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TIME ALLOCATION AMONG RICE FARM HOUSEHOLDS IN CENTRAL LUZON, PHILIPPINES*

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Over the past ten years a substantial body of literature has emerged on the consequences of the new rice technology in Asia. In particular, previous research on farm employment and technological change in Philippine agriculture (Barker, et al. 1972) and the effect of the modern rice technology on labor utilization in rice production (Cordova and Barker, 1977) have indicated that the proportion of family employment allocated to rice farming has declined over time while at the same time, the amount of hired labor has increased (Fig. 1). This raises the question of why rice farmers do not work harder.

To answer this question, we examined the allocation of work time of farmers and their family members to determine how their time allocation is affected by economic, demographic and institutional factors. Changes in population, technology and institutions affect the level of employment and the way in which households allocate their time to rice farming, non-rice farming, hired farm employment, and non-farm employment. As population continues to grow, it becomes important to understand more clearly the relationship between population, technological change and institutions in the allocation of family time. These are the key issues of this study.

This study views the household as an economic unit that maximizes its welfare through decisions regarding the use of its total labor resource in consumption as well as production activities. Following the general household production model of the "new household economics"[1/] it examines the time allocation decisions of a sample of rice producing households.

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[1/] This phrase refers to the growing body of economic literature which emphasizes the production role of the household (see Robert Evenson, "On the New Household Economics," Journal of Agricultural Economics and Development, VI (1): 87-103 (January 1976) provide summaries of the basic features of the new household economics.

A household allocates its total goods and time resources not only among alternative employment but also among its members so as to achieve that division of labor and goods it regards as optimal. The primary objectives of the study are to present time budgets of rice farm households and determine the effects of certain socio-economic and demographic factors on the allocation of time to different employment activities. Data were obtained in two phases.

OBJECTIVES AND HYPOTHESES

OBJECTIVES OF THE STUDY

Phase I of the study had the following objectives: i) to measure the major changes in family employment, both farm and non-farm, as related to the new rice technology; and ii) to determine the major changes in housing quality and consumer durables owned as an indicator of income gain since the introduction of modern rice varieties.

Phase II of the study had the following specific objectives: i) to determine how the family allocates its time among: a) rice farm activity, b) non-rice farm activity, c) hired farm employment, and d) non-farm employment; ii) to determine the main factors influencing the allocation of their time; and iii) to determine the productivity of family labor.

HYPOTHESES

A number of hypotheses regarding the determinants of time allocation of family labor have been formulated in the existing literature on family labor and on labor use in rice production. A number of these were tested in this study.

i) Hours of work and income are negatively correlated. This hypothesis is equivalent to saying that there is a backward sloping supply curve for family labor. Empirical exploration of hours in the U.S. by Finegan (1962) found evidence of some negative association between weekly hours and hourly earnings. An implication of this finding is that, when other things are held constant, a permanent increase in the hourly earnings will result in the reduction of hours worked. Boulier (1976) found this held among Philippine mothers and fathers. However, in some cases, the substitution effect may become predominant. King (1977) found in the Laguna study that given a peso increase in his wage the father increases his daily market time by an hour but the mother decreases her time when her wage increases.

ii) Presence of children under 9 years has negative effect on hours worked. In studies on the labor force participation of married women, Mangahas and Ho (1976) found a negative correlation between labor force participation of Philippine married women and the presence in the family of children below 4 years of age. Similarly, using U.S. data, Gronau (1976) found that the number of young children have a negative effect on mother's market time.

iii) Presence of children over 9 years has a negative effect on hours worked. Navera (1977) in her study on the allocation of household time of rural households with children in Laguna argued that as children enter the labor market, they shift out of the role of recipients of welfare and become important contributors to family income, and therefore the market time of the parents is displaced by work of the children.

iv) Family rice labor and land ownership are positively correlated. A hypothesis has evolved concerning the effect of tenure status on households' productive employment through the arguments between Takahashi and Fegan (1972). Takahashi's contention is that under the conditions of share tenancy, the tenants have no incentive to increase production or reduce labor costs because any increment in farm production would benefit the landowner. Thus share tenants' behavior may be rational, even though they fail to maximize farm income. Instead, they maximize family income by allocating more time to off-farm employment. Fegan argued that off-farm employment is a "sideline" important to all farmers regardless of tenure status and hence tenure would not affect time allocated between farm and off-farm activities. Takahashi further argued that when share tenants become leaseholders and owners, a considerable improvement in farm management and an increased use of family labor would take place.

v) Family rice labor does not vary by farm size. It has been observed that there is a pronounced difference in the proportion of family and hired labor among different sizes of farms. The proportion of hired labor is greater on large farms (over 2.5 ha) than on small farms (Barker and Cordova, 1976). However, despite the presence of more hired labor in large farms, it seems reasonable to expect that family labor devoted to rice production does not vary by farm size.

vi) Cropping intensity and family rice labor are positively correlated but are not correlated with total hours worked. The level of family and hired labor in rice production is influenced by the availability of irrigation facilities. Farm families with both wet and dry season rice crops would likely use more family labor for rice but would have limited outside employment. The question is whether there will be a difference in the total family hours of work. We hypothesize that there will be no difference in total family hours of work between a family with and without a dry season rice crop since a one crop family will compensate by allocating more time to outside employment.

vii) Family non-farm employment and distance to market center are negatively correlated. A survey of employment establishments suggest that the generation of high rice farm income through the adoption of modern rice varieties has led to a substantial increase in non-farm employment especially in areas near market centers (Gibb, 1971). This occurred because the industries linked to agriculture experienced increased demand stimulated by the technological progress in rice production. This suggests that those families close to market centers have more employment opportunities in the non-farm sector.

viii) Family rice labor and labor productivity are negatively correlated. There is a question as to whether or not farmers in a given village who devote more time to rice production have higher labor productivity than those who devote fewer hours to rice production. A related hypothesis is that those who devote more time to rice have lower productivity than those who devote fewer hours.

DEFINITIONS

Work time or market time or labor use - is defined here to include all productive activities.

Rice farm activities - include all productive work on the rice enterprise. This refers to the activities of land preparation, seedling production, pulling and transplanting, weeding, fertilizer application, chemical application, harvesting and post-harvest activities such as hauling, drying, milling and supervisory and managerial tasks associated with rice farming. Hence, anything and everything that is directly associated with rice activities performed by the family and its members including exchange labor in rice activities and maintenance of carabao used in rice production.

Non-rice farm activities - refers to productive work in other farm enterprises. This includes vegetable, corn, sugar cane, coconut, livestock and poultry production and other related activities. Activities such as fishing, hunting and gathering wild plants are included in this category.

Hired farm employment - refers to all agricultural wage activities for other farmers. Examples are pulling seedlings, transplanting, weeding and harvesting-threshing and other related activities.

Non-farm employment - refers to purely non-agricultural wage or salary activities. These include self employment activities such as operating sari-sari store and other related non-farm activities.

METHODOLOGY AND SAMPLING

Choice of study areas. The final choice of study areas were made on the basis of three major considerations. First, the areas selected were in a major rice growing municipalities of Central Luzon. Second, the study areas include both two-crops and one-crop rice farms. Third, villages were chosen based on the distance from the market center or poblacion (Fig. 2).

Choice of barrio. The final choice of barrios were made on the basis of the distance from the market center. One or two near and far barrios per municipality were purposively selected. Near barrios were those adjacent to or less than 3 km from the market center while far barrios were those greater than 3 km from the market center.

Selection of Phase I sample farms. Stratified random sampling was used. A 20% sample of farmers and 10% sample of non-farmers were selected at random in each sample barrio. Phase I survey was conducted in late 1972 (Table 1).

Selection of Phase II sample for record keeping. Phase I farm households were stratified into 3 housing quality groups: good, average, and poor. The quality of housing was based on fair market value of the house judged through occular observation by the enumerator and by the owner's valuation. Good houses were valued above ₱2000, average houses ranged from ₱500 to ₱2000, and poor houses were less than ₱500. To the extent possible, 5 rice farm households in each strata or a total of 15 samples, were randomly selected in each of the 6 barrios (Table 2). Record keeping covered the crop year 1973-74. Each family was asked to record daily productive activities of all working family members, both farm and non-farm, together with income and expenditures. Recorded data were verified by interviews during visits made after transplanting and harvesting each season.

REGRESSION MODELS

Time allocation models

Regression equation models were used to explain variation in time allocation. In principle, time allocation is a joint, simultaneous decision of the household regarding the use of all time. However, because we do not attempt to explain the factors affecting leisure time, no simultaneous relationhsip need be considered. Thus, it was appropriate to use a single equation model for each dependent variable.

Models describing allocation of five dependent variables were estimated: i) total family time, ii) father's total market time, iii) mother's total market time, iv) family rice time, and v) family non-farm time.

The following ten independent variables were used in the regression to explain variation in household time allocation: 1) effective crop area expressed in hectares of rice per year; 2) number of working children, 3) presence of young children (below 9 years old); 4) presence of children above 9 years old; 5) dummy variable for location equal to 1 for Mayantoc and equal to 0 for Gapan and Guimba; 6) dummy variable for tenure status equal to 1 for owner or part-owner and equal to 0 for share tenants and leaseholders; 7) dummy variable for tenure status equal to 1 for owner or part-owner and leaseholder and equal to 0 for share tenants; 8) dummy variable for distance from market center equal to 1 for near and equal to 0 for far barrios; 9) dummy variable for non-farm self-employment equal to 1 if family has self-employment job and 0 if there is none; and 10) family income expressed in pesos per year.

In time allocation equations, we chose a set of core independent variables and let the remainder enter the model using step-wise regression. We included effective crop area, number of working children, and Mayantoc

dummy as the core variables for equations explaining total family employment and family rice time. For equations explaining non-farm employment the core variables were number of working children, Mayantoc dummy and near dummy. All dependent variables were expressed in man-hours per year.

Labor productivity models

In this study, the Cobb-Douglas production function was estimated to derive marginal value products (MVP) of family rice labor and MVP of rice labor for father, mother and children. The other conventional resource inputs were used in the model namely land and capital. Labor was included in various ways: (i) total rice labor; (ii) family rice labor and hired labor; and (iii) father's rice labor, mother's rice labor and children's rice labor. The following equations were fitted:

(i) $Y = f(X_1, X_2, X_3, X_4, X_5)$

(ii) $Y = f(X_1, X_2, X_3, X_{41}, X_{42}, X_5)$

(iii) $Y = f(X_1, X_2, X_3, X_{43}, X_{44}, X_{45}, X_5)$

where:

Y = gross rice output in kilograms/farm/year

X_1 = land expressed as hectares of effective crop area

X_2 = current inputs such as seeds, fertilizers and chemicals used in rice production in pesos/year

X_3 = productive farm cpaital stock of farm machinery, implements and animal power in pesos

X_4 = total rice labor used in rice production in man-hours/year

X_{41} = total family rice labor used in rice production in man-hours/year

X_{42} = total hired labor used in rice production in man-hours/year

X_{43} = father's total rice labor allocated to rice production in man-hours/year

X_{44} = mother's total rice labor allocated to rice production in man-hours/year

X_{45} = children's total rice labor allocated to rice production in man-hours/year

X_5 = dummy for location equal to 1 for Mayantoc and equal to 0 for Gapan and Guimba

In the above production function model, the MVP of labor is computed as the partial derivative of the production function with respect to the labor input holding other inputs fixed at a given level. That is,

$$MVP_i = \frac{\partial Y}{\partial X_i} \cdot P_y = b_i \frac{\bar{Y}}{\bar{X}_i} \cdot P_y$$

where:

MVP_i = marginal value product of labor (i refers to different type of labor)

$\bar{Y}$ = mean value of rice output in kilograms

$\bar{X}_i$ = mean value of i type of labor used

b_i = partial regression coefficient for i type of labor (elasticities of production in Cobb-Douglas model)

P_y = price of rice output in pesos/kilogram

Marginal value product or MVP is the incremental change in the total output value (production x price) that is associated with a one unit change in the quantity of the input (labor) used. Marginal factor cost (MFC) refers to the price or opportunity cost per unit of a factor input (equal to wage rate).

A fundamental condition for the profit maximizing level of resource input is that the MVP of X_i equal its MFC, that is:

$$MVP_i = MFC_{X_i}$$

Labor productivity for different activities is also reflected in the wage rate in a well operating labor market. Average wage rates were obtained by dividing the earnings in a particular activity by the amount of time spent on that activity. For family rice and non-rice farm enterprises farm family labor income was obtained and divided by days worked to determine labor earnings.

RESULTS - Phase I Survey

Employment and the new rice technology. Family composition and employment changed between 1967 and 1972 (Table 3). Farm employment increased by more than 20% while non-farm employment increased more

rapidly among farm households especially in areas near market centers.[2/] This supports the idea that industries which are linked to agriculture had been stimulated by the new technology. For example, the distribution and marketing of seeds, fertilizer, chemicals and equipment as well as processing and marketing of the increased grain harvest have created jobs.

Indicator of gain in income from the adoption of modern varieties. As a consequence of technological change, increased yields have raised the income of many farm families. Reflecting the income gains, the standards of living of the rural families also improved with a substantial proportion of families making housing improvements and purchasing consumer durables (Table 4). The table also shows that the main source of major investments was agricultural incomes for farm families. The proportion of families making such purchases was not influenced by distance from market centers.

RESULTS - Phase II Survey

Socio-economic characteristics of the rice farm households. The socio-economic characteristics of the rice farm families that were studied in more depth are summarized in Table 5. The sample farmers have different tenure status in the 3 locations. Mayantoc farmers were mostly owner-operators while those in Gapan were share tenants and those in Guimba leaseholders. Their farm areas were close to each other, ranging from 2.23 hectares in Guimba to 3.00 in Mayantoc with an average farm size of 2.64 hectares. However, they varied in cropping intensities as shown by their multiple cropping indices (MCI). Gapan had a MCI of 2 which means effective crop area is twice its farm size. On the other hand, Guimba which was partly irrigated had the lowest MCI of 1.44.

Nearly all households were of the nuclear type, where the family was composed of only the father, mother and their children. Average family size for the three locations were almost the same and averaged 7.18 (Table 5). The size of the labor force was 4.11 while the number of working children was 2.12, suggesting that the father and a majority of the mothers were working. They were employed either in their own farm or making some supplemental income in hired farm employment.

The rice farm represents the major source of family income with Mayantoc families having an income of ₱6846. This was the highest among the areas mainly because they were mostly owner-operators. Because of low rice incomes in Guimba, farm families there compensated by obtaining employment and income from non-farm employment and non-rice farming enterprises such as cash crops like vegetables, poultry and livestock.

2/ This supports the earlier findings of Arthur Gibbs, Jr. (1971) that the generation of higher rice farm incomes through the adoption of new rice technology has led to a substantial increase in non-farm employment.

Family time allocation. The general pattern of family labor allocation among Central Luzon rice farm families is shown in Figure 3. On the average, the total amount of family labor employed in productive activities was similar among locations, being about 500 man-days per family per year. However, the proportion of time allocated to specific activities differed widely by location.

In Mayantoc, where owner-operators predominate, a large proportion (90%) of family time was spent in rice activity. In Guimba, on the other hand, almost equal proportions were allocated to rice farming and non-farm employment. This was not only because of tenure status but because the low cropping intensity caused by the lack of second rice crop, dictated the necessity for time diversification. In Gapan, with tenant operated farms and adequate irrigation facilities, families allocated more than 50% of family labor to rice activity.

The main factors accounting for variations in total family hours worked were number of working children, Mayantoc dummy and self-employment business enterprise (Tables 6 and 7). In the second equation of Table 7, variables measuring children over 9 and children under 9 have been substituted for number of working children to see the effect of child's age on family time allocation. The coefficient for children over 9 of age was positive but somewhat lower than that for working children in the first equation. The coefficient for children under 9 was negative which suggests that the presence of young children reduced the amount of family employment but this is not conclusive since the coefficient was not significant.

Intra-family time allocation. The allocation of labor was very different among individual family members (Fig. 4). On the average, fathers in the Central Luzon sample allocated about 200 man-days in a year to productive employment. Of this total time, a major proportion was allocated to rice production. Labor contribution by tasks is shown in Fig. 5.

On the other hand, the time allocated by the mother was about half that of the father. Mothers spent their time helping their husbands with the rice farm activities and partly in non-farm employment, while some mothers have a secondary source of income from non-rice farming such as vegetables.

The average supply of children's time was more than that of the mothers. One interesting observation was the participation of children in rice farming. The significant role that children have in productive activities suggest that they may be regarded indeed as investments by farmer parents. This was found to be one of the basic forces motivating Indian families to have relatively large number of children in the late 1950s -- the high return to the use of raw labor of children compared to investments in skills obtained in schools.3/ Furthermore, in less developed countries, children also contribute substantially to the real

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3/ See Mark Rosenzweig and Robert Evenson, "Fertility, Schooling and the Economic Contribution of Children in Rural India: An Econometric Analysis," paper presented at the Third World Congress of the Econometric Society, November 1975 (Revised).

income of their parents through the work that children do in the household and on the farm and by the food and shelter they provide for their parents when they no longer are able to provide these for themselves. "Children are, in a very important sense, the poor man's capital" (Schultz, 1974).4/

There was an indication that as the number of working children increases, father's total employment time decreases significantly (Table 8) but the mother's time does not (Table 9). Two different relationships between father's and mother's time with regard to family income were found. The father's time had a positive income coefficient while the mother's time had negative coefficient although both were not significant. On the other hand, the Mayantoc dummy was highly significant in both father's and mother's time allocation, while self-employment dummy was only significant for mother's time. The coefficients of children by age were not significant in explaining the variation in father's and mother's time allocation as hypothesized but the coefficient for young children was negative for mother's time.

Family rice labor time. Total family hours devoted to rice farming was very different by location as shown in Fig. 6. This is why Mayantoc dummy variable was included in all regression equations. Other factors explaining the variation in family rice time were effective crop area and number of working children and family income (Table 10). The R^2 value was approximately 60% and the signs and magnitude of the coefficients are according to expectation. The coefficient for family income was significant and negative which implies that higher income leads to a reduction in total hours devoted to rice activity.

The coefficient for effective crop area was positive and significant contrary to our hypothesis that family labor allocated to rice would not vary by farm size.

The positive significant role of children was highly significant and positive as shown by the coefficients of children over 9 years of age.

Family non-farm employment. Table 11 shows the factors included in explaining non-farm time allocation of the households. These include irrigation, distance to market, self-employment and age level of the children.

Not surprisingly there was less non-farm employment for families having a second crop of rice as evidenced by the significant negative coefficient for irrigation dummy variable.

The coefficient of the dummy variable for families near market centers was negative and significant which suggests that farm families in barrios near the market have significantly less non-farm employment contrary to our hypothesis and earlier findings (Gibb, 1971).

4/ See Theodore W. Schultz, "Fertility and Economic Value" in Economics of the Family, T.W. Schultz (ed.) National Bureau of Economic Research, 1974.

Interestingly, the presence of young children negatively affect non-farm time of the family as evidence by the significant negative coefficient of children under 9 years of age.

Productivity of family labor measured in terms of earnings. Labor productivity for different employment activities are shown in Table 13. Average return to family labor was different among locations. The return to rice labor was lowest in Mayantoc, at ₱1.05/hour because of the much higher input of family labor in this municipality. The highest labor productivity on rice was in Gapan at ₱2.21/hr., due to the lower family labor input which was half that of Mayantoc.

On the other hand, the extraordinary high return to labor in non-rice farm activity in Mayantoc as shown in the Table could be explained by the very low labor allocated to that activity.

In Guimba, where many farm families allocate a significant amount of time to non-farm employment, labor productivity in this employment was lowest among the three locations. The average return to non-farm labor was ₱0.65/hr.

Productivity of family labor measured by production function. The rice production function estimates are shown in Table 14 combined for the 3 locations and in Tables 15, 16 and 17 for Gapan, Guimba and Mayantoc, respectively. These production functions were used to calculate the marginal value product (MVP) of labor computed as shown in an earlier section.

The profitability of using a particular input may be determined by comparing MVP with its marginal factor cost (MFC). Under a purely competitive economy, maximum profit is attained when the MVP is equal to its MFC. This implies that it is profitable to use or employ more of a resource when its MVP is greater than its MFC. Therefore, as indicated in Table 18, the MVPs of family and family member's rice labor show that there is scope for using more family labor since their MVPs were greater than their MFCs in pre-harvest tasks. However, it is difficult to increase family labor because of the other work activities. All rice labor activities had MVP's lower than the MFC for harvest and post-harvest activities, but this is not surprising in light of the method of payment for harvest labor.

On the other hand, hired rice labor had an MVP of ₱0.38 which is lower than its MFC. This implies that it is unprofitable for our sample farmers to hire as much pre-harvest labor as they were because it will cost them ₱0.48/hr to obtain additional output worth ₱0.38/hr. This may reflect an underestimate of the productivity of hired labor in the production function.

Furthermore, significant differences in the MVPs existed in the three locations (Table 18). In Mayantoc, MVP of hired labor was ₱0.95/hr, very much higher than the MVP of hired labor in the other locations, and higher than the MVP of family rice labor within Mayantoc. As shown in the table, it would be profitable for Mayantoc farmers to hire more labor because its MVP exceeds its cost. The low population pressure in Mayantoc plus low non-farm employment opportunities, explains the high MVP of hired labor. Likewise, the low MVP of family rice labor is explained by too much family labor allocation in rice activity in Mayantoc.

SUMMARY

Changes in population, technology and institutions affect the level of employment and the way in which households allocate their time to farm and non-farm employment. Farm and non-farm employment increased substantially since the introduction of the new rice technology. Both farm and non-farm family groups experienced this increase. The rural households improved their standard of living substantially as an indicator of gain in income since the adoption of modern rice varieties.

Central Luzon rice farm families spent two-thirds of their total productive time in rice farming, one-fourth in non-farm employment and the rest in non-rice farming and hired farm employment. Households' total productive time were very similar among locations being about 500 work days in a year, but they differ in the proportion of the time spent in specific activities depending on the resource endowments of the location. Time allocation was very different among family members. Fathers' total productive time was about 200 work days while the mothers' had about 100 work days in a year, mainly spent in rice farm activity. The time contribution per child was about 100 days.

Time allocations were affected by economic, demographic and institutional factors (Table 12). The presence of children in the family affects the father's and mother's time allocations. The presence of working children significantly reduces their father's time. However, the presence of young children reduces their mother's work time in non-farm employment.

Family rice labor was negatively correlated with family income, i.e. higher income led to a reduction in total hours worked in rice farming. Family labor utilization in rice production was generally low and will continue to decline due to the availability of increasing numbers of landless workers arising from population growth.

In Mayantoc, where high rates of labor were employed, marginal productivity of that labor is low, and in those activities where employment is low, higher marginal productivity is observed. Caution should be used in the interpretation of the estimated low marginal productivity of hired labor because the elasticity of production may be underestimated.

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Table 1. Phase I sample households by location, Central Luzon, 1973.

	Head of family	
	Farmer	Non-farmer[a]
Gapan, Nueva Ecija		
Mangino (near)	30	53
Kapalangan (far)	47	10
Guimba, Nueva Ecija		
San Roque (near)	36	43
Bacayao (near)[b]	31	9
Triala (far)	30	15
Bunol (far)[b]	43	13
Mayantoc, Tarlac		
San Bartolome (near)	32	10
Pitombayog (far)	25	12
Total	274	165

a/ Includes hired agricultural laborers.

b/ These two barrios were dropped in Phase II samples since they possessed similar characteristics with the remaining two barrios.

Table 2. Phase II sample households by housing quality, Central Luzon, 1974.

	Housing Quality			
	(>₱2000)	(₱500-2000)	(<₱500)	Total
Gapan, Nueva Ecija				
Mangino (near)	6	6	3	15
Kapalangan (far)	5	5	5	15
Guimba, Nueva Ecija				
San Roque (near)*	2	4	8	14
Triala (far)*	4	8	2	14
Mayantoc, Tarlac				
San Bartolome (near)	11	4	0	15
Pitombayog (far)*	5	6	3	14

* One family in each of this barrio did not cooperate in the one-year record keeping and avoided being interviewed when data collection was half-way through, hence, a total of 87 cases were used in the analysis.

Table 3. Average family size and family employment in 1972 and percentage change since 1967 by distance from market center, Central Luzon, 1973.

Occupation of family head	Distance from market	Family size		Farm employment		Non-farm employment	
		No. in 1972	% increase over 1967	No. in 1972	% increase over 1967	No. in 1972	% increase over 1967
Farmer	near	6.9	21	2.5	32	0.6	100
	far	7.1	25	2.6	24	0.5	67
Non-farmer	near	6.1	36	1.3	6	1.7	68
	far	6.6	34	1.7	22	1.0	42

Table 4. Percentage of household's using agricultural income for housing improvements and consumer durables since 1967, Central Luzon, 1973.

Occupation of family head	Distance from market	Making housing improvements since 1967	Using solely agricultural income for improvements	Purchasing consumer durables	Using solely agricultural income to buy durables
Farmer	near	50	65	81	69
	far	48	62	81	65
Non-farmer	near	51	32	57	30
	far	47	45	52	30

Table 5. Number of samples, tenure status, farm size, family size and income, 87 rice farm households, Central Luzon, 1974.

	Gapan	Guimba	Mayantoc	All
		Number of samples		
	30	23	29	87
		Tenure		
Owner & part-owner	0	0	23	23
Share tenant	12	2	4	18
Leasehold	12	26	2	46
		Farm size		
Farm size (ha.)	2.69	2.23	3.00	2.00
Effective crop area (ha.)	5.38	3.21	4.48	4.31
Multiple cropping index (MCI)	2.00	1.44	1.49	1.66
		Family size		
Family size (no.)	7.36	7.28	6.89	7.18
Working children (no.)	2.30	2.03	2.00	2.12
Labor force (no.)	4.35	4.17	3.86	4.11
		Income (₱/yr)		
Rice farm income	4626	2966	6846	4831
Non-rice farm income	146	577	38	249
Hired farm employment	406	176	58	216
Non-farm employment	1221	1101	292	873
Total family income	6399	4820	7234	6452

Table 6. Regression coefficients and related statistics for family's total employment (HHTTIME), Central Luzon, 1974 (Figures in parentheses are t-values).

Independent variables	EQ #1	EQ #2	EQ #3
Constant	2305.425	2261.818	2256.420
Effective crop area (ha.)	29.301^{ns}	12.435^{ns}	12.181^{ns}
	(0.306)	(0.134)	(0.134)
Working children (no.)	771.467**	805.137***	782.050***
	(8.089)	(8.539)	(8.433)
Owner-leasehold dummy	226.493^{ns}	-	-
	(0.506)		
Owner dummy	-	854.934***	-
		(2.938)	
Mayantoc dummy	-	-	844.080**
			(2.294)
Adjusted R^2	0.427	0.456	0.460

* Significant at the 10% level (t=1.663).
** Significant at the 5% level (t=1.987).
*** Significant at the 1% level (t=2.576).
ns Not significant.

Table 7. Regression coefficients and related statistics for total family employment (HHTTIME), Central Luzon, 1974 (Figures in parentheses are t-values).

Independent variables	EQ #1	EQ #2
Constant	2224.195	2063.464
Effective crop area (ha.)	-17.916^{ns}	-64.766^{ns}
	(0.195)	(0.600)
Mayantoc dummy	923.616**	995.388**
	(2.518)	(2.538)
Working children (no.)	738.885*	-
	(1.699)	
Self-employment dummy	-	1273.363***
		(2.751)
Children over 9 years (no.)	-	660.916***
		(7.136)
Children under 9 years (no.)	-	-111.668^{ns}
		(0.848)
Family income (₱)	-	-0.022^{ns}
		(0.572)
Adjusted R^2	0.472	0.409

Table 8. Regression coefficients and related statistics for father's total employment (FTMT), Central Luzon, 1974 (Figures in parentheses are t-values).

Independent variables	EQ #1	EQ #2	EQ #3
Constant	1498.802	1489.230	1327.711
Effective crop area (ha.)	36.578^{ns}	27.638^{ns}	19.429^{ns}
	(0.899)	(0.667)	(0.426)
Working children (no.)	-69.839*	-71.964*	-
	(1.698)	(1.750)	
Mayantoc dummy	344.802**	368.426**	301.458**
	(2.112)	(2.242)	(2.301)
Self-employment dummy	-	219.481^{ns}	183.711^{ns}
		(1.127)	(0.939)
Children over 9 years (no.)	-	-	-54.448^{ns}
			(1.392)
Children under 9 years (no.)	-	-	74.303^{ns}
			(1.334)
Family income (₱)	-	-	0.017^{ns}
			(0.130)
Adjusted R^2	0.058	0.061	0.064

Table 9. Regression coefficients and related statistics for mother's total employment (MTMT), Central Luzon, 1974 (Figures in parentheses are t-values).

Independent variables	EQ #1	EQ #2	EQ #3
Constant	709.576	679.942	505.348
Effective crop area (ha.)	6.853^{ns}	-20.823^{ns}	-9.001^{ns}
	(0.148)	(0.470)	(0.181)
Mayantoc dummy	511.966**	585.102***	614.117***
	(2.775)	(3.322)	(3.422)
Working children (no.)	-29.081^{ns}	-35.657^{ns}	-
	(0.625)	(0.809)	
Self-employment dummy	-	679.477***	680.259***
		(3.255)	(3.213)
Children over 9 years (no.)	-	-	28.312^{ns}
			(0.668)
Children under 9 years (no.)	-	-	31.944^{ns}
			(0.530)
Family income (₱)	-	-	-0.016^{ns}
			(0.931)
Adjusted R^2	0.058	0.156	0.141

Table 10. Regression coefficients and related statistics for family rice labor (HHSER), Central Luzon, 1974 (Figures in parentheses are t-values).

Independent variables	EQ #1	EQ #2	EQ #3
Constant	555.164	580.292	160.090
Effective crop area (ha.)	154.808***	196.718***	186.518***
	(2.652)	(3.126)	(2.861)
Mayantoc dummy	2429.409***	2442.410***	2495.210**
	(10.371)	(10.533)	(10.261)
Working children (no.)	322.179***	340.386***	-
	(5.457)	(5.731)	
Children over 9 years (no.)	-	-	301.789***
			(5.310)
Children under 9 years (no.)	-	-	99.916^{ns}
			(1.229)
Family income (₱)	-	-0.039*	-0.037^{ns}
		(1.677)	(1.559)
Adjusted R^2	0.624	0.632	0.614

Table 11. Regression coefficients and related statistics for non-farm employment of family (HHNONFA), Central Luzon, 1974 (Figures in parentheses are t-values).

Independent variables	EQ #1	EQ #2
Constant	2333.349	2680.063
Irrigation dummy	-2078.801***	-1969.523***
	(4.674)	(4.534)
Mayantoc dummy	-464.503^{ns}	-548.811^{ns}
	(1.388)	(1.659)
Near to market dummy	-514.113*	-757.064**
	(1.667)	(2.525)
Self-employment dummy	1550.734***	1679.207***
	(4.134)	(4.551)
Working children (no.)	304.887***	-
	(3.704)	
Children over 9 years (no.)	-	215.556***
		(2.928)
Children under 9 years (no.)	-	-245.657**
		(2.300)
Adjusted R^2	0.422	0.443

Table 12. Significance of factors affecting time allocation in regression analysis, Central Luzon, 1974.

Factors	Dependent Time Variable				
	HHTTIME	FTMT	MTMT	HHSER	HHNONFA
Effective crop area (ha)				+++	
Irrigation dummy					---
Near to market dummy					-
Mayantoc dummy	++	++	+++	+++	
Self-employment dummy	+++		+++		+++
Working children (no.)	+++	-		+++	+++
Children over 9 years (no.)	+++			+++	+++
Children under 9 years (no.)					--
Family income (₱)				-	

\+ Significant at the 10% level (t=1.663)
++ Significant at the 5% level (t=1.987)
+++ Significant at the 1% level (t=2.576)

Table 13. Labor earnings in different employment activities by location, Central Luzon, 1974.

Employment activity	Location			
	Gapan	Guimba	Mayantoc	All
	Returns to labor (₱/hr)			
Rice farm activity	2.21	1.69	1.05	1.49
Non-rice farm activity	1.35	1.60	3.02	1.57
Hired farm employment	1.02	0.59	1.59	0.87
Non-farm employment	0.92	0.65	0.84	0.78
	Hours of employment			
Rice	2089	1753	4323	2725
Non rice	108	361	13	158
Off-farm	397	302	37	246
Non-farm	1329	1683	347	1116
	Labor income (₱)			
Rice	4626	2966	4558	4069
Non-rice	146	577	38	249
Off-farm	406	178	58	216
Non-farm	1221	1101	292	873

Table 14. Production function estimates, Central Luzon, 1974.[a/]
(Figures in parentheses are t-values.)

Independent variables	EQ #1	EQ #2	EQ #3
Constant in log form	1.107	1.777	1.494
Mayantoc dummy	-0.037^{ns}	-0.094^{ns}	-0.058^{ns}
	(0.647)	(1.501)	(0.851)
Effective crop area (ha.)	0.227*	0.254*	0.319**
	(1.740)	(1.919)	(2.318)
Farm capital (₱)	0.089**	0.114***	0.088**
	(2.398)	(2.960)	(2.199)
Current inputs (₱)	0.317***	0.314**	0.551***
	(2.612)	(2.516)	(4.876)
Total rice labor (man-hour)	0.422***	-	-
	(4.234)		
Hired rice labor	-	0.073***	-
		(3.435)	
Family rice labor	-	0.183**	-
		(2.193)	
Father's rice labor	-	-	0.088*
			(1.782)
Mother's rice labor	-	-	0.031^{ns}
			(1.456)
Children's rice labor	-	-	0.016^{ns}
			(1.060)
Sum of elasticities	1.018	0.844	1.035
Adjusted R^2	0.667	0.660	0.613

a/ Fitted using double-logarithmic form

Table 15. Production function estimates, Gapan, 1974.a/
(Figures in parentheses are t-values.)

Independent variables	EQ #1	EQ #2	EQ #3
Constant in log form	1.123	1.282	1.483
Effective crop area (ha.)	0.099^{ns}	0.098^{ns}	0.110^{ns}
	(0.380)	(0.366)	(0.375)
Farm capital (₱)	0.148***	0.155***	0.170***
	(2.706)	(2.814)	(2.783)
Current inputs (₱)	0.462*	0.479*	0.476*
	(1.857)	(1.886)	(1.876)
Total rice labor (man-hour)	0.293^{ns}	-	-
	(1.577)		
Hired rice labor	-	0.166^{ns}	-
		(1.177)	
Family rice labor	-	0.085^{ns}	-
		(0.551)	
Father's rice labor	-	-	0.028^{ns}
			(0.176)
Mother's rice labor	-	-	0.006^{ns}
			(0.260)
Children's rice labor	-	-	0.037^{ns}
			(1.636)
Sum of elasticities	1.002	0.983	0.827
Adjusted R^2	0.580	0.556	0.563

a/ Fitted using double-logarithmic form.

Table 16. Production function estimates, Guimba, 1974.[a/]
(Figures in parentheses are t-values.)

Independent variables	EQ #1	EQ #2	EQ #3
Constant in log form	0.825	1.310	1.548
Effective crop area (ha.)	-0.213^{ns}	-0.184^{ns}	-0.102^{ns}
	(0.800)	(0.648)	(0.337)
Farm capital (₱)	0.102^{ns}	0.121^{ns}	0.161^{ns}
	(0.94^)	(1.019)	(1.368)
Current inputs (₱)	0.599**	0.592**	0.403^{ns}
	(2.498)	(2.325)	(1.368)
Total rice labor (man-hour)	0.310^{ns}	-	-
	(1.455)		
Hired rice labor	-	0.043^{ns}	-
		(1.087)	
Family rice labor	-	0.142^{ns}	-
		(0.927)	
Father's rice labor	-	-	0.197^{ns}
			(1.146)
Mother's rice labor	-	-	0.028^{ns}
			(0.599)
Children's rice labor	-	-	0.001^{ns}
			(0.044)
Sum of elasticities	0.798	0.714	0.688
Adjusted R^2	0.457	0.438	0.417

a/ Fitted using double-logarithmic form.

Table 17. Production function estimates, Mayantoc, 1974.[a/]
(Figures in parentheses are t-values.)

Independent variables	EQ #1	EQ #2	EQ #3
Constant in log form	2.713	2.881	2.788
Effective crop area (ha.)	0.681***	0.668***	0.618***
	(4.118)	(4.025)	(3.596)
Farm capital (₱)	0.075ns	0.066ns	0.060ns
	(1.278)	(1.083)	(0.996)
Current inputs (₱)	-0.033ns	-0.033ns	0.043ns
	(0.158)	(0.155)	(0.219)
Total rice labor (man-hour)	0.221ns	-	-
	(1.035)		
Hired rice labor	-	0.101ns	0.107ns
		(1.197)	(1.246)
Family rice labor	-	0.107ns	-
		(0.678)	
Father's rice labor	-	-	0.032ns
			(0.786)
Mother's rice labor	-	-	0.044ns
			(1.069)
Children's rice labor	-	-	0.016ns
			(0.860)
Sum of elasticities	0.944	0.909	0.920
Adjusted R^2	0.576	0.567	0.558

a/ Fitted using double-logarithmic form.

Table 18. Estimated marginal value product (MVP) of various rice labor and marginal factor cost (MFC) by location, Central Luzon, 1974.

Type of rice labor	MVP and MFC (₱/hr)			
	Gapan	Guimba	Mayantoc	All
		Marginal Value Products		
Total rice labor	0.63	0.81	0.53	0.97
Family rice labor	0.55	0.49	0.34	0.75
Hired rice labor	0.54	0.46	0.95	0.38
Father's rice labor	0.30	1.20	0.25	0.73
Mother's rice labor	0.47	1.32	0.56	0.73
Children's rice labor	0.80	0.02	0.15	0.59
		Marginal Factor Costs		
Average cash wage rate for pre-harvest tasks	0.56	0.42	0.51	0.48
In kind hourly earnings for harvest and post-harvest tasks	1.82	0.81	1.42	1.38

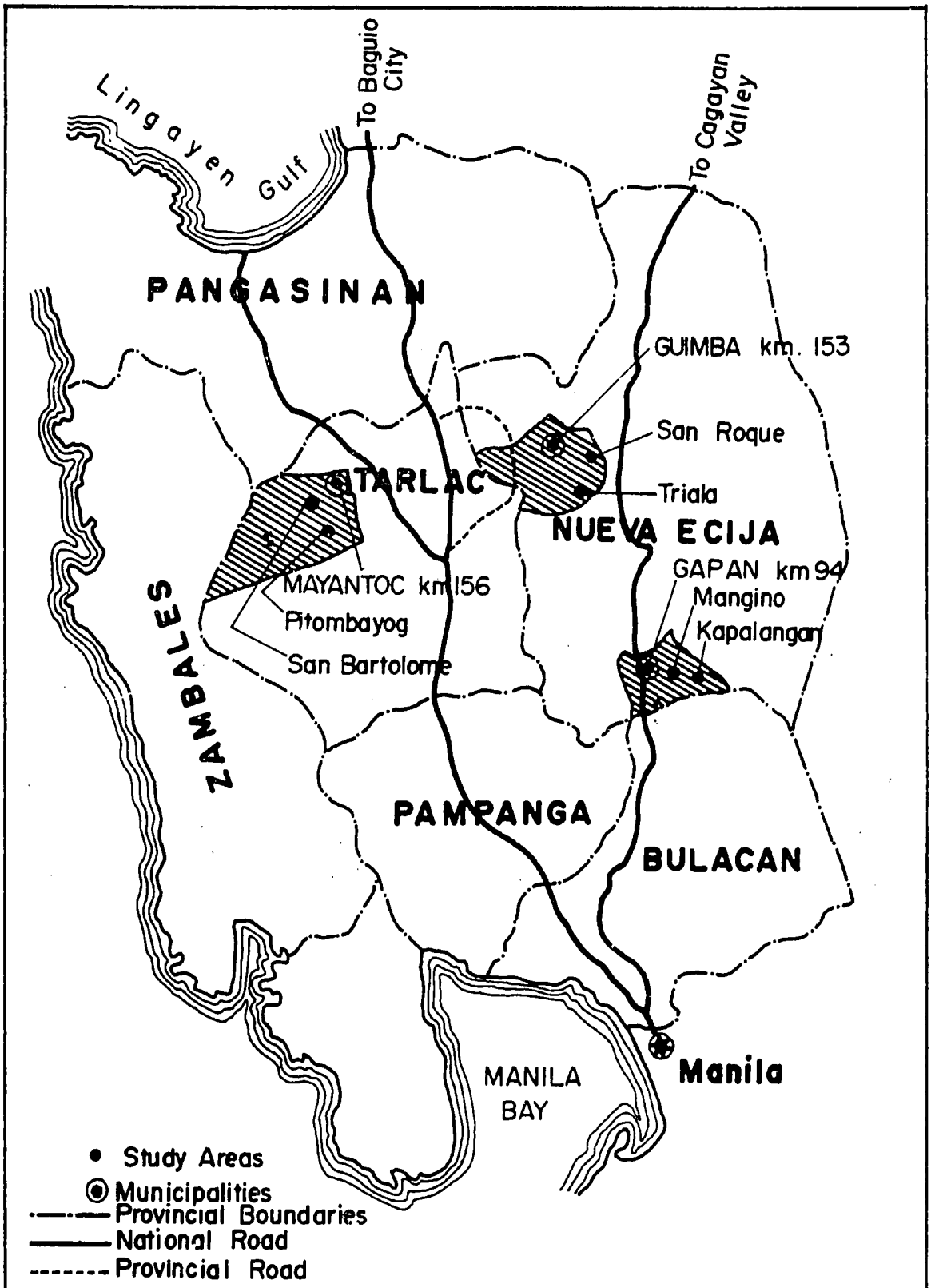

Fig. 2. Map of Central Luzon Showing the Three Municipalities and the Study Areas.

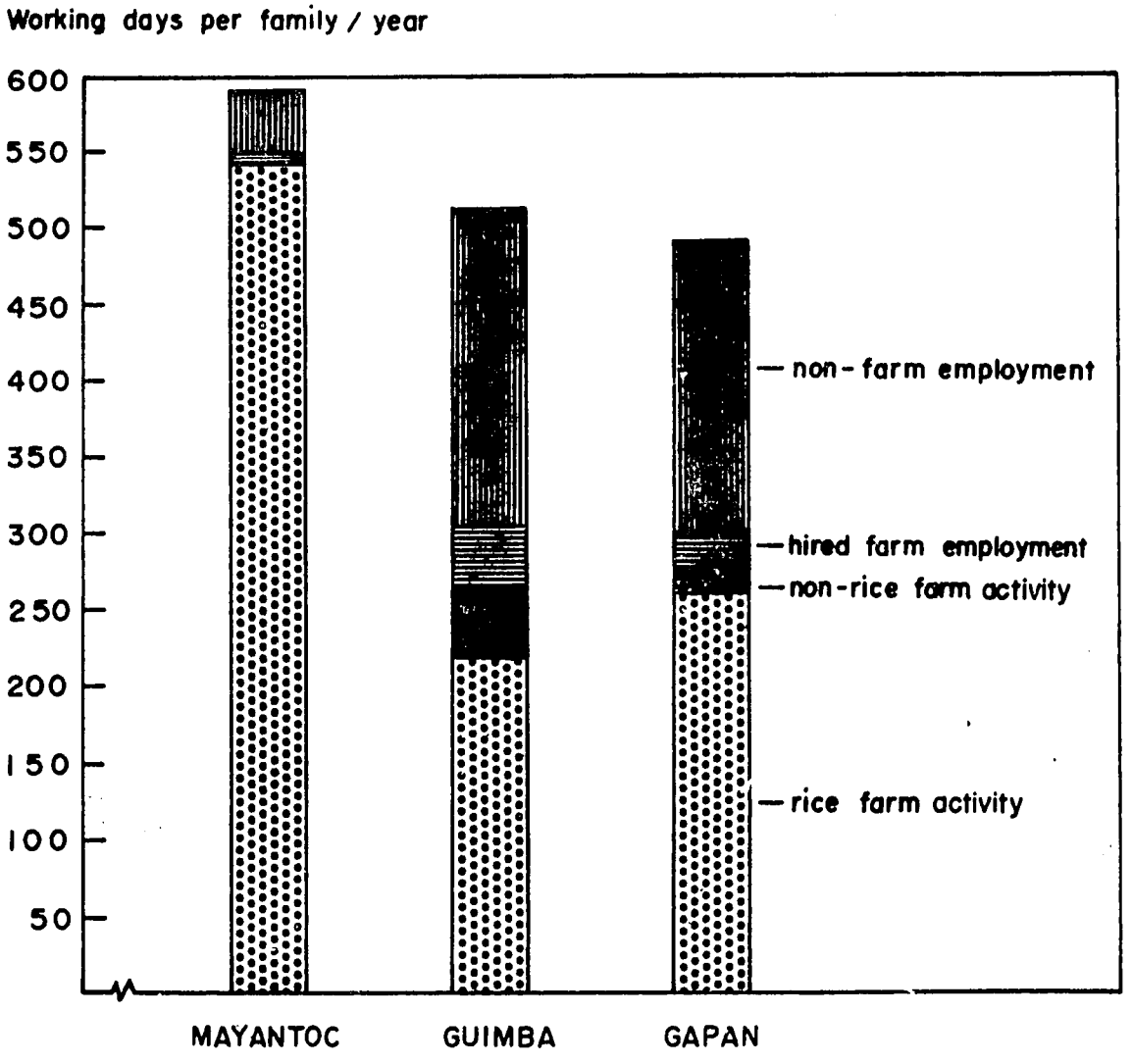

Fig. 3. Labor allocation per family per year for each location, Central Luzon, 1974.

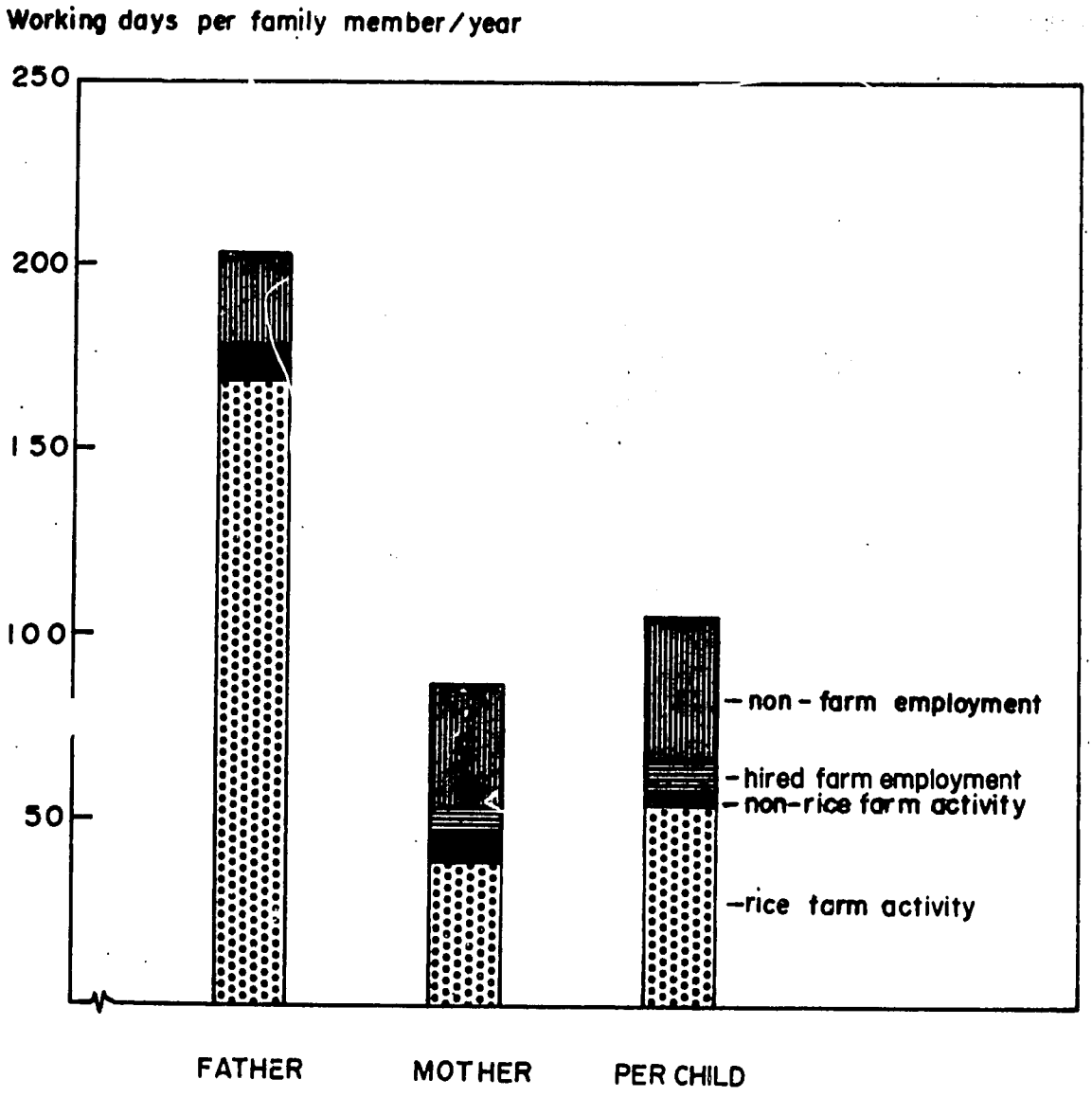

Fig. 4. Labor allocation for each family member per year, Central Luzon, 1974.

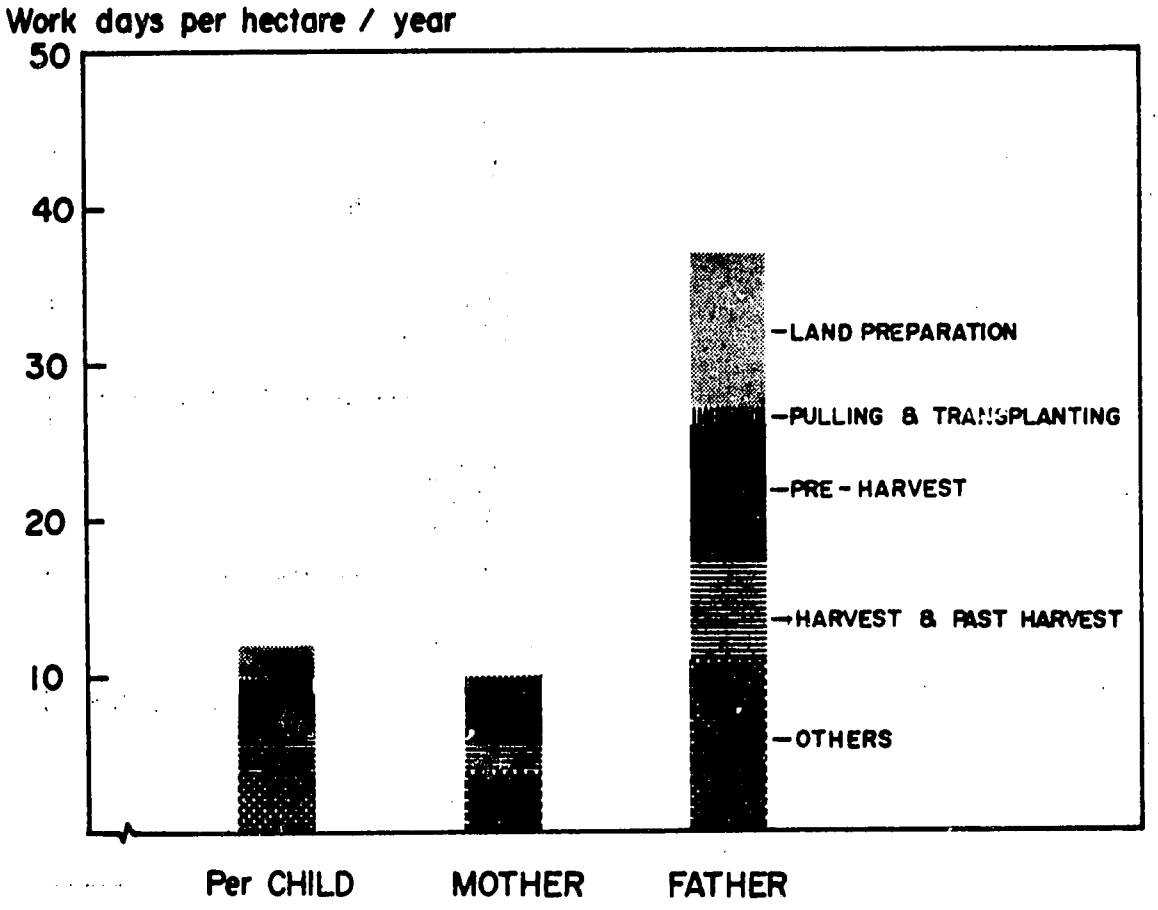

Fig. 5. Labor Contribution by each family member by tasks in rice production, Central Luzon, 1974.

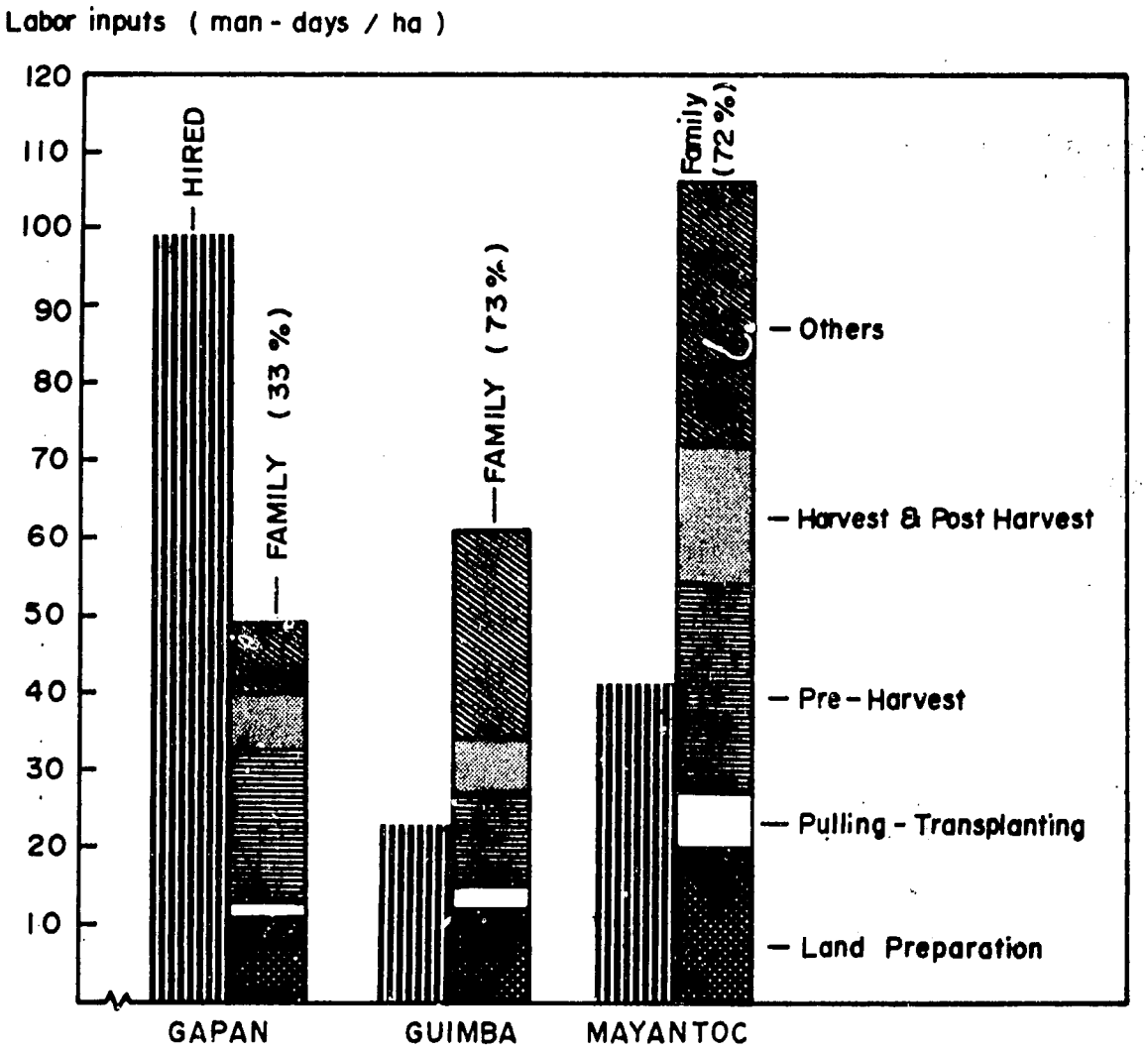

Fig. 6. Labor inputs by type of labor and by tasks in rice production, Central Luzon, 1974.