, and 3 per cent to the genetic purity of the seed used. See [6, p. 87].

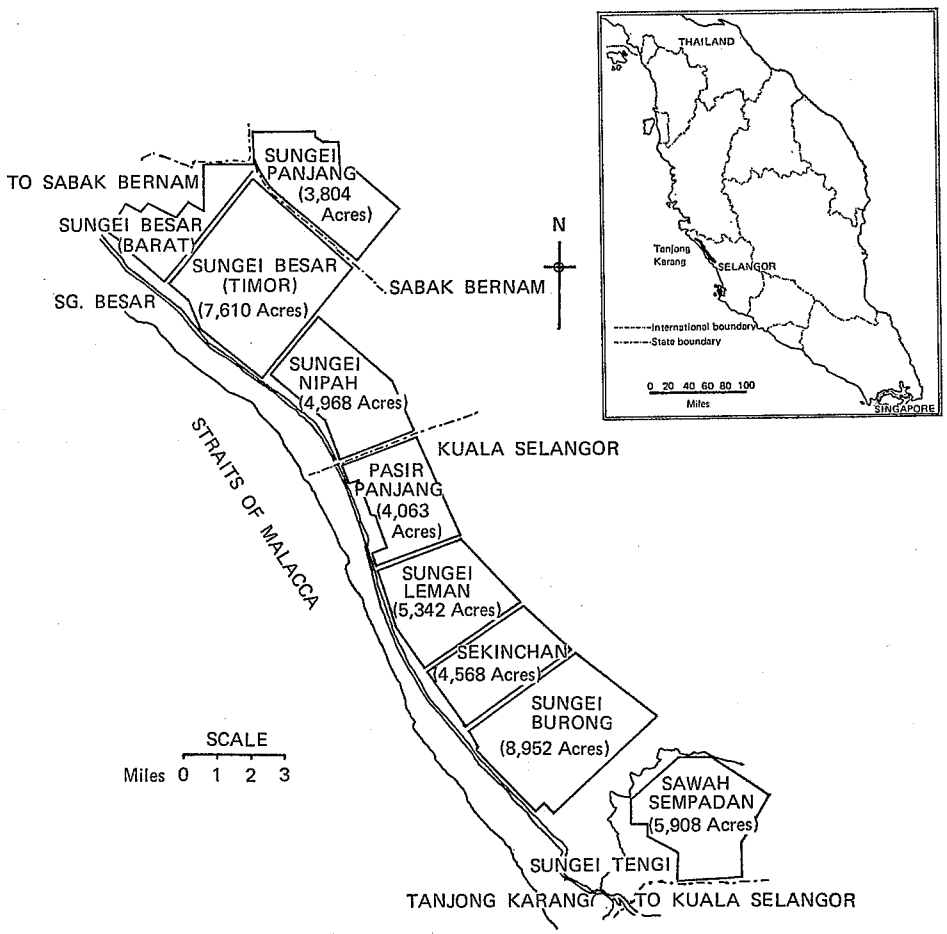
[3] For a recent study see [9].

I. THE RESEARCH PROJECT

The project area[4] is the Sawah Sempadan locality of Tanjong Karang in Selangor. Sawah Sempadan is one of eight *padi* growing areas in the Tanjong Karang belt (see Figure 1), covering 49,006 acres and extending along the Selangor coast.[5] The agricultural potential of the area was initially investigated in 1895 and, from 1918, the coastal strip was developed by settlers from Sumatra and Java. A coastal bund fifty miles along the coast was constructed by the Drainage and Irrigation Department to prevent recurrent tidal inundation.

Investigations into the *padi* growing potential of the area began in 1933 and a coastal strip of two to four miles extending a distance of twenty-seven miles along the coast was found suitable. The geographical limits to rice cultivation

Fig. 1. Tanjong Karang *Padi* Belt



[4] The project was jointly funded by CAMS and the University of Malaya.
[5] The background and agro-economic characteristics of this area is given in [12].

were defined by the depth of peat soil, ranging from peat-free soils along the coast to a depth of four feet along the eastern boundary.

Irrigation works to facilitate *padi* production began in 1936 with actual construction starting only in 1939. Several improvements to the basic scheme of providing irrigation water have been periodically undertaken; sufficient water is now available to irrigate 50,000 acres with two crops of rice. Double cropping in the area began in 1961.

The eight localities are each subdivided into blocks of 200–300 acres, usually consisting of three-acre plots. The original settlement plan was to provide each settler with a three-acre *sawah* plot and one acre of *tanah darat* as the house plot.[6]

The Sawah Sempadan area consists of twenty-three blocks and a total of 1,993 lots having an average size of 2.96 acres. Most of the farmers are of Javanese origin and reside in *kampungs* surrounding the area. However, for the research project, only farmers resident on farm were selected, as identification of the total farming population in this locality would have been both time-consuming and expensive.[7] Further, to eliminate the effects of varying soil conditions, blocks L, M, N, O, P, S, T, and U having the best soils in Sawah Sempadan were selected. Of these blocks, enumeration of about three hundred farmers resident on farm were identified and a sample of seventy-three farmers randomly selected.

II. METHODOLOGY

In order to generate data pertaining to the patterns of labor utilization and income distribution in the locality, three sets of questionnaires were sequentially administered.

After the selection of the sample, a resource questionnaire was distributed to measure the range of labor, land, and capital resources of the farmers selected. At the same time, socioeconomic information, including patterns of institutional affiliation, sources of general and agricultural information, facilities available in homes, and other qualitative data were collected.[8]

The second phase of the survey began with the actual preparation of nurseries and fields prior to the planting of the main season crop in September 1975.[9] A composite questionnaire covering the following items was used:

[6] Unlike the modern day land development and settlement schemes in Malaysia, pioneer settlement in *padi* areas was an arduous and difficult process fraught with uncertainties about the viability of the effort. A minimum of three years was required before the land could be planted with *padi*. Added to this, the Kuala Selangor Colonization Area was provided with only the most rudimentary facilities for settlers. Settlers in this scheme were promised M$12 per acre, educational facilities, water, and "fair" roads. However up to 1949 nothing was done to provide such facilities and up to the mid-fifties, the basic social and economic infrastructure in the area was inadequate. See [13, p. 130].

[7] It is ironical that, despite the number of development agencies providing field level services to farmers, none could provide a reasonable approximation of the farming population of Sawah Sempadan.

[8] Not all these data will however be presented in this paper.

[9] The *padi* variety extensively planted in the area over both seasons is "Mat Candu," an improved local variety with a maturation period of about 140 days.

(a) utilization of family labor (farmer, adult males, adult females, and children) at various stages of the planting cycle and for various functions performed including nursery preparation, field preparation, planting, crop care, harvesting, and transportation. The number of hours worked everyday was recorded and so were the amount, type, and cost of inputs used;

(b) utilization of family labor for social purposes (wedding, funerals, and other ceremonies) and for community (*gotong royong*) projects;

(c) utilization of family labor on other agricultural land operated by the farmer;

(d) utilization of family units as hired labor and wages received;

(e) utilization of hired labor on *padi* farms including costs and modes of payments; and

(f) income from the sale of farm produce (including *padi,* fruits and vegetables, animals), rental of equipment and land, etc.

The third phase of the survey began with the cultivation of the off-season crop (starting April 1976) when adjustments were made to the resource questionnaire to record any significant changes in inventory. The pattern of labor use, costs incurred, and incomes earned were then recorded as in the first season.

In order to ensure some degree of accuracy and reliability of the data collected, weekly visits were made by interviewers to the sample farms. While this method departs from the traditional practice of collecting data at the end of a crop season, it precludes the selection of a large sample of farmers.

III. SAMPLE CHARACTERISTICS

The size distribution of land resources owned or rented by the sample of seventy-three farmers is given in Table I. The table reflects the situation as at September 1975 and incorporates changes in land inventories that occurred by the start of the off-season crop in April 1976.

Forty-five per cent of the farmers operate *padi* plots between 3–4 acres in size, while 15 per cent farm acreages in excess of 5 acres. The overall average size is 3.34 acres (with a total acreage of 244 acres) compared to the 1966 averages of 3.5 acres for Sawah Sempadan and 4.5 acres for Tanjong Karang as a whole. The actual average cultivated area (less homestead) is, however, only 2.99 acres. While all the sample farms fully double-cropped with rice over the two seasons investigated, the multiple cropping index can be expected to approximate an earlier estimate of 166, given the inability of farmers to plant *padi* at the recommended dates.

Nine farmers reported renting-in *padi* land, while five farmers rented out *sawah.* Only one farmer does not own any land whatsoever. A total of twenty-six farmers reported the cultivation of other agricultural crops on non-*padi* land; half of these farms were less than two acres in size. The majority of these farmers (twenty-three of them) plant coconut, while the remainder cultivate rubber or oil palm.

The farm equipment base of the typical farmer consists of farm implements including slashing knives, threshing tubs, gunny sacks, sieves, drying mats, *sam-*

TABLE I

SIZE DISTRIBUTION AND TENURE STATUS OF *Padi* AND OTHER AGRICULTURAL LAND AS OF SEPTEMBER 1975 (MAIN SEASON) AND APRIL 1976 (OFF-SEASON)

Size Class (Acre)	No. of Farmers Cultivating *Padi*		No. of Farmers				No. of Farmers Cultivating Other Land
			Renting-in *Padi* Land		Renting-out *Padi* Land		
	Sept. '75	Apr. '76	Sept. '75	Apr. '76	Sept. '75	Apr. '76	
0–0.99	2 (2.7)	1 (1.4)	—	—	—	—	1
1–1.99	12 (16.5)	13 (17.8)	5	6	4	3	11
2–2.99	8 (11.0)	6 (8.2)	—	1	—	1	6
3–3.99	33 (45.2)	33 (45.2)	2	3	1	1	2
4–4.99	7 (9.6)	12 (16.4)	1	1	—	—	6
5–5.99	3 (4.1)	3 (4.1)	—	—	—	—	—
6–6.99	3 (4.1)	1 (1.4)	1	1	—	1	—
7–9.00	5 (6.8)	4 (5.5)	—	—	—	—	—
Total	73 (100)	73 (100)	9	12	5	6	26
Total acreage	244	239.0	25.0	5.5	30.0	16.0	
Actual cultivated acreage	218.6	212.8					

Note: Figures in parentheses refer to percentages.

pans (to float seedlings), spraying equipment, etc. The value of such small implements on the average rarely exceeds M$100–150 per farmer. In addition, some farmers may own small storage huts, concrete drying spaces, and separate housing for farm animals. All the sample farmers rear ducks and chickens, while fourteen of them also keep goats and cows. Transportation equipment for both farm produce and for the farm family typically consists of bicycles and motorcycles. Only two farmers reported being without either a bicycle or motorcycle; thirty-seven owned both motorcycles and bicycles. In addition, significantly in view of the small sample drawn, nine farmers own tractors with seven owning one each of Kubota two-wheel pedestrian tractors; two owning two each of the latter and one owning one pedestrian tractor and one four-wheel Fiat 640 tractor. No clear relationship with land ownership or operatorship seems evident but it is highly relevant to note that ten years ago, tractors were almost non-existent in this locality.[10]

[10] Two of the tractor-owner reported owning their first tractor as early as 1964 and 1965 although their present tractors were purchased after 1970. Twelve bought their tractors new while two farmers purchased secondhand tractors. Financing was provided overwhelmingly (ten farmers) using their own resources. Of the fourteen tractors, eleven were owned by one owner, two by two farmers and one jointly owned by four farmers. The thirteen two-wheel tractors had a present value of nearly M$70,000, while the four-wheel Fiat 640 which was only one year old cost M$20,000.

Tractor owners reported that they purchased their tractors as much for investment purposes as to facilitate *padi* cultivation on their own farms. Half reported driving their tractors, while the rest of the owners employed a driver. The major problem in tractor ownership appears to the lack of repair facilities, lack of spare parts and servicing facilities; the majority resort to self repair.

TABLE II

SOCIOECONOMIC DATA OF HOUSEHOLD HEADS

Age Group (Years)	Number		Years of Schooling				Type of Schooling		
	Males	Females	0	1–3	4–6	7–9	Javanese/ Arabic	Primary	Secondary
25	2	0	0	1	1	0	0	2	0
26–35	12	0	2	1	9	0	0	10	0
36–45	15	0	4	3	7	1	2	9	1
46–55	14	1	6	1	7	1	1	7	1
56–65	17	1	9	2	7	0	4	5	0
65	8	3	8	2	1	0	2	1	0
Total	68	5	29	10	32	2	9	34	2

Most farmers are affiliated to farmers' associations (60) and U.M.N.O. (56). Membership in other organizations include the cooperative rice mill (15), parent-teachers' association (10), religious institution (5), youth organization (5), and *kampung* committee (1). Only two farmers indicated that they did not belong to any village level institution whatsoever.

Some basic demographic characteristics of the sample farmers are provided in Table II. Heads of households are predominantly males over thirty-five years old; over 50 per cent of the sample (including all five women household heads) are above forty-five years. Forty per cent of all household heads are illiterate and these belong mainly to the older age groups. Of the remaining forty-four farmers, the majority have had between 4–6 years of Malay primary education while ten have had up to three years primary education. Only two household heads reported having secondary education. Given the Javanese ancestry of the farmers, it is not surprising that nine farmers have had a Javanese/Arabic education.

The average family size is 6.04 persons. There are more adult males than adult females per family (1.78 males compared to 1.34 females). Children below sixteen years constitute 47.8 per cent of the total family population represented by the sample.

IV. PATTERNS OF LABOR UTILIZATION

While mechanization particularly in field preparation (ploughing and harrowing) is practised extensively in Sawah Sempadan, *padi* cultivation remains essentially a labor-intensive operation. In investigating the patterns of labor use in both *padi* and non-*padi* activities (including social and cultural activities), a reasonably accurate approximation of labor use patterns and the extent of labor surpluses available can be generated.

Table III provides data pertaining to the intensity of labor use per acre of *padi* cultivated by the different field operations performed. The data, averaged over two seasons (September 1975–March 1976, April–September 1976) is further divided by family labor and hired labor resources used. Family labor pro-

TABLE III

NUMBER OF HOURS AND MAN-DAYS UTILIZED BY FIELD OPERATION PER ACRE OF *Padi* CULTIVATED, AVERAGE OVER TWO SEASONS, 1975/76

Operation	Family Labor (Hours)						Hired Labor	
	Farmer	Male Adults	Female Adults	Children†	Total Hours	Man-Days	Hours	Man-Days
Nursery preparation	9.56	3.27	5.95	0.26	18.99	2.38	—	—
Field preparation	10.67	2.05	4.38	0.16	17.25	2.16	—	—
Transplanting	17.03	6.99	15.45	0.46	39.93	4.99	9.90	1.24
Crop care*	15.56	1.57	4.94	0.18	22.24	2.78	0.27	0.04
Harvesting, threshing, and transportation	21.05	9.35	20.58	0.40	51.38	6.43	25.22	3.15
Total	73.87	23.23	51.30	1.46	149.79	18.74	35.39	4.43

* Including weeding, application of fertilizer, insecticide, herbicide, etc.
† Children under sixteen years old.

vides 80.9 per cent of the total labor resources used per acre of *padi* cultivated and harvested. Family labor resources can be segmented into four groups: the farmer, male adults, female adults, and children below sixteen years old. The farmer is the most important source of family labor inputs (49.3 per cent), followed by female adults, most commonly the farmer's wife (34.2 per cent). The farmer and his wife thus contribute 83.5 per cent of the total labor input in *padi* growing; the contribution of other family members is relatively insignificant but may be crucial (or substituted with hired labor) at the peak periods of labor use in the *padi* planting cycle. It is of significance to note moreover that child labor is insignificant thus indicating the inroads of education upon the stock of family labor and, to some degree, the changing values of the farmer to the role of children in peasant production systems.

The predominant role of the farmer and his wife is evident in all field operations. While the farmer contributes the greatest amount of labor for all operations, it is mainly in harvesting, threshing and transportation (although females rarely transport *padi*), and transplanting that the largest input of female labor resources is absorbed. Hence, although the tendency is towards a gradual disintegration, the sex specific functions in harvesting and transplanting remain a manifestation of Malay peasant cultural traditions.

For both male adults and children, the greatest input by operation is during transplanting and harvesting.

Of the total labor input per acre cultivated, 19.1 per cent is accounted for by hired labor resources who are employed primarily during transplanting, harvesting, and transporting *padi*. These operations require intensive use of labor inputs because of the need to adjust to the pressures of double cropping.[11] For

[11] Specifically, double cropping necessitates speedy harvesting and land preparation in order that the next crop may be planted to coincide with irrigation schedules. For an analyses of the critical importance of the completion of cultivation operations within prescribed time limits in double cropping regimes, see [5].

TABLE IV

NUMBER OF HOURS AND MAN-DAYS UTILIZED PER ACRE OF *Padi* CULTIVATED IN DIFFERENT FARM SIZE CATEGORIES, AVERAGE OVER TWO SEASONS, 1975/76

Farm Size (Acre)	Family Labor (Hours)						Hired Labor		Total Labor Input	
	Farmer	Male Adults	Female Adults	Children*	Total Hours	Man-Days	Hours	Man-Days	Hours	Man-Days
Small (-1.99)	144.29	17.24	77.40	0.97	239.89	29.98	19.74	2.47	268.53	30.30
Medium (-3.99)	75.75	26.54	52.61	1.72	156.62	19.57	31.29	3.29	187.91	23.48
Large (-9.00)	48.38	22.49	41.07	1.18	113.11	14.14	46.40	5.80	159.51	19.94

* Children under sixteen years old.

both operations, hired labor inputs constitute a total of 24.8 per cent and 49 per cent of the total labor input respectively. This reflects the extent to which family labor resources are unable to meet the seasonal peak demand for labor, or conversely, the degree of dependence on non-family labor sources. In the concept of certain economists, a parallel movement along the scale from subsistence to commercialized farming operations is indicated.[12]

Labor use intensities differ significantly in the different farm size categories (see Table IV). The total labor input per acre is greatest for small size farms (30.30 man-days compared to the overall average of 24.57 man-days).[13] This, moreover, is accounted for mainly by family labor inputs, indicating an extensive use of resources which is relatively most abundant in this farm size group. This group, thus, utilizes 1.53 and 2.12 times more of family labor inputs per acre than the medium and large-size farms respectively. In the family labor resource category, the farmer himself supplies the largest input of labor, although the percentage varies in the small (60 per cent), medium (48.4 per cent), and large (42.8 per cent) size groups. While female labor constitutes the second most important source, the absorption of male adult and child labor is highest in the medium and large farms. To some degree, this reflects the variations in the size of the farm family labor force amongst them.[14]

Hired labor is employed least on small-size farms partially because of the more favorable man/land ratio and partially because of the cash flow problem. On the other hand, among large farms, 29.1 per cent of the total labor input is hired as compared to 16.7 per cent on medium size farms.

The different levels of family labor used imply that the average physical productivity of labor is lowest on the small farms and higher on the medium and large farms, due to the decrease in labor input per acre as farm size increases.

Data on the use of family labor on non-*padi* activities is given in Table V. On a per farm basis, the medium and large *padi* farmers spend more time on

[12] See [11, pp. 165–85].

[13] A similar inverse correlation between farm size and labor input per acre has been identified in the Muda Area. See [17, pp. 100–101].

[14] It is relevant to note that the average number of adults per family in the small, medium, and large farms is 2.60, 3.16, and 3.86 respectively. The average number of working units per family is respectively 1.66, 1.86, and 1.96.

TABLE

ESTIMATION OF SURPLUS LABOR AMONG
AVERAGE OVER TWO

Farm Size (No. of Farms)	Avg. No. of Adult	Labor Stock A[a] (hrs.)	Avg. No. of Working Units	Labor Stock B[b] (hrs.)	*Padi* Work (hrs.)	Surplus A (Man-Days)[c]
Small (20)	2.60	2,954	1.66	1,886	298	332
Medium (41)	3.16	3,590	1.88	2,136	440	394
Large (12)	3.86	4,385	1.96	2,227	673	464
Total (73)	3.21	3,647	1.83	2,079	470	397

[a] Based on an average 1,112 hours and 1,160 hours of working time available in the main and off-seasons, thus giving an average of 1,136 hours over the two seasons.

their *padi* farms and their non-*padi* plots than the small-scale farmers. However, the small farmers on average utilize more of their time on wage employment compared to the other two categories of farmers. In terms of social labor expended (on weddings, feasts, and other ceremonies and, to a small extent only, in labor exchange work), small farmers appear to spend more time in such pursuits than either the medium or large farmers.

V. ESTIMATES OF LABOR SURPLUS

Table V provides various estimates of the labor surplus using the labor utilization approach.[15] By different farm size groups, two concepts of the total family labor stock are used. In one, the average number of adults per family is calculated and the total labor stock derived on the basis of an average of 1,136 hours of working time available.[16] The second concept derives its estimate of the average number of working family units on the basis of the heads of household evaluation of the contribution of each family unit to farm work. This estimate reflects that the labor stock actually available takes into consideration individual variations in the labor contributed by family units (old people, handicapped family units, contribution by children, etc.). While recognizing the limitations inherent in both concepts, an upper and lower limit to the total stock of family labor resources and the labor surplus generated can thus be derived.

Six estimates of the labor surplus available in the Sawah Sempadan locality are generated taking into account:

(a) only productive work undertaken on *padi* farms;

(b) all productive work undertaken, including non-*padi* work and wage em-

[15] The authors are mindful, however, of the definitional and conceptual problems associated with the measurement of surplus labor resources. See, for instance, [18].

[16] The average number of days elapsed between nursery preparation and harvesting for seventy-three farmers was obtained for both seasons. These estimates were then reduced by a factor of 300/365 to allow for holidays, etc., and multiplied by eight in order to obtain the total working hours available per family unit. The average working hours over two seasons is used in computing the extent of surplus labor resources available.

V

DIFFERENT FARM SIZE CATEGORIES, SEASONS, 1975/76

Surplus B (Man-Days)[c]	Non-*Padi* Farm Work (hrs.)	Wage Work (hrs.)	Surplus A (Man-Days)	Surplus B (Man-Days)	Social Labor (hrs.)	Surplus A (Man-Days)	Surplus B (Man-Days)
199	29	136	311	178	74	302	169
212	36	142	372	190	68	363	181
194	47	159	438	168	97	426	156
202	56	146	372	177	80	362	167

[b] Based on the farmer's (household head) evaluation of the contribution of individual family labor units to farm work.

[c] One man-day=eight hours.

ployment; and

(c) all productive work and, additionally, activities involving social and cultural labor effort.

Using the two estimates of the stock of family labor (Surplus "A" and Surplus "B"), for all farms an average of 397 man-days and 202 man-days of surplus labor resources are available respectively. If all economically productive work is taken into consideration, the net labor surplus available is reduced to 372 man-days and 177 man-days. Further, assuming social and cultural labor activities to be institutionally unavoidable,[17] then the real net surplus labor resources available in a double cropping regime is depleted to 362 man-days and 167 man-days.

By *padi* farms of different size, the "Surplus A" concept consistently indicates a positive relationship between the total labor surplus available and increasing farm size. This is accounted mainly by the marked differences in the average number of adults in the three farm size groups. Using the "Surplus B" concept, although the average number of working units is still larger than in the medium and large farms, the net surplus labor resources is greater in the medium followed by the small and large-size farms. This is due to the relatively smaller differences in the number of working family units in all size categories and the larger outflows of labor in the large farms to productive and social work.

VI. PRODUCTION, COSTS, AND INCOMES

In analyzing the impact of double cropping on the income of and returns to producers, various definitions of income are used. In the first definition, *padi* income is derived by deducting all input costs (except imputed costs for family labor and own tractor services) to obtain one measure of net *padi* income. In the second measure, all input costs including imputed costs are included to

[17] For both social and cultural labor outflows, it is worth bearing in mind that these activities represent cultural obligations which would otherwise lead to real disbursements of cash. Hence, an opportunity cost can be imputed for such activities.

TABLE

OUTPUT-COSTS AND INCOMES PER ACRE OF GROUPS, AVERAGE OVER

Farm Size Group	Gross Output (lbs)	Gross *Padi* Income (M$)	Inputs				
			Water Rate	Seed	Tractor	Harvesting	Transplanting
Small	3,162	641	8.2	6.1	37.0	20.9	8.3
Medium	2,894	587	6.9	5.2	37.3	30.6	6.7
Large	2,768	559	4.7	4.9	29.8	44.5	18.0
All farms	2,942	596	6.6	5.4	34.7	32.0	11.0

[a] Net income A comprises gross *padi* income minus total input costs.
[b] Family labor costs are imputed at M$1 per hour for adults and M$0.50 for children. Tractor costs are imputed for tractor owners at the rate of M$125 for two ploughings

TABLE

OUTPUT, COSTS, AND INCOMES PER SIZE CATEGORIES, AVERAGE

Farm Size Group	Gross Output	Gross *Padi* Income	Total Input Costs	Net Income A	Total Imputed Costs[a]	Net Income B
Small	3,940	800	182.1	617.7	310.7	307
Medium	8,207	1,664	408.2	1,255.5	435.5	820
Large	16,425	3,311	981.9	2,329.9	747.5	1,582.4
All farms	9,524	1,925	524.1	1,401.1	497.9	903.2

[a] Includes family labor and tractor costs.

estimate net *padi* income. Finally, the farm family income (not including, however, imputed costs) from all sources is computed. Both per acre and per farm estimates of the different measures of farm income are provided.[18]

Table VI refers to the per acre income estimates of the farm enterprise. As small size farms have a tendency to cultivate on an intensive margin, *padi* output and gross *padi* income is highest per acre in this category. At least a part of the variation can be explained by the higher intensity of use of chemical inputs. Among the inputs used in *padi* production, the largest cash outflows are accounted for by tractor services, hired labor, fertilizer, insecticides, and weedicides amounting to 81 per cent, 87 per cent, and 84 per cent for the three farm size categories. Chemical inputs alone constitute 40 per cent, 31 per cent, and 29 per cent of the total input costs for the small, medium, and large farms. Hired labor costs (for transplanting, harvesting, and transportation) are, as expected, highest among the large farms because of the lower family labor/land ratio.

The net returns per acre (excluding imputed costs) are highest in the small

[18] No estimates of the depreciation on capital items used in farming, including implements and machines, have been made.

VI

Padi CULTIVATED BY DIFFERENT FARM SIZE
TWO SEASONS, 1975/76

(M$)					Net Income A[a] (M$)	Imputed[b]		Net Income B[c] (M$)
Transport	Fertilizer	Insecticides, etc.	Rent	Total		Family Labor (M$)	Tractor Costs (M$)	
3.9	53.2	6.1	5.1	148.8	492.2	243.5	6.8	241.9
7.4	42.2	4.4	7.8	148.5	438.5	151	2.7	284.8
4.2	46.2	5.5	17.8	175.6	383.4	111.5	13.9	258.0
5.2	47.2	5.3	10.2	157.6	438.4	168.7	7.8	261.9

of a three acre lot.

[c] Net income B comprises net income A minus imputed family and tractor costs.

VII

FARM BASIS BY DIFFERENT *Padi* FARM
OVER TWO SEASONS, 1975/76 (M$)

Farm Produce		Hired Labor Income	Fixed Wages	Tractor Rental	Land Rental	Net Income C[b]
Chicken, etc.	Coconuts					
39.2	13.6	170.7	287	110.3	26.0	1,264.5
59.0	6.9	147.0	334.9	95.7	18.1	1,917.1
92.4	17.6	202.4	246.1	560.8	—	3,449.2
63.5	12.7	173.4	289.3	255.6	14.7	2,210.3

[b] Net income C comprises net income A and other non-*padi* incomes.

farms and lowest in the large farms. However, the situation changes when family labor and tractor costs are imputed. Medium size farms generate the highest per acre returns because of their lower input of family labor as compared to the small size farms. However, the small size farms have a higher per acre net return than the large farms despite the large variation in imputed family labor costs because the latter have a lower per acre productivity and higher total input costs. The small and large farms actually show average net *padi* income less than the average for the whole sample. It is noteworthy that two farmers each in the small and medium farm size categories earn negative incomes after imputed costs are deducted.

Table VII shows the variations in per farm incomes on the basis of various estimates used. It should be noted that the computation of farm family income is made with reference to the different *padi* farm size groups. Given that the income estimates are related to farm size, the previous findings regarding output, input costs, imputed values, and the two measures of income will now appear more favorable for farms better endowed with land resources. Net *padi* income (excluding imputed values) of the large farms are four times as large as for small farms, while medium-size farms earn an income about 200 per cent in excess of

the small farms. When imputed costs are accounted for, the inter-farm disparities are accentuated: small *padi* farms generate *padi* incomes of about 37 per cent and 19 per cent of the returns to the medium and large farms respectively.

Total farm or family income is made up of net *padi* income (excluding imputed costs), revenue from farm produce sold (coconuts, mangoes, eggs, chicken, cows, etc.), casual or hired labor wages, fixed wages (shopkeeper, seamstress, boat pilot, full-time laborers, coffee shop employee, driver, bus-conductor, *padi*-mill operator, dredge driver), and rental incomes from equipment and land. Of the non-*padi* income sources, fixed wage employment and casual labor work are most significant for both small and medium farms, accounting for a total of 69.9 per cent and 72.8 per cent of their net farm family incomes respectively. Among large farms, tractor rentals generate the highest proportion of non-*padi* income, followed by fixed wage and hired labor employment. It is significant to note that, given the limited base that *padi* farms provide for the support of the farm family, wage employment is highest among the small farms.

In aggregate, net farm family incomes are highest in the large farms, followed by the medium and small farms. Small farm family incomes are 66 per cent and 37 per cent of the incomes of the medium and large farmers. *Padi* incomes alone account for 49 per cent, 65 per cent, and 68 per cent of the family incomes of small, medium, and large farmers respectively.

To obtain a measure of the income inequality among the sample farmers, Lorenz curves were plotted (see Figure 2) for the three income estimates and Gini coefficients of disparity computed.[19] For net *padi* income A (without imputed values), net *padi* income B including imputed values, and net *padi* income A plus other incomes (C), the respective Gini coefficients are 0.251, 0.389, and 0.284. While these coefficients indicate a degree of disparity in incomes less than for other groups,[20] a few observations are relevant:

(i) The Gini coefficient for net *padi* income including imputed values can be approximated to a profit estimate, and as such, a higher degree of disparity should be anticipated.

(ii) Given the cultural and ecological homogeneity of the sample, that income inequalities appear at all indicates a significant phenomenon. Heterogeneous farm size is probably the predominant explanatory variable.

(iii) Taking total family income, the index of disparity is greater than for net *padi* incomes alone (excluding imputed costs). This would reflect the situation

[19] Using the formula:

$$G=1-\sum_{i=1}^{k}(f_{i+1}-f_i)(y_i+y_{i+1}),$$

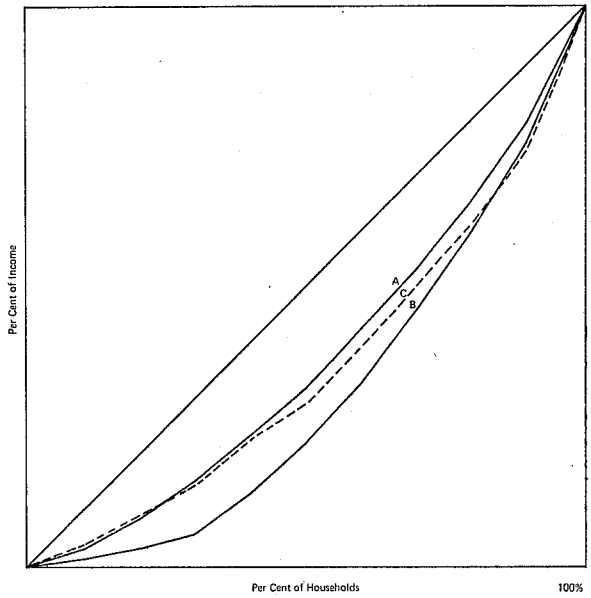
where

f_i=share of recipients in the ith group,

y_i=share of income of the ith group.

[20] The Gini coefficient among rural Malays and between rural-urban Malays estimated by the 1970 Post Enumeration Survey was 0.419 and 0.457. In comparison, on the basis of the Household Budget Survey of 1957, the corresponding coefficients are 0.314 and 0.375.

Fig. 2. Lorenz Curve Representing Income Distribution among *Padi* Farm Households, Tanjong Karang, Malaysia



that access to off-farm work opportunities are, by choice or otherwise, disparate among the three farm size groups.

VII. DOUBLE CROPPING, LABOR UTILIZATION, AND INCOME DISTRIBUTION: POLICY IMPLICATIONS

In a simplistic framework, one could analyze the impact of a double cropping regime on a micro-level through the ways in which it impinges upon the production structure of individual farms. These can be schematically classified as the greater intensity of land use; the increased demand generated by modern rice technology on input-saving factors (mechanization) and output-increasing inputs (chemical inputs, irrigation systems);[21] and differential and uneven rates of adoption of the components of the technology.[22]

Among the *padi* farmers in what is a culturally and ecologically homogeneous locality, double cropping has exercised a differential impact on income distribution; this has largely resulted from unequal access to land resources.[23] Against

[21] In short, what is implied is that biological and chemical technology may be regarded primarily as land-saving whilst mechanical technology is considered to be labor-saving. See [3].

[22] Examples that may be cited include not using the full volume of chemical inputs recommended, not ploughing twice as recommended, using types of fertilizers other than those recommended, and inability to adjust optimally to the designated planting cycle.

[23] The distributional impact of the new technology is almost certainly more adverse if judged on an inter-regional basis rather than an intra-regional basis, given differing

the historical perspective where the original settlers were each allocated three-acre plots of *sawah,* the land ownership pattern has developed to such a stage that farm-size disparities are evident. This phenomenon must be related to rural development strategies oriented primarily to aggregate productivity and output goals. One of the facilitating mechanisms is mechanization. Although in general labor shortages do not exist in the locality, seasonal pressures on skilled labor during peak periods have reached the stage where relative factor prices between tractor ploughing and buffalo ploughing has become advantageous to substitute the former for the latter.[24] In the last ten years since Narkswasdi and Selvadurai initiated their study, all the farmers have converted to tractor ploughing from the recorded percentage of only 11.8 per cent resorting to mechanized ploughing and tilling.[25]

Another factor contributing to the complete displacement of buffalo ploughing is the bottlenecks represented by transplanting and ploughing in the double cropping cycle which necessitate these crucial operations being completed in the minimum time possible. Assuming tractor technology to be not neutral to scale, the historical tendency towards unequal farm size (because of agglomerative pressures in landownership) will be further accentuated by a desire among tractor owners to rationalize investments in tractors and their optimum utilization by repossessing, renting-in or buying *padi* lots. Such a tendency, moreover, will be sharper, as more and more tractor owners emerge in the locality, thus making the opportunities of optimizing tractor use by renting out its services less and less available and the returns lower and lower.

A further watershed can be expected to be reached when the ratio of the cost of hiring out tractors relative to own use will be such that farmers will be encouraged to optimize tractor use by ploughing and tilling their own (extended) land base. Under these circumstances (admittedly a long-run phenomenon), it is possible that the tenant and small owner-operator will be displaced, thus creating a class of landless laborers.[26] If wage rates continue to rise particularly during seasonal bottlenecks in the supply of labor in the cultivation of *padi,* mechanization of other field operations such as harvesting and threshing will proceed apace under inexorable economic pressures, thus facilitating the trend towards larger and larger farms. Given that land is one of the major determining factors of production, large farm sizes can be postulated to increase the degree of dispersion of returns to *padi* producers.

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inherited patterns of resource endowments, variations in the structure of agricultural input and commodity markets and different institutional settings. See [15, pp. 581–82].

[24] Wage rates during peak periods average M$1 an hour and represent the highest wages for agricultural labor in the area. See [7].

[25] See [12, p. 84]. In contrast, labor use intensities can be expected to be significantly lower in single-cropping *padi* areas, especially where buffalo ploughing is practised. However, this does not necessarily imply that labor underemployment or the labor surplus is greater, as off-*padi* agricultural and non-farm employment opportunities must also be taken into account.

[26] The position is exacerbated in areas of acute labor shortage as in Muda where such consequences can be expected to appear sooner. See [1, pp. 39–55].

It should also be noted in conjunction with the arguments above, that manipulation of the relative prices of tractor/hired labor can hasten the process of input substitution. For example, the policy of the Farmers' Organization Authority to provide tractors to farmers on a nonprofit basis will facilitate the process of mechanization (or tractorization) and hasten the tendencies to larger farm size.[27] Such a consequence should not be disregarded by policy-makers who plan on the premise that their policy is oriented towards competition with existing tractor owners and providing better access to modern technology.

Access to other inputs—fertilizers, herbicides, insecticides, weedicides, etc.—takes on a different perspective as compared to the above. The problem here is not so much the availability of these inputs but the differences in actual levels of use versus recommended levels. Farmers as a whole in the sample do not all use the recommended quantities (and recommended qualities) of chemical inputs not so much because of a spirit of non-innovativeness but more reasonably because of the lack of cash resources or access to credit. That these inputs are readily available in the input market (or through the Farmers' Organization Authority particularly) is without question but the lack of credit or cash resources prevents utilization at recommended levels. Further, many farmers do not plough and till their lots twice as recommended largely because of the expenditure involved. One pertinent factor that arises out of the double cropping systems is that cash flows required are consistent and substantial to pay for tractor time, transplanting, input use, harvesting, threshing, and transportation. It is no surprise that for the major cash outflows—transplanting and ploughing—payment is made only after harvest.

Padi double cropping involves the adoption of a package of modern technology if optimum yields are to result. Among the sample farmers, yield differences can mainly be attributed to variations in the adoption of essential practices. In the area, for instance, some farmers are unable to adjust to recommended planting schedules; this leads to less than optimal water requirements and increased crop losses through damage by birds, rats, and other pests. In our sample, for instance, nursery preparations varied as follows: three farmers prepared their nurseries before September 15, thirty-three within two weeks after that and thirty-seven as long as one month later. Such variations have persisted despite the fact that double cropping began fifteen years ago. *Padi* yields are also affected by the practice of having primary and secondary nurseries, one ploughing instead of the recommended two ploughings, and insufficient fertilizer application and at the appropriate times. The need for intensified extension is crucial and more efficient linkages with the key servicing departments and the Farmers' Organization Authority should be forged. As it is, an experimental project to cultivate *padi* five times in two calendar years is underway, with the strong possibility that

[27] As Griffin has pointed out, if prices were not subsidized and thus more accurately reflected social opportunity costs, incentives for mechanization would be markedly reduced. See [8, pp. 68–69]. Lele and Mellor similarly conclude that the uneconomic mechanization that occurs because of subsidies could be avoided through the adoption of policies which did not cause such factor-price distortions. See [10, pp. 20–32].

it will be introduced into the area with refinements in the irrigation system. The greater intensities of resource use (and higher cash outflows) could well accentuate the tendencies mentioned before and provide justification that the Green Revolution is biased not so much to landlords in the case of Malaysia as to large innovative farmers [10, p. 41].

The effects on labor utilization on double cropping systems are not all positive. The reason for this is that certain inputs save on the use of other inputs (input-saving or input-substituting). Further, the net aggregate effect on labor use in double cropping systems can best be viewed not from the point of labor use only in *padi* farming, but also labor use taking into account outflows and inflows of labor and, in a dynamic context, over time.

It is postulated that double cropping leads to labor absorption due to increases in crop intensity, as the same stock of family labor is now more intensely occupied in producing a second crop of rice. While this is true, mechanization of ploughing and tilling displaces family labor formerly occupied in such tasks, and as mechanization of other tasks is undertaken, more labor tends to be displaced. Whether on a net basis labor displacement or labor absorption takes place is a more difficult question to resolve. The answer depends on whether the labor resources now more intensively employed in double cropping were previously gainfully occupied elsewhere in a single cropping system. If, as is often the case, family labor resources were utilized productively in the off-season, then double cropping means a transfer of labor from off-season non-*padi* employment to second season *padi* activities. On the other hand, net absorption would occur if family labor had suffered open unemployment or disguised unemployment previously during the off-season.

We could also extend the argument and suggest that if agglomerative tendencies appear over time, then displacement of small farmers and tenants will be the net result of double cropping. This could result in substantial social and economic dislocations and further accentuate income disparities.[28]

As far as farm families are concerned we have indicated that a labor surplus exists in double cropping. This can be reduced only if more intensive use is made of existing farm land, more farm land is made available or non-farm employment opportunities are created. Moreover, the fact remains that for small farms even double cropping of *padi* does not lead to viable farm incomes because of the factor proportions problem, particularly related to land. The question of the economic *padi* farm size then has to be considered in relation to the insufficiency of *padi* land, the fact that small farmers are more intensive in their practices and thus produce higher yields per acre than medium and large farmers and that cultivated acreage is the main determinant in increasing farm productivity.

Insofar as the remedial measures are possible, in the first alternative, the impact will depend on whether farmers will be able economically, psychologically, and physically to adjust to multiple cropping as in Taiwan. As regards the second

[28] Such tendencies by, inter alia, increasing the extent of capital intensification in *padi* farming, provide added urgency for the adoption of policies which seek to increase both distributional equity and production.

alternative, competition for land is already quite keen especially from landless dependents, although as observed by Griffin [8, p. 41], policy measures to redistribute *padi* farm land from large owners to small farmers may be economically advisable in the future.[29] From our estimates of labor surplus, it would appear that existing family labor resources could utilize between 1–2 acres more of *padi* land in order to increase farm incomes and reduce the surplus. The third alternative of siphoning off excess labor to new land settlements or to industrial employment would obviously be difficult to achieve in the short run. Whatever the policy solution, it would be naive in the extreme to expect that increases in crop intensity inevitably lead to a reduction of surplus farm labor and greater employment opportunities.

The distribution of income among farms of different size can be expected to be skewed, although given the homogeneity of occupation and relatively small heterogeneity of ecology or environment, the low Gini coefficient is to be expected. However, if the agglomerative tendencies noted in this paper gradually make themselves felt overtime, the degree of disparity can be expected to increase. Such developments would be in conflict with the aims of the New Economic Policy where, on the one hand, food self-sufficiency and aggregate production increases are stressed, and, on the other, a reduction in income disparties is deemed desirable. While under the prevailing conditions these tendencies may be irreversible, the policy-maker should be aware of the differential distributional impact of policy aimed at increasing output and productivity in the agricultural sector so that ameliorative measures can be planned and implemented.

In terms of absolute income levels, the small *padi* farmers obtain cash incomes of M$103 per month (excluding imputed costs) compared to M$388 for the other two farm groups. Assuming that family labor and tractor services have an opportunity cost equivalent to the prevailing market rate, net monthly incomes from *padi* cultivation are reduced to M$51, M$137, and M$263 per farm per month in the small, medium, and large farm categories. This compares unfavorably to the mean monthly rural income of M$200 in rural households or M$172 in rural Malay households and M$264 for the national average for 1970. The figures are more reasonable when total farm incomes are considered: M$210, M$319, and M$575 for the small, medium, and large size farm categories.

CONCLUSION

Policies to support multiple cropping in rural development strategies are not without negative consequences on labor utilization and income distribution among *padi* farmers. While aggregate output increases are clearly crucial in developing countries where population growth is a serious problem, the disaggregated efforts of such measures should receive greater attention by policy-makers. Where farm

[29] Cline similarly argues that land redistribution is the policy instrument most likely to increase both equity and output given the prospect of a rapidly growing labor supply, the experience of limited labor absorption in the industrial sector and the increased capital intensity in agriculture. See [4, pp. 139–57].

family size is relatively large, there are limitations upon double or multiple cropping strategies to absorb family labor because of the inevitable trend towards the capital-intensification and commercialization of farming. Further, because the new rice production technologies are resource specific, and where unequal access to such resources is the rule, the consequences for income distribution of double cropping strategies deserve greater attention if growth with equity is to be meaningful.

Policy implications are considerable if one removes the aggregated expectations from output-increasing policies as in double cropping and its massive investments in irrigation infrastructure.[30] There is a pressing need to examine and fashion policy on the basis of the disaggregated impact of double cropping on income distribution and labor employment if the New Economic Policy is to be evaluated at the level where it counts—the farmer.

[30] For an analysis of irrigation schemes for the double cropping of *padi* and of factors influencing the rate of return to irrigation, see [16].

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