Rice Production and Regional Crop Diversification in the Philippines: Economic Issues

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RICE PRODUCTION AND REGIONAL CROP DIVERSIFICATION IN THE PHILIPPINES: ECONOMIC ISSUES

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The paper discusses Philippine rice production on the basis of some economic issues. Its main points are that. 1) the current low world market price of rice adversely affects the economic viability of Philippine rice production. 2) Economic efficiency should be the overriding norm in attempts to alleviate the plight of the poor and disadvantaged groups. 3) Agricultural diversification can be tapped to help improve the economic well-being of poor rice farmers. 4) Given natural resource endowments, technology and trade, the determinant of agricultural diversification should be comparative advantage or economic efficiency.

I. Introduction

The Philippine government has given agriculture the highest priority in its present development program. The development strategy strongly advocates a macro policy environment that removes the bias against agriculture in order that growth and productivity can prevail in the sector. Agricultural growth and productivity increases are expected to boost employment and household incomes in the rural sector. In turn, rapid growth in rural incomes can have high multiplier effects because rural expenditures are heavily oriented to food and industrial consumer goods.

Rice dominates the Philippine agricultural food crop sector. It is the main staple of the populace and the major source of income of a substantial number of farmers in the country. Over the past decade the Philippines has achieved major increases in rice production and has become nearly self-sufficient in the cereal. In the light of the new development strategy and the changing scenario that confronts the rice industry today, there is a need to reassess the potential contribution of the agricultural sector in general and the rice sub-sector in particular to overall economic growth and productivity.

This paper discusses Philippine rice production relative to the following economic issues:

a) trends in world market prices of rice;

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b) technology as it relates to equity and efficiency; and
c) comparative advantage and its implications to diversification and employment across regions in the Philippines.

2. Economic Issues

World Market Price of Rice

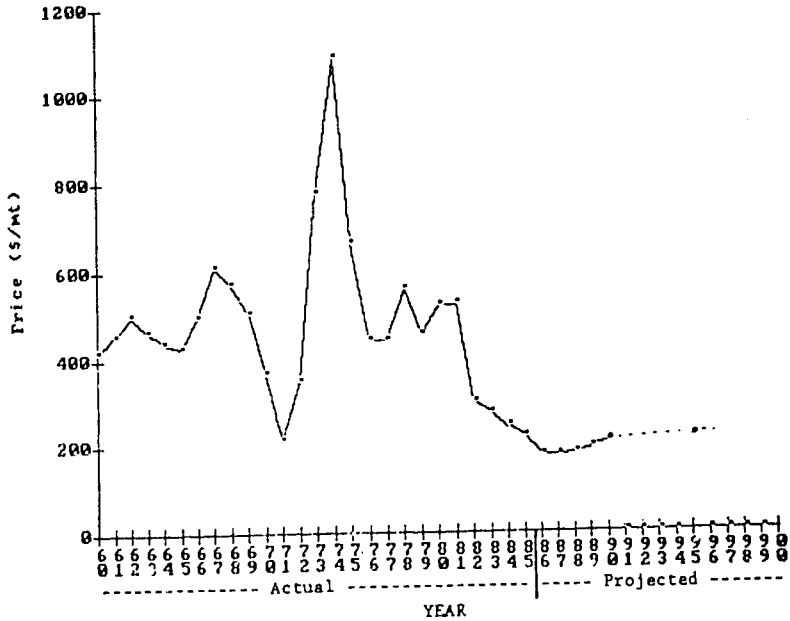
As a small rice producer, the Philippines is not insulated from the developments in the international rice market. The world market price or the border price of rice is important from the Philippine perspective because it is the opportunity cost of domestic rice production. The border price of rice is also the economic price used in assessing the economic viability of investments in the rice sub-sector.

World rice price is determined by international rice trade — "a thin, volatile, and unpredictable market" (Siamwalla and Haykin, 1983) where only 4 per cent of total world production is traded. In the 1980s, the success of the green revolution in rice has contributed to increases in rice supply in Asia, leading to a greater degree of self-sufficiency in rice among the traditional rice importing Asian countries. The excess rice supply, the unreliability of international rice trade and rice economic policies of developed countries particularly the U.S. have contributed to a certain extent in the substantial decline in world rice price during the mid-1980s.

From a high of $1084/mt (FOB Bangkok, 5 per cent broken) in 1974, the price of rice of the same quality declined to an all-time low of $212/mt in 1986. The World Bank further projects that the world market price of rice will remain the same by 1995 and will increase slightly to $216/mt by the year 2000 (Figure 1).

What is the implication of the low world market price of rice to Philippine rice production? If the world market price or border price of rice is the opportunity cost of domestic rice production, then a lower border price affects the economic viability of domestic production (given technology levels). Although it is clear that lower market prices of rice are net gains to rice consumers, it is also equally true that low border prices can act as disincentive in the expansion of investments (such as irrigation, fertilizer, research, and extension) in the rice sub-sector. Adoption of new technologies by farmers to expand

Figure 1 — World Prices of Rice in Constant 1985 Dollar



rice production will likewise slow down causing production shortfalls that might eventually lead to exceptionally high prices. A recent International Food Policy Research Institute (IFPRI) study on the Philippines (Rosegrant, *et al.*, 1987) for example, showed that even under the import substitution assumption, the low 1985 price of rice threatens the economic viability of rice production in the Philippines.

There is a big debate however among economic practitioners whether the current low world market price of rice should be the appropriate border price to use in assessing the economic viability of rice production in a small country like the Philippines. Some economists from the International Agricultural Research Centers (IARCs) (e.g., IFPRI, IRRI) and the academe feel that the current low world market price of rice is artificial and temporary contrary to the World Bank's pessimistic projection (WB, 1987) that it will continue to remain low by the year 2000. A slight decline in global rice supply, from natural calamities or contraction in rice investments will invalidate the WB's projected prices. To avoid future rice shortfalls and to sustain the momentum in rice production, there is a need in the Philippines to establish a price stabilization scheme for rice (Rosegrant, *et al.*, 1987).

Technology vis-a-vis Equity and Efficiency

There is a growing concern among members of the CGIAR and donor countries that technologies generated by the IARCs should be strongly focused on the alleviation of global poverty and the improvement of the nutritional status and economic well-being of low income groups. In the case of rice, there is as much concern to date in discussing equity issues such as increasing the economic livelihood and security of the poor and disadvantaged rice farmers, as on efficiency issues related to rice output expansion. The Strategic Planning Committee (SPC) report (IRRI, 1987) for example, clearly articulates the shift in focus of its rice research to rice environments where majority of the poorer rice producers and rice dependent rural households are located. In short, IRRI is equally concerned in generating rice technology to "the adverse growing environments where farmers have benefited little from the technological changes that swept more favorable environments" (IRRI, SPC, 1987).

In the Philippines, based on the 1980 agricultural census, there were around 1.61 million rice farms totalling to around 3.76 million physical hectares. Using the Bureau of Agricultural Economics data in the same year on rice harvested area, we can further say that around 44 per cent, 45 per cent and 11 per cent account for irrigated, rainfed lowland and rainfed upland rice cultures, respectively.

From the more recent data, the contribution of each type of rice production system to total rice production in the Philippines is also revealing. Irrigated rice dominates the other two rice production systems both in terms of hectarage and contribution to total production (Table 1). We can also note that in terms of harvested hectarage, the area harvested to upland rice has been declining to an average of - 6.9 per cent per annum in contrast to the annual hectarage growth rates of 0.7 per cent and 1.8 per cent for rainfed and irrigated rice, respectively. In terms of the growth of production of each crop type, again production from irrigated rice as a proportion to total rice production in the Philippines ranks first.

A comparison of the financial performance, economic efficiency, and labor requirements of the three rice crop types for the Philippines, by region is shown in Table 2. On the average for the Philippines, irrigated rice is superior over rainfed

Table 1 -- Rice Production, Area and Yield by Crop Type, Philippines, 1961-86

	Irrigated			Rainfed			Upland			Total		
Year	Production	Area	Yield	Production	Area	Yield	Production	Area	Yield	Production	Area	Yield
	(tons)	(has)	(t/ha)	(tons)	(has)	(t/ha)	(tons)	(has)	(t/ha)	(tons)	(has)	(t/ha)
1970	2948070	1381350	2.13	2079485	1391400	1.49	436520	422990	1.03	5464075	3195740	1.71
1971	3192415	1509420	2.11	2036725	1311250	1.55	349075	374330	0.93	5578215	3195000	1.75
1972	2775690	1362590	2.04	2223930	1593810	1.40	325255	375890	0.87	5324875	3332290	1.60
1973	2503860	1282260	1.95	1794285	1491290	1.20	311060	420600	0.74	4609205	3194150	1.44
1974	3253585	1533250	2.12	2217655	1574230	1.41	369480	420270	0.88	5840720	3527750	1.65
1975	3195805	1446980	2.21	2317225	1720150	1.35	396485	464820	0.85	5909515	3631950	1.63
1976	3566535	1534150	2.32	2533805	1739230	1.46	330615	400360	0.83	6430955	3673740	1.75
1977	3647405	1521000	2.40	2675105	1687290	1.59	420020	433090	0.97	6742530	3641380	1.85
1978	4106805	1549770	2.65	2617310	1613320	1.62	474660	438610	1.08	7198775	3601700	2.00
1979	4230205	1507650	2.81	2812835	1625350	1.73	458245	427700	1.07	7501285	3560700	2.11
1980	4587250	1606040	2.86	2874115	1655330	1.74	374430	375440	1.00	7835795	3636810	2.15
1981	4544735	1624870	2.80	2922640	1585250	1.84	255375	249010	1.03	7722750	3459130	2.23
1982	5014630	1699110	2.95	2867130	1503010	1.91	239965	240710	1.00	8121725	3442830	2.36
1983	5193190	1762730	2.95	2380035	1319870	1.80	157100	157030	1.00	7730325	3239630	2.39
1984	4971995	1661550	2.99	2661345	1290800	2.06	207590	188320	1.10	7840930	3140670	2.50
1985	5481565	1801100	3.04	2560230	1264690	2.02	158295	155980	1.01	8200090	3221770	2.55
1986	6075875	1906020	3.19	2870120	1359470	2.11	150935	137120	1.10	9096930	3402610	2.67

Source: BAEcon.

and upland rice production systems in terms of on-farm net financial profitability and economic comparative advantage. However, in terms of total labor requirement, upland rice on the average had the highest of the three production systems with 114 mandays required per hectare. There are of course variations of ranking relative to the three indicators across regions in the Philippines, but overall, irrigated rice was by far more superior than rainfed and upland rice production systems in terms of financial profitability and economic comparative advantage. There was only one region (Western Mindanao) in the study where upland rice had a positive financial profit and comparative advantage (Table 2).

Our study results clearly imply that there are tradeoffs in pursuing the objectives of equity and efficiency. If we promote an economic enterprise which directly benefits the poor but is not economically efficient, then we are misallocating scarce resources which could have been used in more efficient activities. The 'growth linkages" of the efficient enterprises in the agricultural sector will stimulate the growth in the economic activities of the other sectors providing a spillover effect that can benefit the economy as a whole (Mellor, 1986). The role of government policy in this case is to distribute the benefits more equitably to members of society. Economic efficiency therefore should be the norm if we want to alleviate the plight of the poor. The crucial role of technology is to ensure that the tradeoff between equity objectives and the economic efficiency norm is balanced.

The solution to the problem of how to improve the economic well-being of the poor who are located in specific adverse ecological environments is a complex one. Because it centers around the problem of human livelihood, it covers areas of concern beyond the capability of a single crop, like rice, to solve. It involves among others, access to economic employment opportunities, educational assistance to improve labor skills, and a continuous flow of public support services and infrastructures that can guarantee the efficient flow of goods and services from the agricultural sector to the rest of the economy and vice-versa. At least at the farm level, if economic efficiency is the criterion, it involves a strategy that deviates from the monoculture orientation towards rice. It opens up the possibility towards agricultural diversification whether rice-based, non-rice crop based or farming systems based. As a starting point, one should be aware of the alternative economic performances of other crops in

Table 2 — Net Financial Profitability, Comparative Advantage, and Man-Labor Requirement of Rice Production Systems by Region under Import Substitution with Interregional Trade (IRT) Scenario, Philippines, 1985

	Irrigated					Rainfed Lowland					Rainfed Upland				
	Net Financial Profit at Farm	Economic Comparative Advantage	Labor Requirement Hired	Labor Requirement Family	Labor Requirement Total	Net Financial Profit at Farm	Economic Comparative Advantage	Labor Requirement Hired	Labor Requirement Family	Labor Requirement Total	Net Financial Profit at Farm	Economic Comparative Advantage	Labor Requirement Hired	Labor Requirement Family	Labor Requirement Total
	P/ha		MD/ha			P/ha		MD/ha			P/ha		MD/ha		
PHILIPPINES	3595	0.76	63	33	96	1470	0.80	62	43	105	-781	1.15	47	67	114
Ilocos	4087	0.89	35	36	71	2524	0.83	41	39	80	—	—	—	—	—
Cagayan Valley	5095	0.86	52	36	88	1250	0.95	31	70	101	-1355	1.51	39	92	131
Central Luzon	4804	0.78	53	23	76	3691	0.69	63	23	86	—	—	—	—	—
Southern Tagalog	1584	0.82	62	58	120	—	—	—	—	—	-844	1.02	50	64	114
Bicol	1948	0.92	87	23	110	1031	0.88	79	40	119	-143	1.06	19	93	112
Western Visayas	2331	0.75	52	43	95	834	0.78	49	29	78	—	—	—	—	—
Central Visayas	3728	0.71	68	43	111	420	0.89	62	43	105	-813	1.24	56	69	125
Eastern Visayas	2408	0.69	118	55	173	- 69	0.82	105	59	164	-1891	1.39	55	97	152
Western Mindanao	2835	0.66	108	30	138	1005	0.67	17	40	57	359	0.71	51	37	88
Northern Mindanao	4712	0.61	34	24	58	2648	0.62	64	38	102	—	—	—	—	—
Southern Mindanao	5371	0.69	62	37	99	1362	0.83	69	36	105	—	—	—	—	—
Central Mindanao	4236	0.80	77	25	102	—	—	—	—	—	—	—	—	—	—

Source: Philippine Agricultural Diversification as an Alternative Development Strategy (forthcoming).

comparison to rice across specific environments (regions), to have a broader perspective in addressing the problem of improving the economic livelihood of the disadvantaged groups. The economic performance of rice production systems relative to other crops across regions in the Philippines is discussed in the succeeding section.

Comparative Advantage: Its Implications to Regional Crop Diversification

Earlier, a framework was suggested by Gonzales (1984) on how to approach agricultural diversification from a national and regional perspective. Comparative advantage[1] which is used here as synonymous to economic efficiency should determine the direction of diversification in the agricultural sector. Several factors in turn determine comparative advantage: natural resource endowments, levels of technology, and trade. Resource endowments consist of land (soils) capability which can be delineated into texture, slope and elevation, rainfall patterns and physical cropping suitability. These factors when combined with existing or potential levels of production technologies (with defined input/output relationships) enhance the relative competitiveness of a production enterprise.

Trade is an equally important determinant of comparative advantage. Domestic and international trade through their price signals determine simultaneously the financial and economic viability of different production alternatives. Actual domestic (market) prices determine the financial feasibility of an enterprise at the farmer's level. On the other hand, export-import (border) prices determine the economic viability of agricultural production activities at the national economy level.

A summary of the financial and economic performance of rice production systems at the national level in comparison to other crops in the Philippines can be gleaned in Table 3.

[1]Comparative advantage is used here to connote economic efficiency in the expansion of an economic enterprise. It is calculated as the ratio of the domestic resource cost (DRC) of production and the shadow exchange rate (SER) of the peso. An economic enterprise has a comparative advantage, neutral comparative advantage, and comparative disadvantage if the calculated ratio of DRC/SER is less than one, equal to one and greater than one, respectively. For a discussion of the difference between financial and economic profitability, general methodology, and assumptions of comparative advantage analysis as applied to the Philippines, see Rosegrant, *et al*, 1987.

Table 3 — Net Financial Profitability, Comparative Advantage and Man-Labor Requirement of Crop Production Systems by Trade Regime, Philippines, 1985

Crop/Technology	Trade Regime	Net Financial Profit at Farm	Rank	Economic Comparative Advantage	Rank	Labor Requirement Hired	Family	Total	Rank
		₱/ha				MD/ha			
Rice									
Rainfed upland	IRT	-781		1.15		47	67	114	19
Rainfed lowland	IRT	1470	29	0.80	14	62	43	105	23
Irrigated	IRT	3595	21	0.76	12	63	33	96	24
Corn									
Yellow, hybrid	IRT	2329	26	0.66	10	52	28	80	31
Yellow, open-pollinated	IRT	1506	28	0.82	16	34	35	69	32
White, open-pollinated	IRT	460	32	1.09		28	35	63	33
Peanuts, shelled									
Red variety	IRT	6223	13	0.89	18	24	66	90	26
White variety	IRT	3221	23	1.25		40	44	84	29
Peanut, butter									
Red variety	IS			0.53	8	24	66	90	26
White variety	IS			0.62	9	40	44	84	29
Mungbean									
Rainfed upland	IRT	-448		6.57		6	104	120	18
Rainfed lowland	IRT	1438	30	3.01		17	35	52	35
Irrigated	IRT	1536	27	2.58		23	20	43	36
Cotton									
Rainfed upland	IS	8172	8	0.38	6	97	65	162	14
Rainfed lowland	IS	3853	19	0.48	7	33	110	143	16
Irrigated	IS	6426	12	0.37	5	40	12	52	

Table 3 (Continued)

Crop/Technology	Trade Regime	Net Financial Profit at Farm	Rank	Economic Comparative Advantage	Rank	Labor Requirement Hired	Family	Total	Rank
Soybeans									
Rainfed upland	IRT	2475	25	0.90	19	65	44		21
Rainfed lowland	IRT	3671	20	0.79	13	96	40	136	17
Irrigated	IRT	4953	17	0.71	11	77	17	94	25
Sorghum	IRT	831	31	0.81	15	32	30	62	34
Tobacco									
Virginia	EP	4118	18	0.21	2	69	167	236	12
Native	EP	5998	15	0.20	1	43	171	214	13
Abaca	EP	323	34	0.76	12	26	13	39	37
Irish potato	IRT	7709	10	1.00		274	162	436	4
Sweet potato	EP	363	33	1.23		27	81	108	20
Cassava	EP	3160	24	0.88	17	54	35	89	27
Onion	EP	23931	2	0.34	4	187	161	348	7
Garlic	EP	25054	1	0.29	3	145	222	367	6
Ubi	IRT	-1608				98	381	479	3
Gabi	IRT	-1813				66	191	257	9
Ginger	IRT	11901	6			14	136	150	15
Turnips	IRT	10442	7			64	42	106	22
Baguio beans	IRT	3485	22			420	75	495	2
String beans	IRT	6708	11			136	276	412	5
Cabbage	IRT	6062	14			255	232	537	1
Tomatoes	IRT	15880	3			64	183	247	11
Sweet peas	IRT	14199	4			125	218	343	8
Watermelon	IRT	8078	9			45	36	81	30
Banana	IRT	5229	16			16	69	85	28
Pineapple	IRT	12467	5			150	102	252	10

IRT = interregional trade; IS = import substitution; EP = export promotion.
Source: Philippine Agricultural Diversification as an Alternative Development Strategy (forthcoming).

From the aggregated national average, results of the study showed that from the viewpoint of net financial profitability at farm, comparative advantage and labor requirement (employment), rice production systems were less efficient in comparison to other crop production systems. Of the 40 different crop production systems studied, that of irrigated rice (which is the most efficient among the 3 rice production systems) ranked only 21st, 12th, and 24th, respectively, using the criteria of net financial profitability, comparative advantage and employment. Most of the crops (such as onion, garlic, tomatoes, sweet peas, tobacco, cotton, and vegetables) which were more financially and economically efficient than rice had also higher man-labor requirements. This implies (based on the aggregate level data), that if our goal is to increase farm incomes and employment, focus should be made not necessarily on rice alone but on other crops which are far more efficient than rice. There are limits of course to the demand for these crops, considering that they are seasonal and perishables but their supply/demand balances should be assessed effectively if one follows this strategy.

The regional results further accentuate our earlier hypothesis that variances in resource endowments, levels of technology and trade determine comparative advantage. The interaction of these three factors induces regions to evolve a pattern of crop diversification and crop specialization in commodities where they have comparative advantage. For example, the Ilocos region (Table 4) and Cagayan Valley (Table 5) are efficient producers of tobacco, cotton, onions, garlic, and vegetables.

For the Central Luzon (Table 6) and the Southern Tagalog (Table 7) regions, a pattern of crop specialization emerges: garlic, onion, and vegetables are financially and economically viable crops with high labor components. This is followed by major grains, rice, corn, and sorghum.

The regions of Bicol (Table 8), Western Visayas (Table 9), Central Visayas (Table 10), and Eastern Visayas (Table 11) which are situated in the "typhoon belt" are generally deficient in food grains but abundant in fiber and rootcrops. Abaca, cassava, corn, and rice appeared to be the economically efficient crops in these regions.

Table 4 — Net Financial Profitability, Comparative Advantage, and Man-Labor Requirement of Crop Production Systems by Trade Regime, Ilocos Region, Philippines, 1985

Crop/Technology	Trade Regime	Net Financial Profit at Farm	Rank	Economic Comparative Advantage	Rank	Labor Requirement			Rank
						Hired	Family	Total	
		₱/ha				MD/ha			
Rice									
Rainfed upland	IRT	—		--		—	—	—	
Rainfed lowland	IRT	2524	16	0.83	9	41	39	80	14
Irrigated	IRT	4087	12	0.89	10	35	36	71	16
Corn									
Yellow, hybrid	IRT	-396	21	0.97	12	30	30	60	17
Yellow, open-pollinated	IRT	-223	20	0.91	11	33	86	119	12
White, open-pollinated	IRT	1762	18	0.74	7	23	26	49	19
Peanuts, shelled									
Red variety	IRT	—		—		—	—	—	
White variety	IRT	6656	7	1.05	14	32	19	51	18
Peanut butter									
Red variety	IS	—		--		—	—	—	
White variety	IS	6656	7	0.56	5	32	19	51	18
Mungbean									
Rainfed upland	IRT	—		—		—	—	—	
Rainfed lowland	IRT	3647	14	1.80	15	24	15	39	21
Irrigated	IRT	1802	17	2.75	16	27	15	42	20

Table 4 (Continued)

Crop/Technology	Trade Regime	Net Financial Profit at Farm	Rank	Economic Comparative Advantage	Rank	Labor Requirement Hired	Family	Total	Rank
Cotton									
Rainfed upland	IS	4858	10	0.43	4	99	130	229	8
Rainfed lowland	IS	74	19	0.61	6	34	137	171	11
Irrigated	IS	—		—		—	—	—	
Tobacco, Virginia	EP	4118	11	0.21	1	69	167	236	7
Garlic	EP	6917	6	0.41	3	164	163	327	6
Onion	EP	21188	1	0.35	2	188	25	213	9
Irish Potato	IRT	7709	5	1.00	13	[illegible]	162	436	3
Cassava	EP	5091	9	0.82	8		49	77	15
Baguio beans	IRT	3485	15				75	495	2
String beans	IRT	3912	13			98	107	205	10
Sweet peas	IRT	14199	3			125	282	343	5
Cabbage	IRT	6062	8			255	282	537	1
Watermelon	IRT	10945	4			45	42	87	13
Tomatoes	IRT	15948	2			—	395	395	4

Source: Philippine Agricultural Diversification as an Alternative Development Strategy (forthcoming).

Table 5 — Net Financial Profitability, Comparative Advantage, and Man-Labor Requirement of Crop Production Systems by Trade Regime, Cagayan Valley, Philippines, 1985

Crop/Technology	Trade Regime	Net Financial Profit at Farm	Rank	Economic Comparative Advantage	Rank	Labor Requirement			Rank
						Hired	Family	Total	
		₱/ha				MD/ha			
Rice									
Rainfed upland	IRT	-1355	13	1.51	12	39	92	131	5
Rainfed lowland	IRT	1250	7	0.95	7	31	70	101	7
Irrigated	IRT	5095	3	0.86	6	52	36	88	10
Corn									
Yellow, hybrid	IRT	4874	4	0.66	4	61	30	91	9
Yellow, open-pollinated	IRT	634	10	1.00	8	18	52	70	12
White, open-pollinated	IRT	857	9	1.18	11	26	56	82	11
Peanuts, shelled									
Red variety	IRT	5486	2	0.78	5	5	118	123	6
White variety	IRT	1991	6	1.09	10	42	51	93	8
Peanut butter									
Red variety	IS	5486	2	0.48	2	5	118	123	6
White variety	IS	1991	6	0.56	3	42	51	93	8
Mungbean									
Rainfed upland	IRT	462	11	3.23	14	16	116	132	4
Rainfed lowland	IRT	3647	5	4.48	15	22	39	61	13
Irrigated	IRT	—		—		—	—	—	
Tobacco									
Native	EP	5998	1	0.20	1	43	171	214	2
Cassava	EP	-946	12	1.57	13	—	304	304	1
Sweet potato	EP	983	8	1.05	9	—	150	150	3

Source: Philippine Agricultural Diversification as an Alternative Development Strategy (forthcoming).

Table 6 — Net Financial Profitability, Comparative Advantage, and Man-Labor Requirement of Crop Production Systems by Trade Regime, Central Luzon, Philippines, 1985

Crop/Technology	Trade Regime	Net Financial Profit at Farm	Rank	Economic Comparative Advantage	Rank	Labor Requirement			Rank
						Hired	Family	Total	
		₱/ha				MD/ha			
Rice									
Rainfed upland	IRT	—		—		—	—	—	
Rainfed lowland	IRT	3691	10	0.69	7	63	25	86	9
Irrigated	IRT	4804	7	0.78	10	53	23	76	11
Corn									
Yellow hybrid	IRT	—		—		—	—	—	
Yellow, open-pollinated	IRT	553	17	0.59	6	108	103	211	5
White, open-pollinated	IRT	−1278	19	1.53	13	9	36	45	17
Peanuts, shelled									
Red variety	IRT	4560	8	0.81	11	21	43	64	14
White variety	IRT	4161	9	0.92	12	50	56	106	8
Peanut butter									
Red variety	IS	4560	8	0.52	3	21	45	64	14
White variety	IS	4161	9	0.55	4	50	56	106	8

Table 6 (Continued)

Crop/Technology	Trade Regime	Net Financial Profit at Farm	Rank	Economic Comparative Advantage	Rank	Labor Requirement			Rank
						Hired	Family	Total	
Mungbean									
Rainfed upland	IRT	1944	14	12.63	16	—	73	73	13
Rainfed lowland	IRT	2615	12	1.84	14	13	36	49	16
Irrigated	IRT	1928	15	1.99	15	10	27	37	18
Sorghum	IRT	1651	16	0.56	5	36	21	57	15
Garlic	EP	25707	2	0.26	1	158	255	413	2
Onion	EP	26674	1	0.34	2	186	226	412	3
Cassava	EP	3610	11	0.75	8	32	76	108	7
Sweet potato	EP	2046	13	0.76	9	37	43	80	10
Gabi	IRT	-444	18			84	40	124	6
Turnips	IRT	10442	3			64	42	106	8
String beans	IRT	9505	4			143	306	449	1
Watermelon	IRT	5212	6			45	29	74	12
Tomatoes	IRT	5647	5			100	179	279	4

Source: Philippine Agricultural Diversification as an Alternative Development Strategy (forthcoming).

Table 7 — Net Financial Profitability, Comparative Advantage, and Man-Labor Requirement of Crop Production Systems by Trade Regime, Southern Tagalog, Philippines, 1985

Crop/Technology	Trade Regime	Net Financial Profit at Farm	Rank	Economic Comparative Advantage	Rank	Labor Requirement Hired	Family	Total	Rank
		₱/ha				MD/ha			
Rice									
Rainfed upland	IRT	-844	10	1.02	9	50	64	114	6
Rainfed lowland	IRT	—		—		—	-	—	
Irrigated	IRT	1584	8	0.82	8	62	58	120	5
Corn									
Yellow, hybrid	IRT	2730	5	0.57	3	12	38	50	10
Yellow, open-pollinated	IRT	2517	6	0.58	4	7	54	61	8
White, open-pollinated	IRT	2121	7	0.64	5	9	51	60	9
Peanuts, shelled									
Red variety	IRT	11454	3	0.66	6	23	54	77	7
White variety	IRT	-95	9	1.88	10	8	185	193	3
Peanut butter									
Red Variety	IS	11454	3	0.48	2	23	54	77	7
White variety	IS	-95	9	0.78	7	8	185	193	3
Garlic	EP	42538	1	0.19	1	66	184	250	1
Tomatoes	IRT	26046	2			2	168	170	4
Pineapple	IRT	8874	4			154	75	229	2

Source: Philippine Agricultural Diversification as an Alternative Development Strategy (forthcoming).

Table 8 — Net Financial Profitability, Comparative Advantage, and Man-Labor Requirement of Crop Production Systems by Trade Regime, Bicol Region, Philippines, 1985

Crop/Technology	Trade Regime	Net Financial Profit at Farm	Rank	Economic Comparative Advantage	Rank	Labor Requirement			Rank
						Hired	Family	Total	
		₱/ha				MD/ha			
Rice									
Rainfed upland	IRT	-143	9	1.06	9	19	93	112	3
Rainfed lowland	IRT	1031	3	0.88	6	79	40	119	2
Irrigated	IRT	1949	1	0.92	7	87	23	110	4
Corn									
Yellow, hybrid	IRT	838	7	0.59	2	60	16	76	7
Yellow, open-pollinated	IRT	1116	2	0.72	3	42	25	67	9
White, open-pollinated	IRT	937	4	0.74	4	31	44	75	8
Abaca	EP	472	8	0.52	1	27	8	35	10
Cassava	EP	878	6	1.03	8	32	62	94	5
Sweet potato	EP	913	5	0.84	5	45	44	89	6
Gabi	IRT	- 3183	10			23	538	561	1

Source: Philippine Agricultural Diversification as an Alternative Development Strategy (forthcoming).

Table 9 — Net Financial Profitability, Comparative Advantage, and Man-Labor Requirement of Crop Production Systems by Trade Regime, Western Visayas, Philippines, 1985

Crop/Technology	Trade Regime	Net Financial Profit at Farm	Rank	Economic Comparative Advantage	Rank	Labor Requirement			Rank
						Hired	Family	Total	
		₱/ha				MD/ha			
Rice									
Rainfed upland	IRT	—		—		—	—	—	
Rainfed lowland	IRT	834	7	0.78	4	49	29	78	7
Irrigated	IRT	2331	4	0.75	3	52	43	95	4
Corn									
Yellow, hybrid	IRT	7902	1	0.40	1	89	11	100	3
Yellow, open-pollinated	IRT	1324	5	0.89	5	28	63	91	5
White, open-pollinated	IRT	145	8	1.16	6	25	59	84	6
Peanuts, shelled									
Red variety	IRT	3393	3	1.32	8	32	81	113	2
White variety	IRT	3492	2	1.32	8	54	85	139	1
Peanut butter									
Red variety	IS	3393	3	0.64	2	32	81	113	2
White variety	IS	3492	2	0.64	2	54	85	139	1
Mungbean									
Rainfed upland	IRT	137	9	3.85	10	22	44	66	8
Rainfed lowland	IRT	—224	10	3.91	11	—	95	95	4
Irrigated	IRT	878	6	3.01	9	20	25	45	10
Sorghum	IRT	—448	11	1.26	7	38	22	60	9

Source: Philippine Agricultural Diversification as an Alternative Development Strategy (forthcoming).

Table 10 — Net Financial Profitability, Comparative Advantage, and Man-Labor Requirement of Crop Production Systems by Trade Regime, Central Visayas, Philippines, 1985

Crop/Tech	Trade Regime	Net Financial Profit at Farm	Rank	Economic Comparative Advantage	Rank	Labor Requirement Hired	Family	Total	Rank
		₱/ha				MD/ha			
Rice									
Rainfed upland	IRT	-813	7	1.24	6	56	69	125	2
Rainfed lowland	IRT	420	4	0.89	4	62	43	105	4
Irrigated	IRT	3728	1	0.71	2	68	43	111	3
Corn									
Yellow, hybrid	IRT	-1533	8	0.95	5	46	53	99	5
Yellow, open-pollinated	IRT	1324	3	0.57	1	—	47	47	8
White, open-pollinated	IRT	-87	5	1.36	7	26	40	66	7
Cassava	EP	1793	2	0.72	3	63	36	99	5
Sweet potato	EP	-242	6	1.36	7	6	74	80	6
Ubi	IRT	-1608	9			98	381	479	1

Source: Philippine Agricultural Diversification as an Alternative Development Strategy (forthcoming).

Table 11 — Net Financial Profitability, Comparative Advantage, and Man-Labor Requirement of Crop Production Systems by Trade Regime, Eastern Visayas, Philippines, 1985

Crop/Technology	Trade Regime	Net Financial Profit at Farm	Rank	Economic Comparative Advantage	Rank	Labor Requirement Hired	Family	Total	Rank
		P/ha				MD/ha			
Rice									
Rainfed upland	IRT	-1891	8	1.39	5	55	97	152	3
Rainfed lowland	IRT	-69	5	0.82	4	105	59	164	2
Irrigated	IRT	2408	1	0.69	2	118	55	173	1
Corn									
Yellow, hybrid	IRT	–		—		—	—	—	
Yellow, open-pollinated	IRT	-1315	7	2.02	7	18	67	85	7
White, open-pollinated	IRT	-964	6	1.51	6	31	59	90	6
Abaca	EP	584	3	0.56	1	16	24	40	8
Cassava	EP	2173	2	0.69	2	15	84	99	5
Sweet potato	EP	495	4	0.80	3	54	73	127	4

Source: Philippine Agricultural Diversification as an Alternative Development Strategy (forthcoming).

Finally, the Mindanao regions (Western, Northern, Southern and Central) are the producers of the major food and feedgrains. Southern Mindanao (Table 12) in particular has rich resource endowments and favorable climate conducive to agricultural diversification.

3. Summary and Conclusions

We can summarize our discussions of economic issues as they relate to rice production in the Philippines as follows:

1) The current low world market price or border price of rice affects the economic viability of Philippine rice production. Low border prices of rice tend to discourage the adoption of innovations among farmers and act as disincentives to the expansion of investments (e.g., irrigation, fertilizer, research, and extension) in the rice sub-sector. This can cause shortfall in rice supply resulting to abnormally high prices.

2) There are tradeoffs in pursuing the goals of equity and efficiency. The crucial role of technology is to balance these tradeoffs. Economic efficiency should be the overriding norm in pursuing the objective of alleviating the plight of the poor and disadvantaged groups.

3) The solution to the problem on how to improve the economic well-being of the poor rice farmers in the adverse environments is a complex one. It transcends beyond what a monocrop like rice can offer. In this regard, there is a need to examine the potentials of agricultural diversification to other crops or to other agricultural and nonagricultural enterprise that can help increase income and employment of the poor.

4) Given natural resource endowments by ecological environments or regions, technology, and trade, the determinant of agricultural diversification should be comparative advantage or economic efficiency. The dynamic interactions of resource endowments, technology, and trade will induce entrepreneurs within ecological environments/regions to specialize in production activities in which they have comparative advantage. The role of government is not to intervene to the extent that this natural competitiveness is destroyed but rather to provide infrastructures and support services to ensure that the economic efficiency

Table 12 — Net Financial Profitability, Comparative Advantage, and Man-Labor Requirement of Production Systems by Trade Regime, Southern Mindanao, Philippines, 1985

Crop/Technology	Trade Regime	Net Financial Profit at Farm	Rank	Economic Comparative Advantage	Rank	Labor Requirement Hired	Family	Total	Rank
		P/ha				MD/ha			
Rice									
Rainfed upland	IRT	—		—		—	—	—	
Rainfed lowland	IRT	1362	12	0.83	9	69	36	105	6
Irrigated	IRT	5371	7	0.69	6	62	37	99	7
Corn									
Yellow, hybrid	IRT	3775	9	0.50	4	46	35	81	10
Yellow, open-pollinated	IRT	642	15	0.94	12	31	42	73	12
White, open-pollinated	IRT	1255	14	0.84	10	41	25	66	13
Cotton									
Rainfed upland	IS	11486	3	0.33	1	96	51	147	3
Rainfed lowland	IS	7632	5	0.36	2	32	50	82	9
Irrigated	IS	6426	6	0.37	3	40	12	52	15
Soybean									
Rainfed upland	IS	2175	11	0.90	11	65	44	109	5
Rainfed lowland	IS	3671	10	0.79	8	96	40	136	4
Irrigated	IS	4953	8	0.71	7	77	17	94	8
Abaca	EP	-86	16	1.21	13	28	11	39	16
Sorghum	IRT	1289	13	0.62	5	31	31	62	14
Ginger	IRT	11901	2			14	136	150	2
Banana	IRT	11180	4			21	54	75	11
Pineapple	IRT	16060	1			149	109	258	1

Source: Philippine Agricultural Diversification as an Alternative Development Strategy (forthcoming).

gains of these ventures are internalized by private entrepreneurship.

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