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### *Socio-Economic Implications of Technological Development in Agriculture: the Philippine Case\**

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TECHNOLOGICAL development in this paper will be focused on the high yielding varieties (HYVs for short) of rice. Their development and application in the Philippines has had varied implications for farmers, landowners, urban consumers, rice traders, industrial workers, government officials, etc. The urban consumer evaluates the benefits from HYVs in terms of the peso prices he faces. The government must consider how the HYVs affect its programme expenditures and its foreign exchange savings from reduced imports and more exports. Rural people will be most concerned about the profitability of HYVs and the manner in which the benefits are shared among the different factors of production.

This paper presents a perspective of the development and diffusion of HYVs of rice in the Philippines and the consequent events. With data collected from 600 rice farmers an attempt is made to assess their impact. Some changes that have occurred before and after the introduction of HYVs on income, tenant arrangements and credit practices are also discussed.

#### THE HIGH YIELDING VARIETIES OF RICE: DEVELOPMENT AND CONSEQUENCES<sup>1</sup>

Before 1962 the development of new varieties of rice had been done by the College of Agriculture of the University of the Philippines, the Bureau of Plant Industry and a few other agricultural colleges. The recommended varieties which resulted, termed Philippine Seedboard selections were, however, not radical improvements over the traditional varieties. The start of operations of the International Rice Research Institute (IRRI) in 1962 constituted a tremendous increase in the scale of rice research in the Philippines.

Traditional Philippine rice varieties are generally tall and leafy,

\* This paper is based on a research project of the author and Dr Mahar Mangahas which is financed by the United Nations Research Institute for Social Development and the South-East Asian Regional Centre for Agriculture.

profuse tillering, photoperiod sensitive, and susceptible to lodging. They are able to produce moderate but stable yields even in adverse conditions such as deep water and intense weed competition, and are adapted to conditions of low fertility and little protection. The HYVs on the other hand are short and stiff-strawed, with short, narrow and erect leaves, are medium tillering, early maturing and are capable of substantial grain response to nitrogen without lodging.<sup>2</sup>

Soon after the IRRI began operations in 1962, numerous rice varieties, some taken directly from other countries and some developed by the Institute, began to be planted in scattered parts of the country. This was part of the Institute's scheme of field testing. In July 1966, IRRI sold 50 tons of IR 8 seed to the Philippines Government. These seeds had been produced on the government's initiative, viz., the Institute had been urged to produce a large amount of seed in advance of the time it might itself have felt completely ready to introduce a new variety. The government took a chance that the best available variety at that time could make a significant breakthrough. It channelled 40 tons to selected private seed farms and the rest to test plots of the Bureau of Plant Industry and the Commission of Agricultural Productivity (now the Bureau of Agricultural Extension). IR 8 was approved in April 1967, after three seasons of testing and was first planted on large scale in the wet season a few months later.<sup>3</sup>

The government was at this time giving strong support to its rice programme. In 1967/8 irrigation was provided to 106,000 hectares at a cost of over P17 million. Expenditure on research, extension, seed production, soil analysis, pest and disease control and programme administration amounted to about P11 million. These were expenditures over and above those provided in the regular budgets of the agencies concerned.

The Rice and Corn Production Co-ordinating Council (RCPPC) was authorized to subsidize the sale of fertilizers and of seeds. However, it purposely did not implement this subsidy. This was the period when Esso Fertilizer and Agricultural Chemicals Corporation,<sup>4</sup> the largest Philippine manufacturer, had just been established and was implementing a broad marketing effort for its products.

Product and input prices were kept relatively favourable to the diffusion of HYVs. In 1966 the government support price for paddy was raised by legislation from P12 per 45 kg to P16. In 1967/8 the government purchased 400,000 metric tons of domestic paddy, or about 20 per cent of the markets surplus, at the cost of about P115 million and stored much of it. The price of fertilizer on the other hand was relatively stable, with foreign competition representing an important force. In 1964-66, the rice-fertilizer price ratio was rising steadily.<sup>5</sup>

More emphasis was laid on agricultural credit, mainly through funding the private rural banks and guaranteeing a major portion of rice production loans. The total value of institutional loans to support rice production was P189 million in 1965/6, P247 million in 1966/7 and P341 million in 1967/8.

The speed of acceptance of farmers of the HYVs has been phenomenal. In the Philippines as a whole, the proportion of the area planted to HYVs rose from 21 per cent in crop year 1967/8 to 56 per cent in 1971/2 (Table 1). As expected the rate of acceptance was far higher on irrigated area, rising from 24 per cent in 1967/8 to 73 per cent in 1971/2.<sup>6</sup> In terms of production, HYVs produced about one-fourth of the total during 1967/8, and by 1971/2 were producing 63 per cent of the total. The yield advantage from HYVs, averaged over the country as a whole, ranged from 30 to 35 per cent of the yield of traditional varieties.

The first major impact of the HYVs on production was felt in 1967/8. Total production of rice in that year was 103.7 million cavans (paddy), an increase of 14 per cent over the preceding year. This led to the exportation

TABLE 1. *Area, production, and yield per hectare of high yielding varieties of palay, Philippines, 1967/8–1971/2\**

	1967/8	1968/9	1969/70	1970/1	1971/2
<i>Area</i>					
<i>Thousand hectares</i>					
Total area harvested, all palay	3304	3322	3113	3112	3246
<i>Per cent</i>					
Proportion of HYV	21.2	40.6	43.5	50.3	56.3
<i>Thousand hectares</i>					
Total area irrigated	1309	1483	1346	1471	1332
<i>Per cent</i>					
Proportion irrigated	39.6	44.5	43.2	47.3	41.0
Proportion of irrigated area for HYV	34.0	61.6	61.4	67.0	73.4
<i>Production</i>					
<i>Million cavans</i>					
Total production of palay	103.7	101.0	118.9	121.4	115.9
HYV	27.6	48.1	58.3	66.6	73.5
<i>Per cent</i>					
Proportion of HYV	26.6	40.5	49.1	54.8	63.4
<i>Yield per hectare</i>					
<i>Cavans per hectare</i>					
All palay	31.4	30.3	38.2	39.0	35.7
HYV	39.3	35.6	43.1	42.5	40.2
Other varieties	29.2	26.7	34.5	35.4	29.9
<i>Ratios</i>					
HYV to OV	1.35	1.33	1.25	1.20	1.34

Source: Bureau of Agricultural Economics.

Note: 1 cavan = 44 kg. palay = rough rice (paddy).

\* Preliminary estimates based on a subsample of two-thirds of the number of the sample barrios of the final round of the Integrated Agricultural Survey (IAS). Final estimates shall be based on the return for the whole IAS sample from the Census of Agriculture of the Bureau of Census and Statistics.

of some 40,000 metric tons of milled rice in calendar year 1968. The exportation was widely hailed as concrete evidence that the Philippines had reached 'self-sufficiency' at last. In 1968, the mean nominal retail price of rice in Manila was only 18 per cent greater than in 1967, and the mean real retail price had declined by about 0.5 per cent. In the next crop year, production fell to 101.0 million cavans, which was still 10 per cent greater than that of two years before. No steps were taken to import rice. The real price of rice was weakening, and there did seem to be a large stock of rice in the country. The following year 1969/70, was definitely a bumper year. Production rose to an unprecedented 118.9 million cavans. In Manila, the nominal price of rice in 1969 actually fell by 5.1 per cent, whereas the real price fell by 6.1 per cent. Obviously no imports were needed and exports were authorized, possibly with the November 1969 presidential elections (which the administration won) in view.<sup>7</sup> The year 1969 closed at the peak of exuberance with the HYVs of rice.

The growth in production attributable to HYV may be computed as follows. On the assumption that the yield obtained with traditional varieties was obtained on the total rice area, the proportional increase in production due to the HYVs then equals the proportion of total area in HYV multiplied by the proportionate yield differential of HYVs to other varieties. Thus, in 1967/8 the HYVs brought about a production increase of 7.4 per cent.

In 1968/9, the HYVs were responsible for a 13.4 per cent increase. Their growth-contribution declined in the next two years, to between 10 and 11 per cent. While the proportion of land in HYVs continued to grow, the yield differential had declined from about 33 per cent to about 25 per cent only. However, the yield differential was restored to a high level the following year, 1971/2. This was actually a poor production year, with output falling to only 115.9 million cavans. Yet the presence of HYVs enabled production to be nearly 20 per cent greater than otherwise.

In February 1970, the Philippines was forced by balance of payments pressure to a *de facto* devaluation of the peso.<sup>8</sup> Thus, all throughout 1970, and into 1971, a heavy inflationary pressure was felt in the economy. One source of the pressure was the heavy increase in the money supply of 1969, generally associated with elections. The rate of inflation was over 20 per cent in 1970, and subsided only slightly to about 15 per cent in 1971. The price of rice increased by 19 per cent in 1970, which may entirely be attributed to the inflationary pressure of that year. It was not until 1971 that the real price of rice began to increase, indicating that the real supply problems in the rice industry had begun to be more serious than the inflationary or monetary problems.

In the meantime, less government attention was being given to the rice sector. The previous successes in the rice programme may also have led to a feeling of complacency about rice. The RCPCC was converted to the National Food and Agriculture Council, thus spreading the attention of the administrators to other food products.

There was a slow-down in the flow of credit to the rice sector.

Production loans for rice from commercial, rural, and development banks were at their peak in 1967, amounting to about P651 million. However, there was a gradual decline during 1968 to 1970, and then only a small recovery in 1971, to the level of P605 million.

On account of the peso devaluation, there were increases in prices of fertilizers and chemical inputs. The cost of nitrogen (from ammonium sulphate and urea), the prime rice fertilizer, rose by about 40–50 per cent. The amount of rough rice needed to purchase a kilogramme of fertilizer rose from about two kilogrammes to over three kilogrammes.

The crops of both 1970 and 1971 were then hit by the tungro disease, causing a decline in the national output by about 4 per cent. In 1971 the government imported 459,000 metric tons using the tungro problem as the justification. Then in July–August 1972, midway in the growing season, Luzon experienced heavy rains causing the worst floods of the twentieth century. In the meantime, there was drought in the southern parts of the country.

Nevertheless, there are some hopeful elements to the supply situation. A mere seven years after the introduction of HYVs, more than half of the Philippine rice area is now planted to them. Farmers are noticeably shifting to tungro-resistant HYVs (IR 20, C4-63, C4-137) from the tungro-susceptible varieties (IR 8, IR 5, IR 22, and others); there is no trend towards the development of tungro-resistant traditional varieties.

Government attention to the rice programme has been renewed. Irrigation construction continues to progress. The proportion of the rice crop area irrigated rose from an average of 31 per cent in 1963/5 to an average of 44 per cent in 1968/70. Better irrigation will both raise the yield of any variety and further the adoption of the HYVs.

Since September 1972 when martial law was declared, the major government attention to agriculture has been directed not to productivity but to equity. In October, Presidential Decree No. 27 declared that rice and corn tenants are automatically owners, and should pay former owners in instalments in kind, equivalent to the legal leasehold prior to the decree. The relationship between HYVs and land reform has, however, been neutral on the whole. The next section indicates no difference in efficiency of use of inputs or in the rate of adoption of HYVs by share tenants.

## IMPLICATIONS OF HIGH YIELDING VARIETIES: MICRO EVIDENCE

This section presents the results of a survey of 600 farmers from three provinces distributed between the three major island groups of the Philippines. These provinces are Camarines Sur from Luzon, Iloilo from the Visayas, and South Cotabato from Mindanao. Information for both the pre-HYV and the HYV periods was collected. The pre-HYV period refers to the period before the farmer adopted HYV, if he is an adopter, and to 1967 if he is planting traditional varieties while the HYV period refers to both the wet and dry seasons of 1971.

*Rate of adoption*

A high proportion, about 96 per cent, of farmers in the two sample provinces, Camarines Sur and South Cotabato, was planting HYV of rice in 1971. In the former 3 per cent had never tried HYV and 1 per cent had tried before but is not presently using it. About 4 per cent of South Cotabato farmers had never tried HYV. Less than two-thirds of Iloilo farmers used HYV although 11 per cent had tried it previously and had reverted to traditional varieties; one out of four farmers had never tried HYV. Large-scale introduction of HYVs started in 1966 but more farmers adopted them in 1968 to 1970 than in any other year. Information on the new HYVs had come primarily from agriculturists either from the Bureau of Agricultural Extension, Bureau of Plant Industry, or Agricultural Schools in the provinces. This, however, should not be interpreted as a sign of the overriding influence of the extension workers.<sup>9</sup> At the trial and adoption stages, the Filipino farmer usually found himself on his own when IR 8 seeds were first distributed in the Bicol region.<sup>10</sup> Another important source of information, and in fact the major one for South Cotabato, was other farmers. The same observation was reported by Liao.<sup>11</sup>

The rate of adoption was related to the educational attainment of the farmers. Table 2 shows a higher average education of adopters than of non-adopters particularly in Camarines Sur and South Cotabato where none had finished high school among those who were not presently planting HYV. No relation seemed to exist between the age of the farmers and the rate of adoption. Likewise tenancy had not deterred farmers from taking advantage of the new technology. In fact some tenants had obtained their information about the new technology from their landlords.

*Changes in area and production*

Between the pre-HYV and the HYV periods there was a slight increase in the area cultivated by each farmer (Table 3). Production per farm increased by 70 cavans in Camarines Sur and 35 cavans in Iloilo. In South Cotabato where the rate of HYV adoption was largest, production almost doubled between the two periods. In terms of land productivity a much greater increase occurred in South Cotabato than in the two other provinces.

Owner-operators and tenants both increased their yields per hectare. However, it seemed that most of the increase in each province had come from owners. In Iloilo, the wet season yield of share tenants was almost the same for both the pre-HYV and HYV periods whereas owners increased their yield by 7 per cent. Camarines Sur owner-operators registered the highest increase of 69 per cent (increasing from 32 to 54 cavans per hectare) while share tenants increased their yield by 37 per cent.

*Costs and returns*

The costs of production and the net returns derived by farmers from



TABLE 2. *Adoption of HYV and education of operator*

Education	Non-adopter			All farmers
	Adopter	Tried	Never	
<i>Per cent</i>				
<i>Camarines Sur</i>				
None	12.2	—	33.3	12.5
Some primary	33.5	33.3	66.3	34.7
Some intermediate	9.8	16.7	—	9.7
Finished grade school	26.2	50.0	—	26.1
Some high school	8.5	—	—	8.0
Finished high school	7.3	—	—	6.8
Some college work	1.2	—	—	1.1
Finished college	1.2	—	—	1.1
<i>Iloilo</i>				
None	9.2	0	23.3	11.5
Some primary	29.9	35.7	23.3	29.0
Some intermediate	9.2	7.1	13.3	9.9
Finished grade school	26.4	42.9	16.7	26.0
Some high school	14.9	—	13.3	13.0
Finished high school	5.7	7.1	6.7	6.1
Some college work	1.1	—	—	0.8
Finished college	3.4	7.1	3.3	3.8
<i>South Cotabato</i>				
None	11.7	—	14.3	11.3
Some primary	28.7	37.5	28.6	29.0
Some intermediate	17.5	37.5	14.3	18.3
Finished grade school	20.5	25.0	14.3	20.4
Some high school	9.9	—	28.6	10.2
Finished high school	7.6	—	—	7.0
Some college work	3.5	—	—	3.2
Finished college	0.6	—	—	0.5

TABLE 3. *Rice area and production, present and pre-HYV*

Province	Area planted per farm		Production			
	Pre-HYV	Present	per farm		per hectare	
	<i>hectares</i>		<i>cavans</i>			
Camarines Sur	3.23	3.60	109.7	179.7	47.9	49.9
Iloilo	2.28	2.71	123.6	158.4	54.1	58.3
South Cotabata	2.00	2.96	92.4	181.3	46.0	61.2

rice before and after the adoption of high yielding varieties are shown in Tables 4a to 4c for the three provinces studied. Let us start with Camarines Sur. Here the value of total production had increased tremendously for all tenure groups with the largest increase occurring among the owner-operators. Of course part of the increase was due to increase in prices. However, it was noted earlier that the rate of inflation moved faster than that of the price of rice.

The new rice varieties would give high yields only if accompanied with a package of farm practices such as fertilizing, weeding, protection from pests and diseases, irrigation, etc. This implies that the adoption of the HYVs would mean an increase in the expenditures of farmers. This is shown on Table 4a. Expenses for all items increased. In spite of the use of herbicide, hired labour expenditures went up by about three times compared with the pre-HYV which may imply that HYVs had generated additional employment for labourers in the villages. The high rate of fertilizer and chemical use was also noted.

TABLE 4a. *Costs and returns from rice production by tenure and province, present and pre-HYV, Camarines Sur (pesos per farm)*

	PRESENT				PRE-HYV			
	Owner	Lease tenant	Share tenant		Owner	Lease tenant	Share tenant	
			Operator	Landlord			Operator	Landlord
Value of total production	5339	4536	2919	1576	2183	2302	1035	645
Value of rice sold by operator	2167	810	864	—	1236	675	183	—
Cash costs:								
Hired labour	909	1558	788	30	321	1000	260	42
Fertilizer	527	212	68	6	1	—	4	1
Pesticides	236	81	58	3	3	—	6	*
Herbicides	121	41	29	2	*	—	2	*
Seeds	65	32	51	4	57	—	28	6
Irrigation fee	85	361	138	51	—	54	96	35
Total	1943	2285	1133	96	382	1054	396	85
Non-cash costs:								
Land rental		937				405		
Harvester's and thresher's share	561	483	280	279	217	162	117	117
Seeds	110	64	57	19	71	61	29	16
Total	671	1484	337	298	288	628	146	133
Total cash and non-cash costs	2614	3769	1570	394	670	1682	542	218
Net income	2725	766	1349	1172	1413	620	493	427

\* Less than 0.50.

Non-cash expenditures represented by seeds from own production and the share of harvesters and threshers had also gone up.

Net income was obtained by subtracting the sum of the cash and non-cash costs from the total value of rice production. All farmers regardless of their tenure status benefited from the high yielding varieties, that is, owners and tenants whether they be leaseholders or sharecroppers had increased their net income from rice. Landlords, too, shared in the new technology. Net income rose by 93 per cent for owners and 24 per cent for leasehold tenants. The lease tenants had the lowest net income among the three groups. For share tenants, the change between the pre-HYV and HYV periods was quite noticeable for both tenants and their landlords with the former experiencing an increase of 185 per cent and the latter, 129 per cent.

In Iloilo, the rise in the value of total production was less than that in Camarines Sur (Table 4b). In this province, fertilizer and chemical use had been practised by farmers before the introduction of HYVs. The adoption of HYVs, however, brought about a more intensive use of these

TABLE 4b. *Costs and returns from rice production by tenure and province, present and pre-HYV, Iloilo (pesos per farm)*

	PRESENT				PRE-HYV			
			Share tenant				Share tenant	
	Owner	Lease tenant	Operator	Landlord	Owner	Lease tenant	Operator	Landlord
Value of total production	4023	5886	2205	1842	2321	4149	1570	1203
Value of rice sold by operator	625	933	318	—	415	437	174	—
Cash costs:								
Hired labour	807	1069	439	96	376	574	253	60
Fertilizer	169	320	123	25	59	117	30	23
Pesticides	27	76	23	10	16	23	10	5
Herbicides	19	14	13	9	3	19	5	3
Seeds	35	97	19	8	21	24	10	4
Irrigation	63	91	29	5	39	77	24	2
Total	1121	1637	647	153	515	835	331	98
Non-cash costs:								
Land rental		1401				1067		
Harvester's and thresher's share	656	885	375	298	427	660	318	170
Seeds	79	144	59	29	51	107	30	21
Total	735	2430	434	327	478	1834	348	191
Total cash and non-cash costs	1856	4067	1081	480	993	2669	679	289
Net income	2167	1819	1124	1362	1328	1480	891	914

inputs. Again, hired labour which represented the largest item of expenditure had increased.

Among the various categories considered owners had the largest increase in net income of 117 per cent and leasehold tenants had the least, 23 per cent. In absolute terms leaseholders had a net income of P1819 per year compared with P1124 of share tenants. Between the share tenant and the landlord it seems that the greater part of the additional expenses was borne by the tenant. While the landlord's net income from rice had risen by 49 per cent that of the tenant had increased only by 26 per cent.

South Cotabato is an interesting case. Only a handful of farmers were applying fertilizer and chemicals before the development of HYVs (Table 4c). Despite the high rate of adoption, still only a few farmers used these inputs. It was claimed by many farmers that soils in the province were rich in nutrients and that there was no need for them to apply fertilizer. South Cotabato farmers had the least amount of expenditures but the largest percentage increase in net income: owners, 419 per cent and

TABLE 4c. *Costs and returns from rice production by tenure and province, present and pre-HYV, South Cotabato (pesos per farm)*

	PRESENT				PRE-HYV			
	Owner	Lease tenant	Share tenant		Owner	Lease tenant	Share tenant	
			Operator	Landlord			Operator	Landlord
Value of total production	3341	7309	2389	1387	1075	1756	770	414
Value of rice sold by operator	1264	2555	668	—	343	437	187	—
Cash costs:								
Hired labour	332	872	189	59	113	170	62	16
Fertilizer	43	248	45	17	1	2	3	*
Pesticides	53	255	38	13	6	8	7	1
Herbicides	13	246	8	2	2	1	3	*
Seeds	100	—	30	6	8	—	6	1
Irrigation fee	7	—	5	—	4	—	3	*
Total	549	1660	315	97	134	180	84	18
Non-cash costs:								
Land rental		293				191		
Harvester's and thresher's share	524	1123	421	137	176	271	161	39
Seeds	117	212	98	22	28	38	27	6
Total	641	1628	520	159	204	500	188	45
Total cash and non-cash costs	1190	3287	835	257	339	681	273	63
Net income	2151	4021	1554	1130	737	1075	497	351

\* Less than 0.50.

leasehold tenants, 274 per cent. As in the case of Iloilo the increase in the net income of landlords of 231 per cent was higher than that of the share tenants which was 212 per cent. In all three provinces, whether it be before or after the adoption of HYV the cash sales from rice were often not sufficient to cover the cash costs. This implies the need for other sources of income—both farm and non-farm.

Without asking directly for the magnitude of their income, the opinions

TABLE 5. *Change in tenure status, present and pre-HYV*

Tenure	Camarines Sur		Iloilo		South Cotabato	
	Present	Pre-HYV	Present	Pre-HYV	Present	Pre-HYV
	<i>Per cent</i>					
Owner	23.7	22.6	30.8	31.8	36.0	37.3
Part-owner	1.5	1.1	3.5	3.8	0.5	—
Share tenant	68.2	75.8	48.7	51.5	59.5	58.8
Leasehold tenant	6.6	0.5	16.0	12.9	4.0	3.9
Total	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 6. *Change in sharing arrangements between tenants and landlords, present and pre-HYV*

Sharing	Camarines Sur		Iloilo		South Cotabato	
	Present	Pre-HYV	Present	Pre-HYV	Present	Pre-HYV
T: LL						
30:70	0.7	0.7	2.4	1.4	—	—
33:67	3.7	4.8	—	—	—	—
50:50	3.0	3.5	79.8	87.4	41.2	40.4
60:40	15.6	38.2	—	—	5.9	1.9
65:35	1.5	3.5	—	—	1.7	1.9
67:33	23.7	26.4	—	—	29.4	35.6
70:30	29.6	17.9	—	16.2	20.1	20.2
75:25	11.1	2.1	—	—	1.7	—
Others	11.1	3.5	—	—	—	—

of farmers were obtained regarding their present level of income compared with the pre-HYV period. The majority of the farmers in Camarines Sur thought that their present income was higher, 13 per cent said lower, and 17 per cent said the same. More than one-half of the Iloilo farmers thought that they have the same income now as before the introduction of HYVs (note that only 63 per cent of the Iloilo farmers were planting HYV in 1971). Almost 40 per cent said they had higher income and 8 per cent said lower. In South Cotabato, 55 per cent said higher, 38 per cent the same and 7 per cent lower. The common explanations given for having a higher income are (1) use of HYVs, (2) higher production and (3) improved farm practices which are interrelated. Lower income was attributed to (1)

insufficient irrigation, (2) lower production, (3) bad weather conditions and (4) pests and diseases.

*Tenancy implications of high yielding varieties*

Among the three provinces no definite pattern seemed to emerge with respect to a change in the tenure status of the rice farmers. In Camarines Sur there was a slight increase in the proportion of owner-operators but a very slight decrease in the other two provinces (Table 5). The number of leasehold tenants increased, consequently share tenants decreased.

TABLE 7. *Amount of cash borrowed and annual interest rate by source and province, present and pre-HYV*

SOURCE	PRESENT			PRE-HYV		
	Percentage of farms	Amount	Interest	Percentage of farms	Amount	Interest
		Pesos	Per cent		Pesos	Per cent
<i>Camarines Sur</i>						
Private person	30.2	377	19.00	53.3	303	29.45
Landlord	19.8	265	29.34	16.7	102	2.00
Facoma	17.4	651	2.00	11.7	346	2.40
Relatives	7.0	250	0	5.0	500	180.00
Rural bank	25.6	667	10.04	13.3	856	8.38
Average	—	479	—	—	389	—
<i>Iloilo</i>						
Private person	34.4	217	93.27	26.5	250	59.26
Landlord	47.5	235	39.96	65.3	190	81.66
Facoma	4.1	459	79.20	—	—	—
Relatives	2.5	225	14.44	2.1	500	0
Rural bank	11.5	555	12.48	6.1	500	12.00
Average	—	298	—	—	240	—
<i>South Cotabato</i>						
Private person	48.3	235	31.20	71.4	147	14.10
Landlord	41.6	171	131.68	21.4	101	84.00
Relatives	3.4	180	172.20	7.2	160	40.00
Rural bank	6.7	400	11.40	—	—	—
Average	—	212	—	—	134	—

The adoption of HYVs could have affected the sharing of both output and input between tenants and landlords. Table 6 was prepared to study this aspect. There seemed to have been a change towards a greater share of output for tenants in Camarines Sur whereas in South Cotabato the tendency was towards a smaller share. In the former there was a decline in the number of farmers with 30:70, 33:67, 50:50, 60:40, 65:35 and 67:33 sharing arrangements and an increase in the others. However, in South Cotabato, an increase occurred in the 50:50 and 60:40 sharing and a decrease in the 65:35, 67:33 and 70:30.

The change in output sharing could have been brought about by changes in the sharing of input. For the most common output sharing arrangement for each province (70:30 for Camarines Sur and 50:50 for Iloilo and South Cotabato) the changes in the sharing of expenses for land preparation, fertilizers, pesticides, and irrigation were examined. In Camarines Sur payment for tractor and irrigation expenses was shouldered by the tenants in both the present and pre-HYV periods. Five per cent of the tenants was sharing fertilizer equally with the landlord during the HYV period.

In Iloilo and South Cotabato landlord participation in the farm operations seemed to increase in terms of greater sharing of tractor expenses, irrigation and pesticides.

Farmers borrowed either in cash or in kind and repaid these loans either in cash or kind. For all provinces studied there was a definite increase in the number of borrowers between the pre-HYV and HYV periods. The proportion of farmer borrowers increased from 30 to 43 per cent in Camarines Sur, 27 to 67 in Iloilo and 21 to 45 per cent in South Cotabato. There was also an increase in the amount borrowed per farmer, the increase ranging from 23 to 57 per cent in the three provinces (Table 7).

Landlords and private money lenders dominated the sources of credit in spite of the high interest rate charged by these lenders. Other sources of credit included relatives, Rural Banks and the Facomas (Farmers' Cooperative Marketing Association). Proportionally less was borrowed from private lenders during the HYV period and more borrowed from Rural Banks. This may indicate an increasing awareness by farmers of the lower interest rate in the Rural Bank or perhaps a greater availability of small loans from the Rural Bank.

A number of lenders increased their interest rate between the pre-HYV and HYV periods. Particularly in South Cotabato a dramatic increase in the annual interest rates on loans occurred whatever the source was from 84 to 132 per cent for landlords and from 14 to 71 per cent for private money-lenders. One probable explanation for the higher interest rates during the HYV period is the greater increase in the demand for credit compared with the supply. In Iloilo, private lenders raised their interest charge by 34 per cent. Moreover, the rate varied with the method of repayment. Cash repayments, usually had lower interest rates while those loans repaid in kind or combination of cash and commodities had higher interest rates.

## REFERENCES

1 This section has been drawn mostly from M. Mangahas and A. R. Librero *The High Yielding Varieties of Rice in the Philippines: A Perspective*, U.P. School of Economics, Discussion Paper no. 13-11, 15 June, 1973.

2 U.P. College of Agriculture and International Research Institute, *Rice Production Manual*, Los Baños, Laguna, Philippines, 1967.

3 IR 8 was given its name in November 1966. It was followed by IR 5 in 1967, by IR 20 and IR 22 in 1969 and by IR 24 in 1971. Today IR 8 and IR 5 have given away to IR 20

and C4-63 (produced by the College of Agriculture of the University of the Philippines) inasmuch as these latter varieties are more disease resistant.

4 Later purchased by the Sugar Producers Co-operative Marketing Association.

5 In earlier years, there had been a fertilizer subsidy of as much as 50 per cent on fertilizer intended for rice, but without noticeable effect aside from numerous reports that the fertilizer was being diverted to sugar. This is now attributed to the low-fertilizer responsiveness of the best rice varieties formerly available.

6 Until the mid-sixties, Philippine rice data were not classified according to variety. The arrival of the HYVs and their large yield differential over local varieties led to the incorporation of varietal classifications in government survey work.

7 The time pattern of Philippine rice importations seemed to bear some relationship to the schedule of elections. Presidential and congressional elections were held in 1945 and every four years thereafter until 1969. Local elections were held in 1947 and every four years thereafter until 1971. Elections for one-third of the six senators in the upper house of the recently abolished Congress were held every two years, coinciding with presidential and local elections. Thus every odd-numbered year from 1945 to 1971 was an election year.

Considering the time series on rice imports the most interesting sub-period is from 1960 to 1967. In 1960 there were almost no imports, but in the following (presidential) election year, 186,000 metric tons of rice were imported. In the following year, again no imports were made. Then in the (local) election year of 1963, 256,000 metric tons were imported. Although there were importations of 300,000 metric tons in 1964, this was dwarfed by the massive imports of 569,000 metric tons in the (presidential) election year of 1965. Then in 1966 imports fell substantially, to a mere 100,000 metric tons, only to be doubled the following year. From this time onward, the pattern differs, and it does not seem mere coincidence that it coincides with the arrival of the HYVs.

8 The exchange rate moved immediately from P3.90 per U.S. dollar to over P5.00, and kept on growing to over P6.00 by the end of the year.

9 G. T. Catillo, *Impact of Agricultural Innovation on Patterns of Rural Life* (Focus on the Philippines), Undated mimeo paper.

10 B. R. Sumayao, *The Bicolano Farmer's Response to an Improved Rice Variety -IR 8-288-3*, U.P. Colleges of Agriculture, Los Baños, Philippines, 1969.

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