GREEN REVOLUTION-TYPE GROWTH, POLICY REGIME, AND INCOME DISTRIBUTION: THE PHILIPPINE CASE

A.M. Balisacan

Agricultural growth commonly has been regarded as a critical element of rural development strategy in developing countries. Through intersectoral linkage effects, this growth is considered to stimulate new industries, directly as well as indirectly, thereby facilitating industrialization as well as directly addressing the problems of poverty, unemployment, and underemployment (Adelman 1984; Ranis and Stewart 1993, Mellor 1995). However, the character of agricultural growth may also matter. If this growth is not broadly based, the intersectoral linkage effects may not be as large as expected. Moreover, if the state of rural infrastructure is poor, the rural nonfarm sector's response to agricultural growth may be weak, thereby limiting the nonfarm employment effects of growth in agricultural income. The policy environment, including the character of trade and exchange rate policies, could also influence the response of rural nonfarm areas to the stimulus provided by agricultural growth.

In the Philippines, the diffusion of modern varieties (MVs), particularly of rice, was one catalyst of the agricultural sector's relatively rapid growth from the mid-1960s to the early 1980s. However, rural poverty did not respond to this growth as strongly as expected (Balisacan 1993a).[1] Nor did indicators of rural poverty respond strongly to the relatively rapid growth of national income during this so-called green revolution period. On the other hand, during the second half of the 1980s and the first half of the 1990s, indicators of rural poverty did appear to be strongly influenced by agricultural growth and overall income growth (Balisacan 1995), even though agricultural growth was much slower than in the earlier period. The reasons for this differential response are not well understood. One plausible explanation is that policy and institutional reforms undertaken in recent years have been successful in broadening the participation of the poor in sectoral and economywide growth.

[1]Recent experience in Colombia, Costa Rica, Kenya, the Punjab of India, Taiwan, and Thailand demonstrates the powerful stimulus that agricultural growth can provide to rural employment and income. For a careful account of these country cases, see Mellor (1995).

This paper demonstrates the critical importance of initial conditions, including the policy regime, in shaping the impact of green revolution-type growth on income and equity. The first section of the paper provides an historical overview of the patterns of agricultural growth and rural poverty in the Philippines during the green revolution period. The second and third sections discuss two contrasting perspectives on the green revolution's impact on poverty and income distribution. The final section of the paper contains concluding comments.

AGRICULTURAL GROWTH IN COMPARATIVE PERSPECTIVE

The agricultural sector of the Philippine economy performed remarkably well between 1965 and 1980, the height of the green revolution (Table 1). The sector's average annual growth was substantially higher than the averages for most developing Asian countries and compared favorably well with those for Thailand and Indonesia. Remarkably robust agricultural growth was accompanied by growth in gross domestic product (GDP) that closely matched the averages for middle-income developing countries of Asia. However, agricultural growth in the 1980s and early 1990s was way below the averages for these countries. Dismal growth in the agricultural sector paralleled the poor performance of the overall economy during that same period.

It is important to note that growth was not uniform among the major subsectors of agriculture, however (Table 2). The impressive growth of crop gross value added (GVA), averaging 4.6% a year, contributed about 90% of the observed growth of agricultural GVA during this period. Growth was particularly high in maize (5.7%), bananas (11.8%), and the "other crops" category (7.5%). Surprisingly, the average growth in GVA for rice (4.0%), the nation's staple crop, was not spectacularly high compared with the average for the entire agricultural sector, although its share in total crop GVA remained substantial (about 25% in the early 1980s). Thus the commonly held view that production gains in agricul-

Table 1. Average growth (% yr^{-1}) of agriculture and gross domestic product (GDP) in developing countries of Asia, 1965-93.

Country	Agriculture		GDP	
	1965-80	1980-93	1965-80	1980-93
Philippines	4.6	1.2	5.9	1.4
Indonesia	4.3	3.2	8.0	5.8
Malaysia	na[a]	3.5	7.3	6.2
Thailand	4.6	3.8	7.2	8.2
Bangladesh	1.5	2.6	2.4	4.2
India	2.5	3.0	3.6	5.2
Nepal	1.1	3.6	1.9	5.0
Pakistan	3.3	4.4	5.1	6.0
Sri Lanka	2.7	2.1	4.0	4.0
China	2.8	5.3	6.4	9.6

Source: ADB (1995), World Bank (1990, 1995). [a]na = not available.

Table 2. Average annual growth rates (% yr^{-1}) of gross value added (GVA) in agriculture in the Philippines, by sector, 1965-95.[a]

Sector	1965-80		1980-95	
Agriculture	3.7	(100)	1.8	(100)
All crops	3.0	(80.7)	0.9	(48.8)
Rice	4.0	(14.1)	2.7	(22.4)
Maize	5.7	(8.0)	2.1	(7.4)
Coconut	3.8	(8.8)	-3.2	(-10.3)
Sugarcane	4.2	(4.6)	0.0	(0.0)
Banana	11.8	(4.9)	0.1	(0.1)
Other crops	7.5	(40.3)	2.4	(29.2)
Poultry and livestock	2.3	(7.6)	5.3	(47.0)

Source: NSCB (various issues). [a]Growth rates are based on 3-yr moving average trends. The agriculture sector includes crops as well as poultry and livestock. Figures in parentheses are the contributions of the indicated sector to total agricultural growth.

ture between 1965 and 1980 were primarily attributable to the green revolution in rice is a myth. The growth of rice GVA contributed only 15% to the growth observed in agricultural GVA during this period.

Production growth rates of virtually all crops decelerated in the 1980s and early 1990s. One reason for this slowdown is that less new land was brought into cultivation. Although agricultural land increased at a rate of 3.6% yr^{-1} in the 1970s (primarily because of deforestation), this rate had fallen to only 0.8% yr^{-1} in the 1980s and early 1990s (Balisacan 1994). The uncertainty concerning the implementation of the government's Comprehensive Agrarian Reform Program has also contributed to slower crop growth rates. Launched in June 1988, this program has not only discouraged the flow of private investments into agriculture but has also encouraged nonplanting and premature conversion of agricultural land to nonagricultural uses (Medalla and Centeno 1994). Still another reason is the sharp fall of public investments in agriculture—especially rural roads, irrigation, and research—during the 1980s and early 1990s (David et al 1993). Investments in agricultural research and development (R&D), the single most important source of long-term production growth, stagnated in the 1970s and then dropped in absolute value in the 1980s. The total spent on R&D in the early 1990s was only about 60% of that in the early 1970s.

Surprisingly, the macroeconomic difficulties of the 1980s and early 1990s did not prevent the poultry and livestock subsector from achieving a respectable growth rate. This subsector had the highest growth rate (5.3% yr^{-1}) of all subsectors of agriculture, accounting for about one-half of the observed growth of agricultural GVA. The growth in GVA for poultry (mainly chicken) accounted for much of this growth. Favorable domestic prices, arising from the relatively high nominal protection—averaging 50%—accorded by domestic policy to the subsector (David 1995) may have partly encouraged this subsector's growth.

Beginning in the mid-1960s, increases in land productivity (that is, in output per unit of land) increasingly became the major source of growth in food production. At the height of the green revolution period, yield increases accounted for about 80% of the production growth in agriculture. These increases were brought about mainly by the expansion of irrigation systems, increased application of fertilizers, adoption of high-yielding varieties, and investments in rural infrastructure and education.

For rice, the country's major staple, more than 90% of the production growth in 1965-94 could be attributed to yield growth (Table 3). Yields rose by 3.4% annually during this period, although the growth was significantly lower in the latter part of the 1980s. Rice harvested area, on the other hand, almost stagnated, indeed even fell slightly in the 1980s, owing partly to a series of natural calamities and partly to the shifting of land away from rice production.

The share of harvested area under irrigation expanded at 2.6% yr^{-1} in 1965-94, whereas rainfed area diminished by an annual rate of 1.4%. Irrigated area thus increasingly accounted for a greater proportion of rice harvested area, rising from 33% in the mid-1960s to 61% at the start of the 1990s. Because the adoption of MVs and fertilizer was more rapid in irrigated areas than in rainfed areas, yield growth tended to be faster in irrigated areas, at least at the early stage of the green revolution. Irrigated areas thus also increasingly accounted for a greater proportion of total rice production, rising from 43% in the mid-1960s to 71% in the early 1990s.

Irrigation is associated with increased double cropping. Since total harvested area increased only minimally during 1965-94, the expansion of irrigated area increased the share of dry-season area in total harvested area. This share rose from 29% in the mid-1960s to 40% in the early 1990s. The production share of dry-season crops rose correspondingly from 26 to 39% during the period.

The development of irrigated area and the widespread adoption of MVs contributed substantially to the high growth of fertilizer use in the rice sector. Fertilizer use on rice

Table 3. Sources of growth in rice production in the Philippines.[a]

	1965-80	1980-94
Total		
Production	4.28	1.86
Area harvested	0.83	-0.40
Yield	3.45	2.26
Irrigated		
Production	6.80	3.45
Area harvested	3.22	2.03
Yield	3.57	1.42
Rainfed		
Production	1.97	-0.92
Area harvested	-0.48	-2.94
Yield	2.45	2.02

[a]Growth rates are based on 3-yr moving average trends.

rose from an average of only 9 kg NPK ha^{-1} in 1964 to 67 kg NPK ha^{-1} in 1990. Harvested area planted to MVs also soared, rising from barely 10% of total harvested area in the mid-1960s to about 90% at the turn of the 1990s.

IMPACT OF THE GREEN REVOLUTION: A "RICE VILLAGE" PERSPECTIVE

The green revolution, specifically modern rice technology, has commonly been blamed for the high incidence of landlessness and the fragmentation of rural societies into landless and landed classes. It is argued that modern technology has been inherently biased in favor of large-scale farmers and capital owners, partly because of the relatively high capital and intermediate inputs (particularly fertilizers and insecticides) required to exploit the yield potential of the technology. This argument is often corroborated by casual reference to segmented credit markets in rural areas and the contention that large-scale farmers face a lower effective unit cost of credit than small-scale farmers. Finally, it is also argued that the technology, because of its alleged labor-saving bias, has reduced the employment opportunities of agricultural workers, thereby depressing their real wages.

Empirical support for these claims, however, is rather weak (Ruttan 1977, Barker and Herdt 1985, Lipton and Longhurst 1989, David and Otsuka 1994). Rice-village studies, particularly those undertaken by the International Rice Research Institute (IRRI), show that, by and large, MV adoption occurred quite evenly among farmers of all farm-size groups and land tenure classes. Large-scale farmers tended to reach full adoption of the technology earlier than small-scale farmers, but the gap in adoption eventually disappeared. The adoption of the modern technology did not result in increased farm sizes. Although mechanization of land preparation and threshing occurred in some areas, particularly where irrigation was available and double cropping practiced, total labor use per hectare increased rather than decreased. The expanded use of labor was noticeable, particularly in crop establishment, crop care, and postharvest operations. Both farm operators and hired labor benefited from technical change, but because real rice prices fell more rapidly than general consumer prices, the bulk of income gains from technological change accrued to consumers.

The green revolution in rice has been concentrated in irrigated and favorable rainfed areas with adequate water control. Hence, the adoption of modern rice technology increased production and returns to land in the favorable areas more than in the upland and unfavorable areas (Otsuka et al 1992). Whether inequality in the distribution of income widens or not depends on the mobility of factors of production. In particular, if labor is not mobile, the increase in labor demand in favorable areas will raise wages in those areas, while the reduction in labor demand in unfavorable areas, owing to the decrease in rice prices, will reduce wages in those areas. The rice-village study of Otsuka et al (1990) revealed a tendency for wages to equalize between favorable and unfavorable areas. Moreover, the inequitable effect of differential adoption of MV technology between favorable and unfavorable areas was mitigated by a reallocation of resources to nonrice activities in unfavorable areas and by the implementation of land reform in rice-growing areas.

The conditions favoring the substantial increase in the incomes of those who benefited from land reform require some elaboration. Under the Operation Land Transfer (OLT) program, land sold to former tenants was assessed at 2.5 times the gross normal output prior to 1972, the year the program was started. The land was amortized for 15 yr at an annual interest rate of 6%. The annual amortization fee was equivalent to about one-fourth of the gross value of normal production in the early 1970s (Mangahas 1985). Under the Leasehold Operation (LHO) program, leasehold tenants paid a fixed rent amounting to 25% of the average output (net of the costs of seed, harvesting, and threshing) of the three previous normal crop years prior to 1972. The technological change brought about by the green revolution in irrigated rice farms resulted in substantial yield increases, thereby permitting a divergence between the amortization fees and leasehold rents, on the one hand, and the implicit land rent, on the other.[2] Based on the rice-village study of Otsuka (1991), it would appear that in some favorable areas the gap approached two-thirds of the implicit land rent, which suggests that beneficiaries of the land reform program captured a substantial economic surplus.

Another consequence of the tenancy regulation has been the emergence of permanent labor contracts in areas where the adoption of modern technology is relatively high and the implementation of the law is effective. Otsuka et al (1993) have reported, for example, that in irrigated areas of Central Luzon, the ratio of permanent workers to total landless workers increased to 20-30% in the late 1980s from a negligible level before 1970. While permanent workers are economically better off than casual laborers, they are worse off than tenants and owner-cultivators. Their exclusion from the land reform program effectively blocked the main avenue by which they could improve their economic welfare. Moreover, since a permanent labor contract is inefficient compared with share tenancy, the restriction on tenure choice in land reform legislation reduced both efficiency and equity (Hayami and Otsuka 1993).

The almost exclusive attention given to the green revolution in rice is, however, disturbing. As shown in the previous section of this paper, the contribution of the green revolution in rice to the observed production growth of agriculture was relatively small. Growth in other sectors of agriculture (except forestry and fisheries) was equally rapid from the mid-1960s to the early 1980s. This growth contributed about 85% of the observed growth of agricultural value added. Moreover, while the adoption of MVs was relatively rapid during this period, investments in infrastructure, especially irrigation, as well as added input use have likewise been equally important sources of yield growth (Evenson 1986). Thus, the frequent reference to MVs as the major source of rice production growth is not justified.

The "rice village" perspective is also limited in providing a broad description of the dynamics of rural development. The next section of this paper will go beyond the rice economy to provide a broad description of the changes in rural poverty and income distribution in the Philippines from the mid-1960s to the early 1980s. It examines results of

[2]The gap was narrower in unfavorable areas (rainfed or unirrigated) where yield growth was limited.

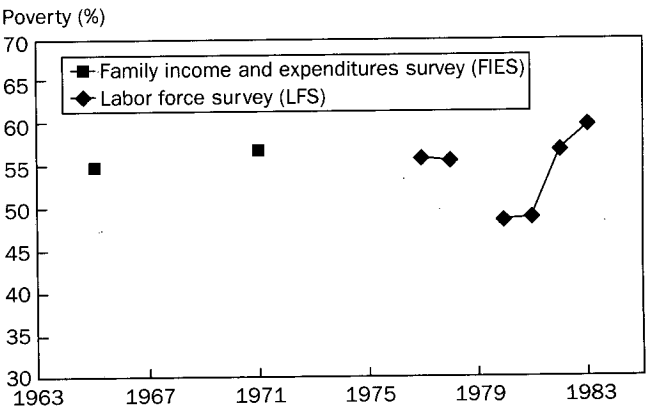
simulation exercises designed to characterize the economywide effects, particularly on income and equity, of green revolution-type growth.

AGRICULTURAL GROWTH AND RURAL PERFORMANCE: A MACROECONOMIC PERSPECTIVE

Data on rural poverty and income distribution for the period of rapid agricultural growth in the Philippines are limited. Only 2 yr—1965 and 1971—are available from the Family Income and Expenditures Survey (FIES), the major source of nationally representative data for poverty calculations. Utilizing data on workers' earnings (wages, salaries, and entrepreneurial incomes from self-employment) based on quarterly labor force surveys, Balisacan (1993b) has provided a complementary set of rural poverty estimates for the late 1970s and early 1980s. Figure 1 summarizes these estimates, together with those based on the FIES.[3]

Evidently rural poverty during the period was insensitive to the rapid agricultural growth that was taking place. Thus the Philippine experience with regard to the alleviation of rural poverty does not fit the commonly observed pattern, which demonstrates the powerful stimulus that agricultural growth provides to rural employment and income. As noted previously, in other countries and regions (e.g., Bangladesh, Colombia, Costa Rica, and the Punjab of India) where rapid agricultural growth took place, the farm-nonfarm growth linkages were stronger, thereby inducing increases in rural real wages, a reduction in rural poverty, and, to some extent, a more egalitarian distribution of income.

Before and during the period of high growth, small-scale farmers received less attention and support from government in comparison with large-scale farmers and agribusiness



1. Rural poverty during a period of rapid agricultural growth, Philippines.

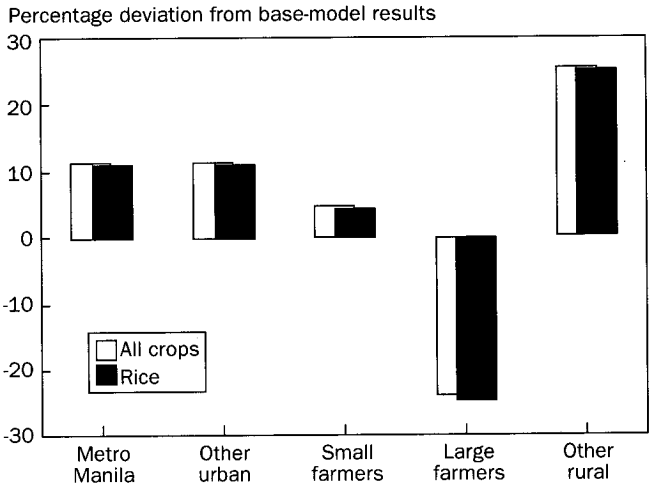
[3]The intertemporal profile is robust with respect to poverty lines and alternative, commonly employed aggregate measures of poverty.

enterprises. The benefits of public investment in agricultural research, input and output subsidies, and infrastructure accrued disproportionately to the large farms. Public spending favored urban areas heavily. The unfavorable effects of foreign trade and payment restrictions, the low interest rate policy, and the effective rationing of institutional credit impinged much more heavily on small-scale farmers (Bautista 1987, David 1989). These factors contributed to the failure of rapid agricultural growth to translate into reduced poverty and rapid, sustainable economic growth.

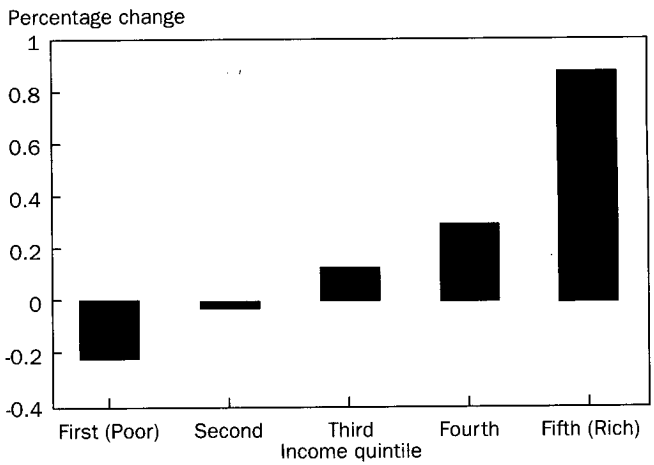
How would the Philippine economy have fared during the green revolution period under conditions more favorable to small-farm agriculture? Bautista (1996) has examined this issue using a modified social accounting matrix (SAM) framework which allows for interrelations among production, household expenditures in rural and urban areas, household incomes, and the macroeconomic linkages of sectoral activities. In his policy experiment, government investments and subsidies are assumed to be redirected to small farms, thereby raising productivity and value-added for these farms. Labor income is expected to rise owing to the greater labor intensity of production in small farms. And considering the strong intersectoral growth linkages of small farms, including the direct and indirect consumption-linkage effects arising from increased income of small-farm households, the focus on small-farm development is expected to favor both equity and growth. Indeed, the Bautista policy experiment has confirmed expectations. That is, had the observed sectoral growth during the green revolution period taken place in an environment in which public investments and subsidies did not discriminate against small farms, poverty reduction and economic growth in the Philippines would have been substantially higher than what was actually achieved. The counterfactual experiment leads to a gain in the real incomes of small-scale farmers and a reduction in those of large-scale farmers (Fig. 2). What is even more remarkable is that incomes also increase—relative to the base model—for other rural households as well as for urban and Metro Manila households, though at a descending order of magnitude.

The SAM framework ignores supply constraints and relative price effects, so the induced changes estimated by Bautista could have been on the high side. A computable general equilibrium model of the economy allows supply constraints and relative price responses to be incorporated. A highly disaggregated general equilibrium model of the Philippine economy has been employed to characterize further the income and equity effects of the sort of technological change that occurred during the high-growth period. The model has 50 commodities produced in 41 sectors, three agricultural regions of the country (Luzon, Visayas, Mindanao), seven consumer goods, and five households. One attractive feature of this model is that the behavioral parameters entering its structure are based on econometric research using Philippine data. The parameters therefore reflect the underlying supply and demand constraints, including initial distribution of incomes and assets, prevailing in the economy.

Empirical estimates of the rates of technological progress in Philippine agriculture are scanty, but they tend to average about 2% yr^{-1}. This average, however, disguises the fact that technological progress in agriculture has occurred at greatly different rates for



2. Income effects of small-farm development, Philippines.



3. Income distribution effects of technological change in agriculture, Philippines.

rainfed (upland) and irrigated (lowland) areas, as well as for various regions of the country. For example, the rate of technological progress in irrigated areas has exceeded 5%, while that in unirrigated areas has been barely one-half of 1% (Warr and Coxhead 1992). Similarly, the rate of technical progress has been much faster in Luzon (at about 3%) than in Visayas (about 1%) and Mindanao (about 2%).

Figure 3 summarizes the income distribution part of the simulation results incorporating the empirically estimated rates of technological change in agriculture. The regres-

sive impact of technological change is evident. Even more significant is the decline in the real incomes of the bottom two quintiles of the population. The rural poor—including farmers—largely constitute these groups. Their real incomes fall as a result of a decline in agricultural prices and agricultural labor use. The relatively large increase in the real incomes of the topmost quintile—mainly the urban rich—reflects the benefit they derive from lower food prices as well as the small effect of the decline on the income side.

The results depicted in Figure 3 are somewhat consistent with those obtained earlier by Evenson et al (1993). Also employing a CGE framework, these authors performed an experiment involving a 10% increase in the rate of technological change for all agricultural commodities. Their analysis shows that such an increase would have decreased agricultural labor use (presumably owing to relative labor-saving bias); reduced the real incomes of landless workers; raised tenants' incomes; caused large increases in owner-cultivator incomes; and increased the real incomes of 7-10 deciles because these are the urban rich who benefit from lower food prices and are affected little on the income side.

In summary, the macroeconomic approach to understanding the impact of green revolution-type growth suggests that initial conditions—quality of infrastructure, human resources, agrarian structure, and the economic policy and institutional environment—considerably influence the response of rural areas to the stimulus that such growth provides. When the distribution of land holdings is highly skewed, rural infrastructure is in poor condition, and the economic incentive structure (emanating from both agriculture-specific and economywide policies) is biased against small farms, it is expected that increases in agricultural incomes induced by growth in agricultural productivity will provide only a weak stimulus for domestic nonfarm activities. Because the consumption pattern of large-scale farmers is most likely geared to those goods and services with high import (or urban) content, and because rural nonfarm activities are constrained by poor rural infrastructure, the linkages of agricultural income growth are weak in setting in motion a sequence of employment and income multiplier effects on the rural (as well as urban) economy (Haggblade and Hazell 1989, Ranis and Stewart 1993). Given this environment, the impact of agricultural growth on poverty and equity is limited.

CONCLUDING REMARKS

Because the per capita availability of arable land is declining as population pressure grows, technological progress represents the main source of growth in agricultural production in the foreseeable future. The future rate and character of technological progress will influence not only the contribution of agriculture in national output and employment but also the pace of poverty alleviation, especially in rural areas.

Broadly based agricultural growth, anchored on technological progress, holds the key to the sustained alleviation of rural poverty in the Philippines. This type of growth requires that the *initial* conditions—including income distribution, rural infrastructure, and the macroeconomic and political environment—would have to be made more favorable than they have been in recent years. The response of rural nonfarm areas (as well as

urban areas) to the stimulus provided by rapid agricultural growth during the green revolution period was weak, owing largely to the poor state of rural infrastructure, the bias of public spending in favor of large-scale farmers and agribusiness enterprises (and against small-scale farmers), the disproportionately negative effects of trade and exchange rate policies on small-scale farmers, and the high inequality in the distribution of wealth (particularly land).

CITED REFERENCES

Adelman I (1984) Beyond export-led growth. World Dev. 12: 937-949.

ADB—Asian Development Bank (1995) Key indicators of developing Asian and Pacific countries. Manila, Philippines.

Balisacan A M (1993a) Agricultural growth, landlessness, off-farm employment, and rural poverty in the Philippines. Econ. Dev. Cult. Change 41: 533-562.

Balisacan A M (1993b) Agricultural growth and rural performance: a Philippine perspective. J. Philipp. Dev. 20: 289-317.

Balisacan A M (1995) Anatomy of poverty during adjustment: the case of the Philippines. Econ. Dev. Cult. Change 44: 33-62.

Balisacan A M (1994) Economic modernization, market responses, and rural welfare in the Philippines. Paper presented at the conference on Social Science Methods in Agricultural Systems Research: Coping with Increasing Resource Competition in Asia, 2-4 Nov, Chiang Mai, Thailand.

Barker R, Herdt R W, Rose B (1985) The rice economy of Asia. Resources for the Future, Washington, D.C.

Bautista R M (1987) Production incentives in Philippine agriculture: effects of trade and exchange rate policies. Research Report 59. International Food Policy Research Institute, Washington, D.C.

Bautista R M (1996) Income and equity effects of the green revolution in the Philippines: a macroeconomic perspective. J. Int. Dev. (in press)

David C C (1989) The Philippines. *In* Food trade and food security in ASEAN and Australia. A. Booth et al (eds). ASEAN-Australia Joint Research Project, Kuala Lumpur, Malaysia, and Canberra, Australia.

David C C (1995) Economic policies and agricultural incentives: the Philippine case. Discussion Paper 95-15. Philippine Institute for Development Studies, Makati City, Philippines..

David C C et al (1993) Organizing for results: the Philippine agricultural sector. *In* Poverty, growth, and the fiscal crisis. E.S. de Dios et al (eds). Philippine Institute for Development Studies, Makati City, Philippines.

David C C, Otsuka K, eds. (1994) Modern rice technology and income distribution in Asia. Lynne Rienner Publishers, London, UK.

Evenson R (1986) Infrastructure, output supply, and input demand in Philippine agriculture: provisional estimates. J. Philipp. Dev. 13: 62-76.

Evenson R E, Quisumbing A, Bantilan M C L (1993) Population, technology and rural poverty in the Philippines: rural income implications from a simple CGE impact multiplier model. *In* Perspectives on Philippine poverty. A.M. Balisacan et al (eds). University of the Philippines Center for Integrative and Development Studies and Yale University Council on Southeast Asian Studies, Quezon City, Philippines.

Haggblade S, Hazell P (1989) Agricultural technology and farm-nonfarm growth linkages. Agric. Econ. 3: 345-364.
Hayami Y, Otsuka K (1993) The economics of contract choice: an agrarian perspective. Clarendon Press, Oxford, UK.
Lipton M, Longhurst R (1989) New seeds and poor people. Unwin Hyman, London, UK.
Mangahas M (1985) Rural poverty and operation land transfer in the Philippines. *In* Strategies for alleviating poverty in rural Asia. R. Islam (ed). Bangladesh Institute for Development Studies and ILO/Asian Employment Program, Dhaka, Bangladesh, and Bangkok, Thailand.
Medalla F, Centeno L (1994) Land use, urbanization, and the land conversion issue. *In* Spatial development, land use, and urban-rural growth linkages in the Philippines. A.M. Balisacan et al (eds). National Economic and Development Authority, Pasig, Philippines.
Mellor J W, ed.(1995) Agriculture on the road to industrialization. The Johns Hopkins University Press, Baltimore, Maryland.
NSCB—National Statistical Coordination Board, Philippines (various issues) Philippine statistical yearbook. Manila, Philippines.
Otsuka K (1991) Determinants and consequences of land reform implementation in the Philippines. J. Dev. Econ. 35: 339-355.
Otsuka K, Chuma H, Hayami Y (1993) Permanent labour and tenancy contracts in agrarian economies: an integrated analysis. Economica 60: 57-77.
Otsuka K, Cordova V, David C C (1992) Green revolution, land reform, and household income distribution in the Philippines. Econ. Dev. Cult. Change 40: 719-741.
Otsuka K, Cordova V, David C C (1990) Modern rice technology and regional wage differentials in the Philippines. Agric. Econ. 4: 297-314.
Ranis G, Stewart F (1993) Rural nonagricultural activities in development: theory and application. J. Dev. Econ. 40: 75-101.
Ruttan V W (1977) The green revolution: seven generalizations. Int. Dev. Rev. 19: 16-23.
Warr, P G, Coxhead I A (1992) Technical progress, income distribution, and economic policy in Philippine agriculture. Paper prepared for the Technical Change in Agriculture, Income Distribution, and Economic Policy in the Philippines Project, supported by the Australian Centre for International Agricultural Research (ACIAR), Canberra, Australia.
World Bank (1990, 1995) World development report. Oxford University Press, Oxford, UK, and New York, New York.

NOTES

Author's address: University of the Philippines School of Economics, Diliman, Quezon City, Philippines.
Citation information: Pingali P, Hossain M, eds. (1998) Impact of rice research. Proceedings of the International Conference on the Impact of Rice Research, 3-5 Jun 1996, Bangkok, Thailand. Thailand Development Research Institute, Bangkok, Thailand, and International Rice Research Institute, P.O. Box 933, Manila, Philippines.