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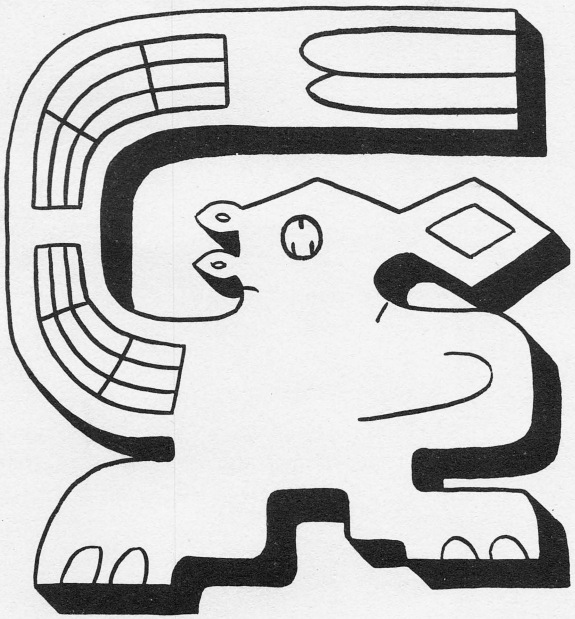

Tenure and Productivity of Philippine Rice Producing Farms

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The Philippine Economic Journal
Number Nine, First Semester 1966, Vol. V, No. 1

TENURE AND PRODUCTIVITY OF PHILIPPINE RICE PRODUCING FARMS

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Introduction

Understanding of the economic implications of land tenure systems rests on a dual foundation. First there is a set of historical generalizations about the consequences of alternative tenure arrangements for economic growth. There is also a set of logical deductions about the effects of alternative tenure arrangements on resource allocation and output levels derived from the neo-classical theory of the firm. Among western economists, economic history and economic logic have combined to produce a remarkable unity in doctrine to the effect that an agricultural sector organized on an owner-operator pattern (a) achieves a more efficient allocation of resources, and (b) makes a greater contribution to national economic growth than alternative systems.

In this paper an attempt is made to test the logical deductions implicit in the neo-classical theory of the firm

* The author wishes to express his appreciation to Mr. Jose Castillo, Bureau of Agricultural Extension, Department of Agriculture and Natural Resources (Philippines), and Dr. Gloria Feliciano, University of the Philippines (Los Baños and Diliman), for making unpublished data tabulations available and to Mr. Maximo Pabale, University of the Philippines (Los Baños), for assistance in statistical tabulation and analysis. He also wishes to express his appreciation to Dr. Philip Raup, University of Minnesota, for critical review of an earlier draft of the paper. The research on this paper was completed while the author was Agricultural Economist at the International Rice Research Institute, College, Laguna, Philippines.

regarding the relationship between tenure and productivity against Philippine data.[1]

Formal exploration of the empirical consequences for the equilibrium level of output and factor-product ratios of (a) the method of pricing factor inputs, and (b) the constraints on decision making under alternative "ideal type" tenure arrangements have been presented in a series of articles by Schultz, Schickele, Heady, Johnson and Drake.[2] The empirical hypothesis generated by the neo-classical analyses imply that share tenure results in (a) less intensive use of labor and current inputs by the tenant, (b) lower levels of investment in land improvement and fixed capital by the landlord, (c) slower adoption of new technology involving more intensive use of labor or the purchase of current or capital inputs, and (d) lower levels of output per unit of land and labor than under fixed rent leasehold or owner-operator systems.

Estanislao, in a perceptive article in a previous issue of the *Philippine Economic Journal,* (a) has indicated that the available data from the Philippines are not entirely consistent with the hypothesis derived from either the historical generalizations or the neo-classical models, and (b) has suggested that technical progress in Philippine agriculture, particularly the use of purchased inputs, has not yet reached a level where share tenancy acts as a restraint

[1] For discussion of the relevance of the historical generalizations for land reform in the Philippines and Southeast Asia, see V. W. Ruttan, "Land Reform and National Economic Development," in G. P. Sicat (ed.) *The Philippine Economy in the* 1960's, (U.P., I.E.D.R., Diliman, 1964), pp. 92-119. Reprinted in *Indian Journal of Agricultural Economics,* Vol. 19. Nos. 3 and 4 (July-December, 1964), 114-130; V. W. Ruttan, "Equity and Productivity Issues in Modern Agrarian Legislation." Paper presented to the International Economic Association Conference on the Economic Problems of Agriculture, Rome, September 1-8, 1965.

[2] T. W. Schultz, "Capital Rationing, Uncertainty and Farm Tenancy Reform," *Journal of Political Economy,* Vol. 48, No. 3 (June 1940) 309-324. Reiner Schickele, "Effect of Tenure Systems on Agricultural Efficiency," *Journal of Farm Economics,* Vol. 23 (February, 1941), 185-207; E. O. Heady, Economics of Farm Leasing Systems," *Journal of Farm Economics,* Vol. 34, No. 3 (August, 1947), 650-678; D. G. Johnson, "Resource Allocation Under Share Contracts," *Journal of Political Economy,* Vol. 57 (April, 1950), 111-123; L. S. Drake, "Comparative Productivity of Share and Cash-Rent Sytsems of Tenure," *Journal of Farm Economics,* Vol. 34, No. 4 (November, 1952), 535-550.

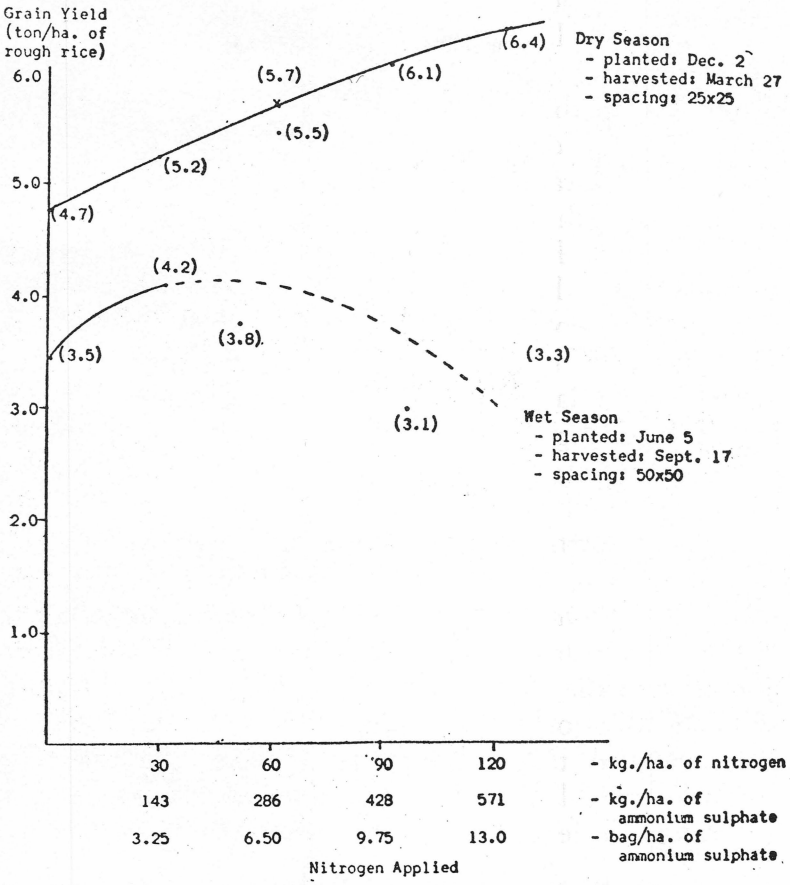


FIGURE 1

YIELD OF PETA AT IRRI IN THE 1963 DRY AND WET SEASONS

Source: Based on data reported by A. Tanaka in IRRI 1963 *Annual Report.* (Los Baños, Laguna, January 1964), p. 48.

on growth of output.[3] Furthermore, implementation of the 1963 Philippine Land Reform Code[4] lends importance to further tests of the productivity hypothesis.

[3] J. P. Estanislao, "A Note on Differential Farm Productivity, By Tenure," *The Philippine Economical Journal,* Vol. 4, No. 1 (First Semester 1965), 120-124.

[4] *Agricultural Land Reform Code* (Republic Act No. 38441, Manila, Bureau of Printing, 1963).

In this paper the empirical hypotheses generated from the neo-classical theory are tested in two ways: (a) a normative test based on the implications of theory of the firm for rational economic behavior by the farmer, or (b) a positive test based on observations of farmer behavior under alternative tenure arrangements.

A normative test of the productivity hypothesis

The normative test involves the use of partial budgeting[5] to examine the implications for rational behavior of farmers with respect to the use of (a) an output increasing input or innovation (fertilizer), and (b) a cost reducing innovation (herbicides).[6]

Output increasing changes (fertilizer)

The data presented in Figure 1 show a response curve for rice (variety Peta) to nitrogen fertilizer obtained at the IRRI during the 1963 dry and wet season.[7] From this response data it is possible to estimate by the approach shown in Example 1, (a) the incremental costs associated with increments in fertilizer application (Subtotal A), (b) the incremental value of the rice production resulting from the alternative levels of fertilizer use (Subtotal B), and (c) the incremental change in net returns resulting from alter-

[5] V. W. Ruttan and J. C. Moomaw, "Partial Budgeting of Costs and Returns Using Experimental Data from Herbicide and Fertilizer Experiments," *Philippine Agriculturist,* Vol. 48, No. 6-7 (December 1964), 249-268. I. F. Fellows (ed), *Budgeting—tool of research and extension in agricultural economics.* Bulletin 357, Storrs Agricultural Experiment Station, University of Connecticut, 1963.

[6] This classification of innovation is based on E. O. Heady, "Basic Economic and Welfare Aspects of Farm Technological Advance," *Journal of Farm Economics,* Vol. 31, No. 2 (May 1949), 293-316. While valid for micro-economic analysis, this classification is not useful for macro-economic analyses where all innovations which are actually adopted become output increasing.

[7] Fertilizer response curves for rice grown under irrigated conditions during the dry season typically, lie above and extend farther to the right than wet season response curves. The shorter and lower response to fertilizer during the wet season is due in large measure to the lodging induced by the greater vegetative response of the rice to fertilizer during the cloudy wet season. For additional information see IRRI 1964 *Annual Report,* (Los Baños, Laguna, January 1965), pp. 88-126.

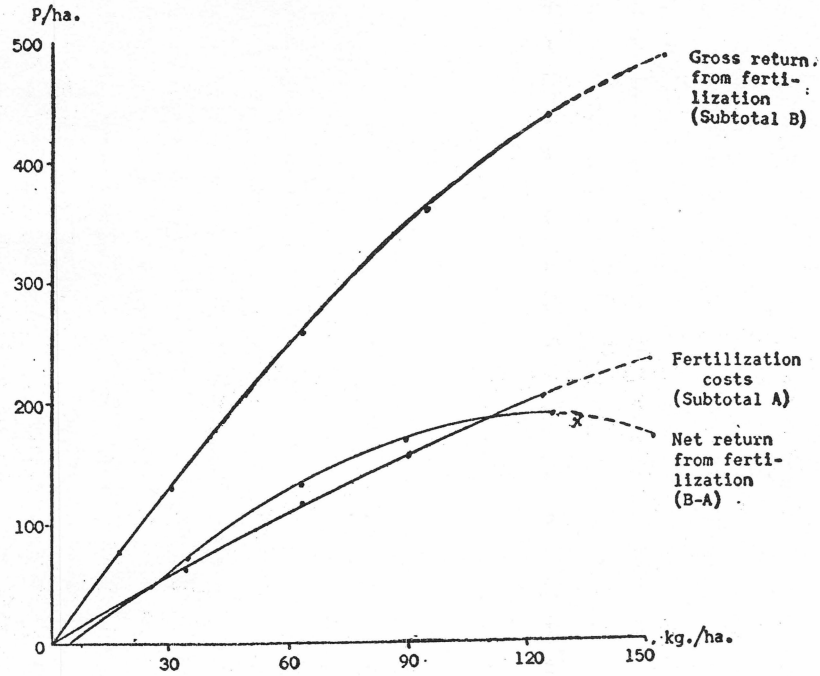
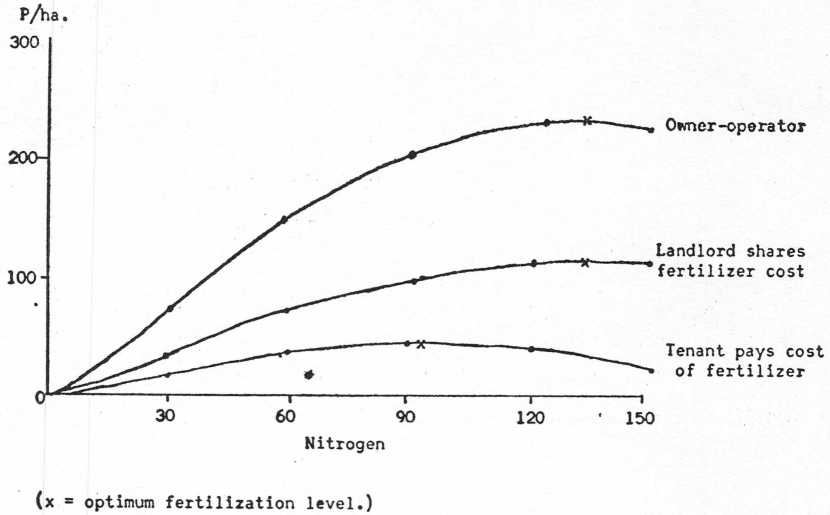


FIGURE 2

CUMULATIVE COSTS AND RETURNS TO FERTILIZATION OF PETA, 1963 DRY SEASON (based on the fertilizer response reported in Figure 2)

Gross return						
— total	₱0.00	₱136.50	₱273.00	₱382.20	₱463.80	₱504.75
— change	₱136.50	₱136.50	₱109.20	₱ 81.60	₱ 40.95	
Cost						
— total	₱0.00	₱ 63.79	₱124.98	₱181.42	₱233.60	₱278.95
— change	₱ 63.79	₱ 61.19	₱ 56.44	₱ 52.18	₱ 45.35	
Net return						
— total	₱0.00	₱ 72.71	₱148.02	₱200.78	₱230.20	₱225.80
— change	₱ 72.71	₱ 75.31	₱ 52.76	₱ 29.42	₱ -4.40	

native levels of fertilizer (B-A). The results of the computation of a series of such partial budgets for a farm operating under an owner-operator systems for the dry season fertilizer response curve of Figure 1 are presented in Figure 2.



(x = optimum fertilization level.)

FIGURE 3

IMPLICATIONS OF TENURE ON NET RETURNS AND OPTIMUM LEVEL OF FERTILIZATION OF PALAY
(based on the fertilizer response reported in Figure 2 and a price of ₱12.00/cavan for palay)

In Figure 3 the net return curve for the owner-operator system is compared with the net return to the farm operator under two alternative share tenure arrangements. When the landlord shares the fertilizer cost (the "good landlord" case) and the net harvest (after deducting the harvest share) with the tenant operator, the operator's net return curve is lower than under the owner-operator situation but the optimum level of fertilizer application remains unchanged. When the tenant pays the full cost of the fertilizer (the "bad landlord" case) and shares the net harvest with the landlord, the operator's net return curve is still lower. Also the optimum level of fertilizer input and rice output per hectare is to the left of the optimum levels under the owner-operator system. In a situation characterized by (a) even a moderate degree of uncertainty with respect to fertilizer response, such as might prevail under rain-fed rice production, or (b) capital rationing it seems

EXAMPLE 1

APPLICATION OF 30 KG. OF NITROGEN (Per Hectare Basis) VS. NO FERTILIZER, VARIETY PETA, 1963 DRY SEASON

a. Added costs		c. Added returns	
Materials[1]	₱33.90	Change in palay produced[5]	₱136.50
Interest[2]	2.03		
Equipment[3]			
Application[4]	5.20		
Harvesting[5]	22.66		
b. Reduced returns		d. Reduced costs	
Change in palay produced[5]			
Subtotal A	₱63.79	Subtotal B	₱136.50
		Estimated change (B-A)	₱ 72.71

[1] 30 kg. of nitrogen @ ₱1.13/kg. (₱10.50/44 kg. bag of ammonium sulphate containing 21% N).

[2] 6 per cent for 6 months.

[3] Broadcast, no equipment cost.

[4] Broadcasting — 8 man-hours/ha. @ 0.65¢/hour = ₱5.20

[5] (a) Increased production of 500 kg. valued at ₱0.273 per kg. ₱12.00/cavan of 44 kilos). = ₱136.50

(b) Harvest cost (at 1/6 of 500 kg.), kg. valued at ₱0.273 per kg. = ₱ 22.66

quite likely that the rational share tenant would decide not to use any fertilizer at all given a fertilizer response curve and factor and product prices such as those specified in this test.

The same type of analysis could be developed for investment decisions by the landlord. The implication of such analysis is that share tenure clearly limits the landlord's incentive to invest in productivity increasing land improvements or capital equipment. The return to the landlord on investment in a pump irrigation system designed to permit multiple cropping is sharply reduced under a tra-

ditional share rental system as compared to a large scale owner-operator system.

Cost reducing changes (herbicides)

In the fertilizer example the increments in inputs of fertilizer were incurred in order to achieve increments in output. The analyses of the economics of herbicides involve the substitution of one factor (cost) — a herbicide or weed-killing chemical —for another factor — labor used for weeding.

In Example 2 data are presented comparing the cost of mechanical weeding with use of the herbicide 2,4-D for weed control. In both cases a final hand weeding operation is employed. Given the assumptions regarding factor costs, product price and technical efficiency used in the example, it is clearly profitable to substitute the use of the herbicide for mechanical weeding.

The results are, of course, heavily dependent on the wage-rate or opportunity cost of labor assumption. This is illustrated in the price map of Figure 4 reflecting the result of a series of partial budgets constructed using alternative wage rates. The lines separate the cost of herbicide — farm wage rate surface into two regions for two herbicides with different levels of technical efficiency. For any combination of farm wage rate and herbicide cost lying to the right of the line, use of herbicide is more profitable than use of mechanical weeding.

In this case a share tenure situation in which the tenant pays the full cost of the input imposes no barrier, as compared to an owner-operator system, to use of the herbicide, (Example 3) since there is no increase in output to share with the landlord. The decision to employ the herbicide in this case depends primarily on the tenant's opportunity cost for labor. In the "good landlord" example where the landlord shares the cost of the herbicide, the ten-

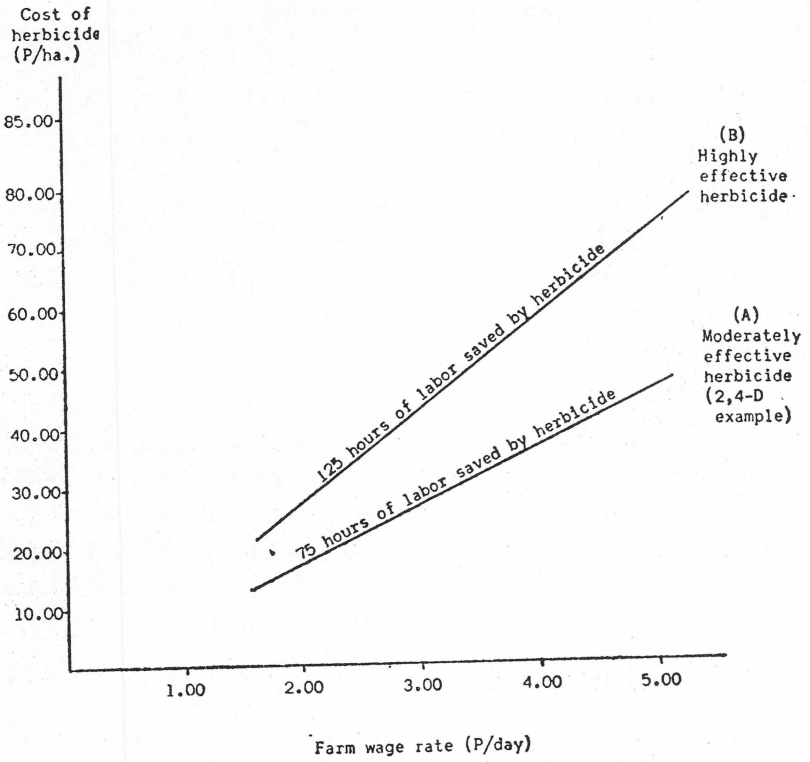


FIGURE 4
EXAMPLE OF PRICE MAP FOR SCREENING HERBICIDES

ant's incentive is even greater than under an owner-operator situation.

A similar analysis would apply in the case of other cost reducing innovations, such as the small walking tractor (primarily a substitute for animal labor) which do not have a measurable impact on output. Innovations of this type could be expected to diffuse most rapidly in provinces near urban areas (such as Laguna) where opportunity costs for labor are relatively high because of the non-farm employment opportunities.

This point, that share tenure provides a possible incentive for the adoption of labor saving innovations, has ap-

EXAMPLE 2

MECHANICAL WEEDING (plus hand weeding at closing in time) VS. 2,4-D APPLIED TO FLOODED PADDY 11 DAYS AFTER TRANSPLANTING (plus hand weeding at closing time), BPI-76, 1963 WET SEASON, IRRI WAGE RATES. (per hectare basis)

a. Added costs		c. Added returns	
Materials[1]	₱ 10.00	Change in palay produced[4]	
Equipment (herbicide sprayer) charge[2]	1.00		
Application labor[3]	2.60		
b. Reduced returns		d. Reduced costs	
Change in palay produced[4]	—	Hand weeding labor[5]	₱ 48.75
		Interest[6]	1.40
Subtotal A	₱ 13.60	Subtotal B	₱ 50.15
		Estimated change (B-A)	₱ 36.55

[1] 1.25 kg. of commercial hedonal @ ₱8.00/kg. (80% wetable powder or 1 kg. of active sodium 2,4-D).

[2] Arbitrary assumption.

[3] 4 hours/ha. @ ₱0.65/hour (₱5.20/day) = ₱2.60.

[4] No statistically significant change in yield.

[5] Mechanical and hand weeding labor reduced from 152 to 77 hours. 75 hours @ ₱0.65/hour = ₱48.75.

[6] Saving in other costs (₱48.75 — ₱13.60 = ₱35.15) @ 1% per month for 4 months = ₱2.29.

parently not received attention in the land tenure literature. The formal analysis also leads to the conclusion that share tenure results in an incentive for tenants who place any value greater than zero on the marginal value product of their own labor to adapt less labor intensive enterprise combinations (for example, rice rather than vegetables) than tenants operating under fixed rent leasehold or owner-

EXAMPLE 3

IMPLICATIONS OF SHARE TENURE FOR MECHANICAL WEEDING (plus hand weeding at closing in time) VS. 2,4-D APPLIED ON WATER, IRRI LABOR RATES, BPI-76, 1963 WET SEASON. (per hectare basis)

Tenant pays cost of herbicide

a. Added costs		c. Added returns	
Materials[1]	₱ 10.00	Change in palay produced[4]	
Equipment rental[2]	1.00		
Application labor[3]	2.60		
b. Reduced returns		d. Reduced costs	
Changed in palay produced[4]		Labor[5]	₱ 48.75
		Interest[5]	1.40
		Landlord's share of materials[6]	—
Subtotal A	₱ 13.60	Subtotal B	₱ 50.15
		Estimated change (B-A)	₱ 36.55

Landlord shares cost of herbicide

a. Added costs		c. Added returns	
Materials[1]	₱ 10.00	Change in palay produced[4]	
Equipment rental[2]	1.00		
Application labor[3]	2.60		
b. Reduced returns		d. Reduced costs	
Change in palay produced[4]		Labor[5]	₱ 48.75
		Interest[5]	1.60
		Landlord's share of materials[6]	5.00
Subtotal 4	₱ 13.60	Subtotal B	₱ 55.35
		Estimated change (B-A)	₱ 41.75

[1] 1.25 kg. of commercial hedonal @ 8.00/kg. (80% wetable power or 1 kg. of active sodium 2,4-D).

[2] Arbitrary assumption.

[3] 4 hours/ha. @ ₱0.65/hour.

[4] No change in rent since there is no change in yield.

[5] Mechanical and hand weeded labor reduced from 152 to 75 hours. 75 hours save @ 0.65¢/hour = ₱48.75.

[6] Half of[1].

operator systems.[8] In a labor surplus economy this bias toward the adoption of labor saving innovations and the adoption of labor saving enterprise combinations is clearly inconsistent with efficient resource allocation, and may seriously affect the aggregate level of output.

Implications of the normative test

The normative test, using experimental data, indicates at least a minor qualification in the productivity generalizations that "there is no substitute from the standpoint of sheer productivity, and irrespective of sociological considerations for an owner-operated agricultural system."[9] The analysis is consistent with the proposition that share tenancy does reduce the incentive for intensive use of labor inputs and for the use of output increasing technical inputs such as fertilizer and insecticides. However, it appears that share tenancy may actually encourage a more rapid rate of adoption of labor saving technology than would occur under fixed rent leasehold or owner-operator systems.

Positive tests of the productivity hypotheses

The normative test was based on an assumption of rational economic behavior of tenants and owner-operators in an environment characterized by efficient factor and product markets. It is also useful to test the productivity implications of the theory of the firm against observations of the actual behavior of farms of the same size operating under alternative tenure systems.[10] In this section the productivity implications are tested against data for al-

[8] I am indebted to my colleague Philip Raup for pointing out the enterprise combination implication of share tenure. See also R. V. Elefson, "Tenant Farmers Want More Livestock," *Minnesota Farm Business Notes*, (May 26, 1958), pp. 1-3.

[9] L. S. Drake, *op. cit.*, 535.

[10] Data on productivity classified by both size and tenure are surprisingly difficult to find both in the Philippines and Southeast Asia. Typically one finds one-way classifications which indicate that yield per unit area is inversely related to size and/or that tenants operate smaller size farms than owner-oper-

ternative tenure classes in the Philippines as a whole and in five barrios in Central Luzon.

The national test

The test for the Philippines as a whole utilizes data collected by the Bureau of Agricultural Economics (DANR) on rice yields classified by size of farm and tenure, for farms throughout the Philippines. The data are summarized in Table 1.

From the national data it appears that (a) yield per hectare is typically higher on share tenure than on owner-operated farms and (b) yield per hectare is lower on large farms than on small farms for most categories of farms. The first result is clearly inconsistent with the productivity hypotheses.

There are serious difficulties in using the national data as a test of the productivity hypotheses, however. There is a strong possibility that the yield advantage of share tenant relative to owner-operator farms is primarily the result of aggregation. Share-tenancy represents the dominant system of cultivation in the major commercial rice producing areas such as Central Luzon. These are also the areas where irrigation is most fully developed and where yields are highest.[11] The data presented in Table 1 may, therefore, not be inconsistent with the hypotheses that owner-operator or lease tenure farms achieve higher yields

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ators. See, for example, Ervin J. Long, "The Economic Bases of Land Reform in Underdeveloped Areas," *Land Economics,* Vol. 37, No. 2 (May 1961), 113-123; Horst and Judith von Oppenfeld, J. C. Sta. Iglesia and P. R. Sandoval, *Farm Management, Land Use and Tenancy in the Philippines,* Central Experiment Station Bulletin 1, UPCA, College, Los Baños, Laguna, pp. 23, 80-82. Two major exceptions are: (a) Eldon Smith "Tenancy Among Padi Cultivators in Malaya" Ford Foundation, Kuala Lumpur, 1965 (mimeographed). (b) Thailand *Census of Agriculture,* 1963, National Statistical Office, Office of the Prime Minister, Bangkok, Thailand, which presents area planted, area harvested, and production by tenure and size of holding for rice. The new Thailand data identify four tenure classes: Owner, cash renter, crop renter and others. It is not possible to distinguish between share tenure and fixed lease tenure, however.

[11] E. C. Venegas and V. W. Ruttan, "Analysis of Rice Production in the Philippines," *Economic Research Journal,* Vol. II, No. 3 (University of the East, December 1964), 159-180.

TABLE 1

RELATIONSHIP BETWEEN FARM SIZE, TENURE AND PRODUCTIVITY ON RICE PRODUCING FARMS IN THE PHILIPPINES, 1962.

	Size of farm in hectares									
	0.6-0.9	1.0-1.4	1.5-1.9	2.0-2.9	3.0-3.9	4.0-4.9	5.0-9.9	10.0-14.9	15.0-24.9	25.0-49.9
	Yield (-44 Kilo cavans per hectare)									
All rice producing farms										
Share tenants	27.8	35.6	39.3	37.9	36.2	35.6	35.9	38.4	*	*
Full owner	33.4	27.8	27.5	26.6	28.7	28.1	25.5	25.5	19.6	16.6
Irrigated first crop										
Share tenant	41.1	36.1	46.5	44.6	41.4	44.2	40.1	*	*	*
Full owner	38.0	37.1	30.4	35.0	37.8	36.4	33.2	36.6	*	*
Irrigated second crop										
Share tenant	32.9	35.8	41.4	35.9	34.0	35.9	34.6	*	*	*
Full owner	37.1	32.9	33.6	29.9	36.4	29.5	30.7	30.2	*	*
Non-irrigated (rainfed) first crop										
Share tenant	29.9	38.0	40.3	40.4	38.9	35.2	39.3	*	*	*
Full owner	24.1	26.0	29.9	27.9	30.2	27.3	27.0	26.1	26.0	13.9
Upland rice										
Share tenant	15.0	19.4	23.2	20.7	16.4	22.0	19.2	*	*	*
Full owner	32.5	19.7	15.2	17.7	18.9	24.3	17.7	19.1	14.8	15.7

* Less than 5 farms reporting

Source: Tabulated from data collected by the Bureau of Agricultural Economics, Department of Agriculture and Natural Resources.

than share tenure farms when physical environment (soil, water, etc.) as well as farm size are held constant.

The Central Luzon test

The Central Luzon test utilizes data from five barrios in the province of Bulacan.[12] The physical environment in the 5 barrios is relatively homogeneous. The data should, therefore, be much less subject to composition bias than the data from the national sample.

In addition to a test of the productivity hypotheses the Bulacan data permit a test of the implications of the theory of the firm regarding the effect of share and fixed rent lease tenure systems for the use of purchased technical inputs and family labor. More specifically it permits a test of the following three hypotheses:

(a) Farms operated under lease tenure achieve higher levels of land productivity (kilograms of rough rice per hectare) and higher levels of labor productivity (kilograms of rough rice per day of available family labor) than farms operated under share tenure.

(b) A higher percentage of farms operated under lease tenure use purchased technical inputs (fertilizer and insecticides) than of farms operated under share tenure.

(c) A higher percentage of the family labor potentially available for rice production is employed off the farm on farms operated under share than under lease tenure.

The data for irrigated rice farms producing two crops of rice per year in the 5 barrios are presented in Tables 2 and 3. In Table 2, the data for the entire 5 barrios, classified by size of farm and tenure, are presented. In Table 3 data classified by size of family labor force and tenure are presented for the two individual barrios which contained a sufficiently large number of lease tenants to permit intra-barrio comparison.

[12] The data used in this test were collected by the UPCA Deparment of Communications under the direction of Dr. Gloria Feliciano.

The data presented in Table 2 for all five barrios appear consistent with the first two hypotheses. For the entire group of farms both land and labor productivity is higher on lease tenure than on share tenure farms. A higher percentage of lease than share tenure farms use fertilizer and insecticides. However, a higher percentage of the labor force on lease tenure farms work off farm than on share tenure farms.

Examination of the data by size of farm indicates, however, that on the smaller size farms (2.0 ha. and below) share tenants typically achieve higher productivity levels than lease tenants. Furthermore, on the smallest size farms (1.0 ha. and below) a higher proportion of share than lease tenants use fertilizer and insecticides.[13] It is apparent, therefore, that the first two hypotheses are confirmed, in the aggregate, primarily because of the differential impact of tenure on resource use and productivity on the larger size farms.[14] It should also be noted that the data for the larger size farms are consistent with the third hypothesis.

In Table 3 data are presented separately for the two barrios, Santol and Balatong B, which account for a relatively high percentage of all lease tenants in the five barrios. The area in which the two barrios are located appears relatively homogeneous with respect to soil and irrigation. There are, however, other major differences between the two barrios. Barrio Balatong B appears to be a more traditional community than Barrio Santol. It is characterized by less adequate communication (poorer roads, fewer radios), less contact outside the community (through extension workers, non-farm employment), more traditional attitudes toward authority, lower level of edu-

[13] There is also some evidence from other studies that share tenants achieve lower rates of capital accumulation than other tenure classes. P. R. Sandoval, "Implications of Tenure Arrangements for Savings and Capital Formation in Philippine Agriculture," *The Philippine Economic Journal,* Vol. 3, No. 2 (Second Semester 1964), 184-188.

[14] This is consistent with results reported earlier for lowland rice farms in the Province of Laguna. Ruttan, *op. cit.* (1964).

cation, an older age distribution, and a consumption rather than production value orientation.[15]

The individual barrio comparisons indicate that average land and labor productivity is higher on lease tenure than share tenure farms in Barrio Balatong B but not in Barrio Santol. In both barrios, however, lease tenants typically operate larger farms and obtain higher yields on these larger farms than share tenants. There is a strong negative relationship between size of farm and both land and labor productivity on share tenure farms in both barrios.

No clear cut relationships are indicated between tenure, farm size and the use of purchased inputs. Fertilizer and insecticides are used by a relatively high percentage of both share and lease tenants in Barrio Santol and by a relatively low percentage in Barrio Balatong B.

A higher percentage of share tenants than lease tenants are engaged in off farm work in both barrios. However, the percentage for both tenure classes is relatively high in Barrio Santol and low in Barrio Balatong B.

The most striking conclusion to emerge from the interbarrio comparisons is that differences in productivity between barrios are substantially greater than the intra-barrio differences in productivity associated with tenure.

Summary and Implication

Both the normative and positive tests lead to the conclusion that the relationships between tenure and productivity are not as clear cut as hypothesized.

The major exception to the normative test is that share tenancy may not act as a barrier to the use or adoption of labor saving inputs. This exception would appear to be most important in an economy with an expanding non-farm labor market or in the vicinity of a rapidly growing urban-industrial center. In a labor surplus economy

[15] Based on preliminary tabulation of data from the Bulacan survey conducted under the direction of Dr. Gloria Feliciano.

TABLE 2

TENURE, PRODUCTIVITY, AND FARM SIZE ON IRRIGATED RICE FARMS PRODUCING TWO CROPS PER YEAR IN FIVE BARRIOS IN BULACAN, 1963-64

	Size of Farm (ha.)				
	0.1-1.0	1.1-2.0	2.1-3.0	Above 3.0	Total
Land productivity (kg. of rough rice/ha./year)					
Share tenure	4,948	3,836	3,189	1,919	3,541
Lease tenure	4,748	3,013	3,522	5,964	3,738
Labor productivity (kg. of rough rice per day)					
Share tenure	4.67	7.70	8.49	9.12	7.15
Lease tenure	6.08	7.55	8.56	13.73	8.90
Percent of farms using fertilizer					
Share tenure	52.8	35.9	47.3	33.3	43.6
Lease tenure	45.5	75.0	75.0	60.0	62.5
Percent of farmers using insecticide					
Share tenure	38.9	20.8	21.0	21.9	24.8
Lease tenure	36.4	37.5	25.0	40.0	34.4
Percent of available labor days employed off farm					
Share tenure	12.7	13.3	12.7	29.6	13.8
Lease tenure	16.7	28.1	17.1	18.6	19.8

Source: U.P. College of Agriculture, Department of Agricultural Information Survey.

share tenure may, therefore, encourage the premature adoption of labor saving technology and discourage the adoption of desirable labor intensive farm enterprises.

The positive test indicated two major exceptions to the hypothesized relationships: (a) Share tenure farms appear to achieve higher levels of productivity and to use higher levels of purchased inputs than owner-operated or lease tenure farms in the smaller size ranges. (b) Productivity differences between tenure classes were smaller in a barrio characterized by high off farm employment opportunity than in barrio with few off farm employment opportunities.

Two hypotheses can be suggested to explain the relatively high productivity on small share tenure farms: (a)

TABLE 3

PRODUCTIVITY ON FARMS CLASSIFIED BY TENURE AND SIZE OF FARM ON IRRIGATED RICE FARMS PRODUCING TWO CROPS PER YEAR IN TWO BARRIOS IN BULACAN, 1963-1964.

	Size of Farm (ha.)				
	Below 1.0	1.1 -2.0	2.1 -3.0	Above 3.0	Total
Land productivity (kg. of rough/rice/ha./year)					
Santol — Share	4,479.2	4,488.0	4,274.0	1,709.7	4,121.5
Lease	4,694.1	2,990.0	4,078.3	3,966.3	3,921.0
Balatong B — Share	5,252.2	3,114.7	2,755.6	1,114.7	2,993.4
Lease	4,251.8	3,080.0	1,904.0	3,960.0	3,412.5
Labor productivity (kg. of rough rice/day of available labor)					
Santol — Share	5.74	8.17	12.05	5.75	9.20
Lease	7.26	8.27	10.45	6.55	9.34
Balatong B — Share	5.33	5.18	6.88	6.43	5.96
Lease	5.17	5.92	4.02	23.38	8.20
Percent of farms using fertilizer					
Santol — Share	80.0	80.0	75.0	0.0	73.7
Lease	80.0	100.0	100.0	75.0	90.5
Balatong B — Share	36.4	15.4	37.5	0.0	28.6
Lease	20.0	0.0	0.0	0.0	10.0
Percent of farms using insecticides					
Santol — Share	60.0	20.0	50.0	0.0	42.1
Lease	20.0	38.3	50.0	75.0	42.9
Balatong B — Share	18.2	0.0	12.5	0.0	9.5
Lease	0.0	0.0	0.0	100.0	10.0
Percent of available, labor days employed off farm					
Santol — Share	31.8	40.0	23.1	60.0	34.0
Lease	31.6	36.0	22.6	22.8	27.6
Balatong B — Share	0.3	7.3	7.1	0.0	6.0
Lease	0.0	0.0	0.0	0.0	0.0

Source: UPCA, Department of Agricultural Information Survey

Share tenants operating small units may have more adequate access than small lease tenure or owner-operated farms to the market for credit and purchased inputs through their landlords. (b) The marginal utility of additional labor inputs on share tenure farms may not begin to decline until the tenant has produced enough rice to satisfy his minimum domestic consumption needs.

It seems clear that the higher productivity of both share and lease tenure farms in Barrio Santol relative to Barrio Balatong B is related to the greater use of purchased inputs by both lease and share tenants. It also seems reasonable to hypothesize that the greater use is a joint consequence of more effective communication leading to greater contact with extension agencies, and better functioning of factor and product markets. The availability of substantial off farm employment may, as implied in the normative test, result in greater incentive to adopt labor saving technology by share tenants.

A major implication of the data presented in this paper is that the first step in achieving greater precision in predicting the productivity implications of changes in land tenure arrangements is to reject the assumption that there is any single optimum land tenure system. It seems reasonable to hypothesize that the relationship between land tenure and productivity varies (a) with the extent of commercial (or subsistence) production, (b) with the level, rate and direction of technological development, (c) with the extent of diffusion (or concentration) of political and economic power.

The historical generalizations concerning the favorable resource allocation and productivity effects of land tenure legislation designed to transfer a share or lease tenure system to an owner-operator system have been based almost entirely on observations from economies characterized by technically progressive, small scale, commercial farms operating in an environment characterized by (a) an expanding non-farm labor market, and (b) an "open" socio-political

structure. Similarly, the neo-classical analytical models designed to examine the implications of alternative tenure systems on resource allocation and the growth of productivity have been designed, either implicitly or explicitly, to apply to farm operations in the same type of environment.

The data presented in this paper support the hypothesis that in agrarian systems, such as the Philippines, which are undergoing a transition from a static subsistence structure to be a technically progressive small scale commercial structure attempts to determine empirical relationships between productivity, tenure and farm size will yield conflicting results. Furthermore, the potential productivity gain from land reform in such transitional economies will not be as easy to achieve as in economies which have moved farther out along the three dimensions of commercial, technological and political development. In transitional economies the potential productivity gains are likely to be achieved only if the traditional land reform concept is broadened to include other agrarian policies including (a) the development of effective rural credit institutions capable of serving even the relatively small farmer (under 2 hectares, for example), (b) effective research and extension programs capable of rapid production and diffusion of new technical information, and finally, (c) the development of effective factor (input) and product market institutions. The role of the factor markets is particularly important since much of the new technology is "embodied" in new plant varieties and more efficient materials such as fertilizer and insecticides.

This should not be interpreted to imply the desirability of waiting to implement land tenure reform policies, particularly a shift from share to fixed rent lease tenure, until the relatively late "stages" of a nation's economic development.[16] Share tenure clearly encourages inefficient use of the tenant's labor relatively early in the development process — probably as soon as the product market becomes gen-

[16] This point of view seems to be the implicit point of much of the note by Estanislao, *op. cit.*

erally monetized. It acts as a tax on the adoption of output increasing technology — dampening tenant's incentives to adopt output increasing technology embodied in current inputs and the landowner's incentive to adopt output increasing technology in new capital equipment. Finally the strong negative relationship between farm size and productivity on share tenant operated farms acts as an incentive for the landowner to keep the size of unit operated by the tenant small. When a nation does reach a stage in its development where non-farm employment growth is sufficiently rapid to reduce the size of the farm labor force absolutely,[17] permitting average farm size to rise, the continued existence of share tenure further dampens agricultural output growth because of the negative relationship between farm size and productivity under share tenure conditions.

The 1963 Philippine Agricultural Land Reform Code reflects a highly sophisticated insight into the changes that must be associated with the land tenure modifications if the productivity potentials inherent in the legislation are to be achieved. The actual impact of the Code on productivity growth will require a similar level of sophistication in its administration.

[17] See Folke Dovring, "The Share of Agriculture in a Growing Population," *FAO Monthly Bulletin of Agricultural Economics and Statistics*, Vol. 8, No. 819 (August-September 1959), pp. 1-11, for a fuller exposition of the conditions under which an absolute decline in the farm population is possible.

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