XI Challenges for Less Favored Areas

INTRODUCTION

Past agricultural development strategies in Asia, including the green revolution, have concentrated on irrigated agriculture and "high-potential" rainfed lands in an attempt to increase food production and stimulate economic growth. This strategy has been spectacularly successful in many countries and was responsible for the transformation of rural Asia, and the resulting general economic development, described heretofore in this book.

At the same time, however, large areas of agricultural land have been neglected and lag behind in their economic development. These lands are characterized by lower agricultural potential, often because of poorer soils, shorter growing seasons, and lower and uncertain rainfall, but also because past neglect has left them with limited infrastructure and poor access to markets. Despite some out-migration to more rapidly growing areas, the population of these areas continues to grow and this growth has not been matched by increases in yields. The result is often worsening poverty and food insecurity problems, as well as widespread degradation of natural resources (for example, mining of soil fertility, soil erosion, deforestation, and loss of biodiversity) as people seek to expand cropped area.

It has become increasingly clear that, if the general goals of poverty alleviation and environmental sustainability through development are to be met, the less favored areas cannot continue to be bypassed by the revolution that has transformed

so much of rural Asia. More attention will have to be given to these lands in setting priorities for policy and public investments. Two key policy questions need to be addresssed and answered: first, what level of investment can be justified in less favored areas? Second, how should the resources allocated to less favored areas be used to promote development that is beneficial to the poor and environmentally sustainable?

EXTENT OF POVERTY AND ENVIRONMENTAL DEGRADATION IN LESS FAVORED AREAS

Less favored areas (LFAs) are extensive in Asia. According to a report prepared by the Technical Advisory Committee of the Consultative Group for International Agricultural Research (CGIAR) (TAC 1996), 550 million ha of land currently used for agricultural purposes in Asia can be classified as "marginal," and another 340 million ha are sparsely populated arid lands. In contrast, there are only 305 million ha of high-potential or "favored" environments currently in agricultural use.

The LFAs are also home to a significant share of Asia's rural poor. Using FAO and other data sources, Hazell and Garrett (1996) estimated that 263 million rural poor live in less favored lands in Asia. Given that there were 633 million rural poor living in Asia in 1988 (IFAD 1995), this implies that about 40 percent of Asia's rural poor live in LFAs. While a very rough estimate, this figure is supported by more precise estimates for India and the PRC.

For India, Fan and Hazell (1999) used regional data available for 47 out of 65 agroclimatic zones to arrive at the results in Table XI.1. In 1993, of the 184 million rural poor living in the 47 agroclimatic zones analyzed, 16 percent, or 30 million, lived in irrigated areas (defined as areas with more than 40 percent of the cropped area irrigated), while the vast majority—84 percent, or 154 million—lived in rainfed areas. Fan and Hazell also classified the rainfed areas as high- or low-potential based on climate and soil data for each agroclimatic zone. On this basis, 76 million people, or 41 percent of all of India's rural poor,

Table XI.1: Changes in Rural Poverty by Type of Regions in India 1972, 1987, and 1993

	Irrigated Areas	Rainfed Areas		
		Total	High Potential	Low Potential
Number of Poor (Millions)				
1993	30	154	78	76
1987	35	167	79	88
1972	37	155	80	75
Percentage of Poor in Total Population (%)				
1993	28	39	44	36
1987	32	46	48	44
1972	39	52	59	47

Source: Fan and Hazell (1999).

Note: Only 47 agroclimatic zones (of total 65) are included in the calculation due to data unavailability. An agroclimatic zone is defined as rainfed if less than 40 percent of the total cropped area is irrigated, and as irrigated if irrigated share is over 40 percent.

lived in low-potential rainfed areas in 1993. That same year, the incidence of rural poverty as a percentage of the total population was also higher in the rainfed areas; (39 percent in rainfed as compared to 28 percent in irrigated areas), though it was higher in the high-potential rainfed areas (44 percent) than in the low-potential rainfed areas (36 percent). Table XI.1 also shows the corresponding poverty data for earlier years of 1987 and 1972. Despite the fact that India's total rural population increased by about 50 percent between 1972 and 1993, the total number of rural poor declined a little (from 192 million in 1972 to 184 million in 1993). Virtually all the reduction occurred in irrigated areas, and there was very little change in the number of poor in either type of rainfed area. But because of population growth, the poor represented a declining proportion of the total rural population in irrigated and rainfed areas.

Similar poverty data are currently being compiled for the PRC by Shenggen Fan at IFPRI. Tentative estimates are that 43 percent of the total rural poor live in regions that can best be characterized as low-potential agricultural areas (Fan, personal communication).

Poverty and Productivity in the LFAs: Evidence of Links

Further confirmation of the high concentration of poverty in LFAs comes from the analysis by Sharma et al. (1996) of the relationship between the incidence of malnourished children and the CGIAR's agro-ecological zones (AEZs). For Asia, the highest incidence of malnourished children (62 percent) occurs in the warm semi-arid tropics, where food production per hectare and per person are the lowest. The incidence of malnutrition is lowest (20 to 25 percent) in the cooler sub-tropical AEZs, where food production per person is among the highest of all AEZs. In most of the semi-arid and subhumid AEZs (with productivity levels between these extremes), the incidence of childhood malnutrition runs at about 45–50 percent. More evidence from India comes from Hossain (1995), who shows a strong and negative correlation between foodgrain yield and the incidence of poverty across states. Poverty is especially acute in regions where foodgrain yields have remained low, such as Bihar, Orissa, and Madhya Pradesh.

Many LFAs with lower agricultural production have also seen that production grows more slowly than in irrigated and high-potential rainfed areas. Hossain (1995), for example, reports that most of Asia's growth in rice production in recent decades has arisen from yield growth within irrigated areas and from expansion of irrigated areas. There has been relatively little growth, by contrast, in rainfed, particularly upland, rice-growing areas. From 1964–93, yields grew by 2.1 percent per year on average in intensively irrigated areas (more than 50 percent irrigated), but in largely rainfed areas (less than 50 percent irrigated) they grew by only 1.2 percent per year. Yields actually grew more slowly than population in the rainfed areas, and to compensate, farmers expanded their cultivated rice area at a faster rate in the rainfed than in the irrigated areas (0.5 percent compared to 0.3 percent). Even so, production grew at only 1.7 percent per year in the largely rainfed areas compared to 2.4 percent in the mostly irrigated areas. Current rice yields exemplify the widening disparities among regions: irrigated areas yield about 5.0 t/ha of rice, compared to 2.3 t/

ha for rainfed lowlands, 1.5 t/ha for flood-prone areas, and 1.1 t/ha for upland areas. Since the low-yielding areas (flood-prone and rainfed uplands) account for about one third of Asia's total rice area (Crosson 1996), or 31 million ha, the gap has important implications for large numbers of rural people.

In India during 1992–94, total agricultural production per hectare (including crop and livestock production) in the low-potential rainfed areas was only 40 percent of that in the irrigated areas and 46 percent of that in the high-potential rainfed areas (Fan and Hazell 1999). The gap between irrigated and low-potential rainfed areas has changed little since 1970 because agricultural production grew at similar rates in both types of areas (2.26 and 2.68 percent per year, respectively). But the gap between low- and high-potential rainfed areas has widened; in 1970, total agricultural production per hectare in the low-potential rainfed areas was 66 percent of that in high-potential rainfed areas, but in 1992–94 it was only 46 percent as large. These gaps seem destined to widen; since 1990, low-potential rainfed areas have undergone an apparent slowdown to 1.9 percent growth per year in agricultural production, while both irrigated and high-potential rainfed areas have seen slightly higher agricultural production growth rates (2.6 and 3.6 percent per year, respectively).

In another worrying trend, labor productivity has grown much more slowly in the low-potential rainfed areas than elsewhere in India, averaging only 0.25 percent per year since 1970 (Fan and Hazell 1999). Since wage rates and per capita incomes are highly correlated with labor productivity, this trend does not bode well for the future welfare of the rural poor in these regions.

Environmental Degradation in the LFAs: Outcome of Low Productivity and Expansion of Cropped Area

The low baseline productivity and slower growth rates of the LFAs lie behind a good part of the continuing and sometimes worsening poverty and food insecurity problems

there. With continuing population growth and a scarcity of good land, cropped area can only be expanded by encroaching into forested and woodland areas and onto steeper slopes, with increasing soil erosion (see, for example, Zeigler, Hossain, and Teng 1994; Penning de Vries et al. 1998; Scherr and Hazell 1994). Soil erosion contributes not only to lower yields on site but also to siltation problems downstream, reducing the capacity and productivity of reservoir and irrigation schemes and thereby affecting an even broader area. Likewise, deforestation in upper watershed regions can also have broader effects, for example by contributing to flooding problems in lowland areas.

These problems are already serious in many "hot spot" areas in Asia such as the foothills of the Himalayas, sloping areas in southern PRC and Southeast Asia, and the forest margins of Indonesia, Malaysia, Viet Nam, Cambodia and the Lao PDR (Scherr and Yadav 1995). This kind of degradation can result in high economic costs. One study of soil erosion in Java, for example, estimated the economic costs at between US$340 million and US$406 million per year, of which about 90 percent were on-site costs and 10 percent were downstream damages from siltation (Magrath and Arens 1989). Unfortunately, few reliable studies of this kind have been undertaken, and while there are good reasons to be skeptical about some of the available estimates of the extent and costs of land degradation in Asia (see Chapter VIII and Crosson and Anderson 1992), there are, nevertheless, good reasons to expect that the problems are most severe within the LFAs themselves.

RETURNS ON PUBLIC INVESTMENTS IN THE LFAS

The amount of public investment that can be justified in any region should depend on the net social returns realized through productivity growth, poverty reduction, and the containment of environmental degradation. While investments that contribute to all three of these goals ("win-win-win"

outcomes) are generally better, an investment that involves some tradeoff among these social goals may also be attractive, providing any sacrifice of one goal is adequately compensated by gains in others.

Returns on Investment in High-Potential Areas: New Realities Challenge Conventional Wisdom

Conventional wisdom suggests that the productivity returns on investment are highest in irrigated and high-potential rainfed areas, and that growth in these areas also has substantial trickle-down benefits for the poor, including those residing in the LFAs. Even though investing in LFAs might have a greater direct impact on the poor living in those areas, it is argued that investments in high-potential areas give higher social returns for a nation than investments in low-potential areas and a more favorable impact on poverty in the long run. The logic behind this position is as follows: investment in high-potential areas generates more agricultural output and higher economic growth at lower cost than in less favored areas. Faster economic growth leads to more employment and higher wages nationally and greater agricultural output leads to lower food prices, both of which are beneficial to the poor. LFAs will benefit from cheaper food, from increased market opportunities for growth, and from new opportunities for workers to migrate to more productive jobs in the high-potential areas and in towns. Fewer people will try to live in less favored lands; this will help reduce environmental degradation and increase per capita earnings. Migrants may also send remittances back to LFAs, further increasing per capita incomes there, especially for the poor.

Many of the expected benefits arising from rapid agricultural growth in high-potential areas have been confirmed in Asia (Pinstrup-Andersen and Hazell 1985; Hazell and Ramasamy 1991; David and Otsuka 1994). Nevertheless, the rationale for neglecting the LFAs is being increasingly challenged by a) the failure of past patterns of agricultural growth to resolve growing poverty, food insecurity, and

environmental problems in many LFAs; b) increasing evidence of stagnating levels of productivity growth and worsening environmental problems in many high-potential areas that make further investments less attractive (see Chapter V and Pingali and Rosegrant 1994); and c) emerging evidence that the right kinds of investments can increase agricultural productivity in many LFAs to higher levels than previously thought.

It now seems plausible that increased public investments in many LFAs may have the potential to generate competitive if not greater agricultural growth on the margin than comparable investments in many high-potential areas, at the same time having a greater impact on the poverty and environmental problems of the LFAs to which they are targeted. If so, then additional investments in less favored areas may actually give higher aggregate social returns to a nation than additional investments in high-potential areas. In fact, they might even offer "win-win-win" possibilities.

Productivity and Poverty Impact of Investment in LFAs: Emerging Evidence

There have been few rigorous attempts to test these competing hypotheses, hence a recent study completed by IFPRI is of relevance (Fan and Hazell 1999). This study analyzed the growth and poverty-alleviation impact of alternative types of investments in high- and low-potential areas in India over recent decades (environmental data were not available). India provides a good example because past public investments have been biased towards high-potential areas, and the remarkable productivity gains achieved in those areas (which have led to national food surpluses) can now be juxtaposed with the lagging productivity, widespread poverty, food insecurity, and environmental degradation that exist in many less favored rainfed areas.

The study combined data on cross-sections (districts for production and agroclimatic zones for poverty) and time series (annually from 1970 to 1993 for production, and 1972, 1987 and

1993 for poverty) to estimate an econometric model that included production and poverty functions. These functions included, among other things, public-investment variables on the right-hand side. This enabled calculation of the marginal contribution of an additional unit of investment in each type of infrastructure to agricultural production and poverty alleviation. The model was estimated for three different types of lands: irrigated, high-potential rainfed, and low-potential rainfed. Table XI.2 summarizes the key results.

For every investment, the highest marginal impact on production and poverty alleviation occurs in one of the two rainfed lands, while irrigated areas rank second or last. Moreover, all types of investments in low-potential rainfed lands, except regulated markets, give some of the highest production returns and have some of the most favorable impacts on poverty. These results provide strong support to the conjecture that more investment should now be channeled to LFAs in India.

More specifically, the marginal impact of high-yield varieties (HYVs) on production is much larger in high- and low-potential rainfed areas (243 and 688 rupees per hectare of HYVs adopted, respectively) than in irrigated areas (63 rupees per hectare). HYVs also contribute more to poverty alleviation in rainfed areas; another hectare of HYVs raises 0.02 and 0.05 persons above the poverty line in high- and low-potential rainfed areas, respectively, compared to no measurable poverty impact in irrigated areas. Roads have sizeable productivity impacts in all three types of areas, but a much larger impact on poverty alleviation in rainfed areas, particularly the low-potential rainfed lands. Rural electrification and education have their biggest productivity impacts in rainfed areas; they also impact favorably on the poor in these areas. Their impacts in irrigated areas are very small. Canal irrigation has its biggest productivity and poverty impacts in high-potential rainfed areas, while private irrigation has its biggest impacts in low-potential rainfed areas. These results seem consistent with the relative water endowments of the two types of rainfed lands; there is little surface or groundwater to capture through private

Table XI.2: Marginal Returns to Infrastructure and Technology Inputs by Type of Region, India, 1994

		Irrigated	High-potential Rainfed	Low-potential Rainfed
Returns to Production (1990 prices)				
HYV	Rps/Ha	63	243	688
Roads	Rps/Km	100,598	6,451	136,173
Markets	Rps/Number	(276,745)	7,808,112	(4,794,073)
Canal Irrigation	Rps /Ha	938	3,310	1,434
Private Irrigation	Rps/Ha	1,000	(2,213)	4,559
Electrification	Rps/Ha	(546)	96	1,274
Education	Rps/Labor	(360)	571	102
Returns to Poverty Reduction				
HYV	Persons/Ha	0.00	0.02	0.05
Roads	Persons/Km	1.57	3.50	9.51
Markets	Persons/ Number	(2.62)	537.79	(312.72)
Canal Irrigation	Persons /Ha	0.01	0.23	0.09
Private Irrigation	Persons/Ha	0.01	(0.15)	0.30
Electrification	Persons/Ha	0.01	0.07	0.10
Education	Persons/ Labor	0.01	0.23	0.01

Source: Fan and Hazell (1999).

Notes: Numbers in parentheses are negative; in most cases they are not statistically significant.

investment in low-potential areas because of their low rainfall. Market development has a huge marginal impact on production and poverty alleviation in the high-potential rainfed areas, but not in irrigated and low-potential rainfed areas.

It should be noted that the marginal impact of different investments is reported gross of their costs. It could be argued that some investments are more expensive to undertake in the LFAs, because of the diverse and generally less favorable agro-ecological conditions. The development of HYVs for less favored areas, for instance, may be more difficult, and widespread adoption more constrained by the diversity of growing conditions, than past experience with high-potential areas, if extrapolated to low-potential areas, might suggest. Investments in roads and other infrastructure may also be more costly per kilometer in many less favored lands because of difficult topographical conditions or remoteness from major population

centers or markets. But data obtained at the state level for India (Fan, Hazell, and Thorat, 1998) suggest that the unit costs of key investments are not all that different across states, despite considerable diversity in the proportions of their irrigated and rainfed areas.

STRATEGIES FOR DEVELOPING LFAS: RECOGNIZING COMMONALITY AMID DIVERSITY

Many past attempts to develop LFAs in Asia (for example, integrated rural development projects and watershed-development projects), including a good deal of agricultural research undertaken by national and international agricultural research centers, were not very successful. The reasons for this are complex, but include

- inappropriate macro, trade and sector policies that penalized agriculture;
- insufficient levels of investment in agricultural research in LFAs and research of the wrong type;
- insufficient investments in rural infrastructure and human capital targeted on LFAs;
- inappropriate development strategies that were too top-down; and
- poor performance by, and coordination among, many public-sector institutions working in LFAs.

Structural-adjustment programs and market-liberalization policies have created a more enabling economic environment for the development of many LFAs, although recent reductions in government budgets as a result of macro-economic policy reforms and the economic crisis are also constraining the needed expansion of public investment in these areas. But future investments in LFAs need to be based on new or improved paradigms for sustainable development.

LFAs are very diverse in their agroclimatic conditions and hence in their potential for agricultural growth. In some areas agricultural development may not be an economically viable alternative, and solutions will have to be sought through development of the rural nonfarm economy and through accelerated out-migration. Possibilities for achieving these alternatives are most promising when the national economy is growing rapidly and when agriculture has become a relatively minor share of national income and employment (as in many of the fast-growing East and Southeast Asian economies). Prospects are much less promising in slow-growing and predominantly agrarian economies, since the rural nonfarm economy is then constrained by local demand for its output, which is in turn constrained by the level of per capita incomes. Without agricultural growth, incomes in these areas remain low and the demand for rural nonfarm goods and services remains stagnant (Hazell and Reardon 1998).

Migration and nonfarm diversification will also have to play an important role in the long run for most types of LFAs if their per capita incomes are to keep pace with rising national living standards. This longer-term view needs to be kept in mind when strategies for the short to medium term are being developed, particularly when those strategies are focused on alleviating poverty and environmental problems. Policymakers need to avoid inadvertently locking too many people into marginal areas where their long-term prospects are limited.

But for many less favored lands, agricultural intensification must be a key component of their development strategy, particularly over the next few decades while the number of people living in these areas continues to grow. But because of poor infrastructure, low to moderate yield potential, fragile soils, and high climate risk, the strategy will typically need to be different from the green-revolution approach adopted in irrigated and high-potential rainfed areas.

Agricultural development strategies need to be tailored to local agroclimatic conditions and to the social and economic conditions that determine the type of development pathway that local communities are best suited to follow (Pender, Place,

and Ehui 1998). There are no "one-size-fits-all" approaches. Nevertheless, some common elements of appropriate development strategies can be identified.

Promote Broad-Based Agricultural Development

Broad-based agricultural development that reaches small and medium-sized family farms as well as larger commercial farms should be promoted. There are few economies of scale in agricultural production in developing countries (unlike many agricultural processing and marketing activities), hence targeting family farms is attractive on both equity and efficiency grounds. Broad-based development strategies require that small and medium-sized farms receive priority in publicly funded agricultural research and extension and that they obtain adequate access to markets and credit and input supplies. These requirements demand special attention at a time when markets and agricultural services are being privatized, since the high transport costs and thin markets of many LFAs do not make them attractive to private agents. Special attention must also be given to women farmers, who have traditionally been discriminated against in their access to resources and improved technologies, credit and farm inputs.

Improve Technologies and Farming Systems

Because of the poor infrastructure, low yield response and high climate risk in many LFAs, the intensive use of modern inputs like fertilizers is unlikely to be economical. Monocrop farming systems, moreover, can be environmentally destructive as well as very risky. Agricultural researchers and farmers need to step back from narrow commodity approaches and take a more holistic approach to improving resource-management practices at the farm and landscape levels. These may need to include a) management at the watershed level of water catchment and use and soil erosion control; b) improved soil moisture and fertility

management, including improved crop rotations and intercropping and better integration of farm trees and livestock into cropping systems to generate and recycle plant nutrients; and c) more rational exploitation of favorable niches in the landscape for production of high-value crops and trees (Scherr and Hazell 1994). This will require that research be more multidisciplinary, more site-specific, and more responsive to farmer (both men and women) and community needs.

Ensure Equitable and Secure Access to Natural Resources

The distribution of land is often quite inequitable in the LFAs, land leases tend to be short term and insecure, and the incidence of landlessness is high. The poor are also dependent on access to common property resources (for example, woodlots, grazing areas, and wetlands) to supplement their incomes, yet these resources are increasingly being degraded as more people use them and the ability of local organizations to regulate and manage their use erodes. These problems affect poverty and economic development in a number of ways. For example, uneven access to land can prevent the most efficient allocation of land, labor and other inputs, with too much land tied up in the hands of larger, less efficient producers and away from more efficient smallholders. Insecure tenure inhibits land-improving investments and may encourage unsustainable farming practices. Land access is highly correlated with poverty and households with even the smallest holdings face a much lower risk of absolute poverty than landless households (Mearns 1999).

Land-reform programs are politically difficult to implement and have not been very successful in redistributing land to the poor. Market-assisted land redistribution offers a new and potentially promising way of avoiding the usual political barriers to achieving such change (Van Zyl, Kirsten, and Binswanger 1996). Efficient land-lease markets can also help offset many of the worst effects of an inequitable distribution of land ownership. Unfortunately, land leasing is often

discouraged by government policy; in India, for example, many states discourage land leasing and some even outlaw it altogether, an outgrowth of "land-to-the-tiller" movements that have sought to protect farmers' rights to their land. While such laws rarely succeed in eliminating all land leasing, they do constrain its volume and, by forcing its concealment from the authorities, lead to short-term leases with little protection for the tenant. There is a need to reform these policies. Mearns and Sinha (1999) suggest opening up land-lease markets in combination with the credible enforcement of land-ceiling laws and clearly defined, enforceable lease contracts.

At the same time, land fragmentation is often cited as a constraint to agricultural development (for example, Singh 1990), but evidence shows that it performs a useful role in helping farmers spread risk in rainfed areas with variable microclimates (Ballabh and Walker 1992; Blarel et al. 1992). Consolidation programs have not made any headway in rainfed areas and are not likely to be a useful investment.

Farmers also need assured long-term access to land if they are to pursue sustainable farming practices and to make long-term investments in improving and conserving resources (such as tree planting, continuous manuring, and terracing and contouring for soil and moisture conservation); see, for example, recent work by Otsuka, Suyanto, and Tomich (1997) and Pender and Kerr (1996). Feder et al. (1988) have demonstrated the value of land titles in areas where property rights are insecure, such as in newly settled areas.

Many resources are owned and managed as common properties in less favored lands because this provides a more effective way to share risks and to ensure equitable access to resources by all members of the community. If these resources are to remain common properties and are not to be privatized or overexploited, effective local organizations are needed to manage them. Often, governments have undermined indigenous institutions by nationalizing important common-property resources, such as forests and rangelands. Public institutions have then failed to manage these resources effectively and they have degenerated into open-access areas. The most successful

institutions for managing common properties are local organizations dominated by the resource users themselves.

Conserving or improving natural resources often requires collective action by groups of users even when the resources are not commonly owned. Examples include organizing adjacent farmers in a landscape to invest labor in land terracing, bunding or water catchment, or for biological pest control. Organizing farmers into effective and stable groups for collective action is difficult and success is conditioned by a range of physical, social, and institutional factors (Uphoff 1986; Ostrom 1994; Rasmussen and Meinzen-Dick 1995). Collective action is facilitated if there is a smaller number of users, if there is homogeneity of members in terms of shared values and economic dependence on the activities of the group, and if the net benefits from group membership are substantial and equitably distributed. Institutional design is also important. Ostrom (1994) has identified seven design principles for effective local organizations:

- a clear definition of the members and the boundaries of any resource to be managed or improved;
- a clear set of rules and obligations adapted to local conditions;
- the ability of members to modify those rules collectively in response to changing circumstances;
- adequate monitoring systems; with
- enforceable sanctions, preferably graduated to match the seriousness and context of the offense;
- effective mechanisms for conflict resolution; and
- the protection of the organization, if not its empowerment or recognition by government authorities, against being challenged or undermined by those authorities.

Policymakers can facilitate more effective community management by

- legitimizing the ownership rights of the group;
- providing institutional options for resolving disputes, particularly with outsiders; and
- recognizing the role of some NGOs in helping local organizations to manage common-property resources.

Ensure That Risks Are Managed Effectively

Risk management is important in all rainfed environments, but the problems are most severe in low- and high-rainfall areas that are susceptible to catastrophic droughts and floods. The economic problems resulting from climate risks are the most severe in areas where poverty is widespread and the regional economy is heavily dependent on agriculture. Risk of crop or livestock losses due to bad weather, pests, or diseases can discourage investments by farmers in land improvements and adoption by them of productivity-enhancing technologies.

Agricultural research can help reduce risk, for example, by improving drought or pest resistance in crops or developing better ways to conserve soil moisture. Additionally, governments may need to assist farmers in coping with catastrophic losses, particularly losses arising from risks that affect most farmers in a region at the same time (drought, for instance), and to provide effective safety-net programs and credit and insurance markets. Care should be taken in designing such interventions, however, for if heavily subsidized, they can all too easily lead to changes in farming practices that increase the dependence of the beneficiaries on subsidized assistance in the future. Subsidized drought insurance, for example, increases the profitability of risky farming practices beyond their true economic value and encourages their adoption, even though this may lead to greater financial exposure in future droughts, as well as to resource degradation.

Agricultural insurance has often appealed to policymakers as an instrument of choice for helping farmers and agricultural banks manage climate risks like drought; many countries in Asia spend large sums of public money each year on such insurance. But the experience has generally not been favorable (Hazell, Pomareda, and Valdés 1986; Hazell 1992). Publicly provided crop insurance has without exception depended on massive subsidies from the government and even then, its performance has been plagued by moral-hazard problems associated with many sources of yield loss, by high administration costs, by political interference, and by the difficulties of maintaining the managerial and financial integrity of the insurer when government underwrites all losses (Hazell 1992). Nor has crop insurance been able to reach the poorer farmers or to assist nonfarm members of rural communities who also suffer in catastrophic agricultural years (among them landless laborers, agricultural traders, and shopkeepers). Area-based yield insurance may offer a better alternative, and has recently been tried in India with some success (Mishra 1996). Unfortunately, it remains very costly to the government, because the premium rates are set far too low in relation to costs. It is also unnecessarily restricted to farmers who grow the insured crops. A more promising approach would be area-based insurance based on rainfall rather than yield. This could be a useful risk-management aid to all kinds of rural households and could be simpler and cheaper to operate than area-yield insurance schemes (Hazell 1992).

Invest in Rural Infrastructure and People

LFAs are often poorly placed to compete in liberalized markets because of their restricted access to markets and high transport and marketing costs. The public sector has an important role to play in building and maintaining roads in these areas and in promoting expansion of private transport, marketing, input supply, and financial services that are competitively priced. Investments in electricity and telecommunications are also needed if the private sector is to grow. Investments in clean water and the education and health

of local people not only increase their productivity in agriculture, but enhance their opportunities to diversify into nonfarm activities, including out-migration to better-paying jobs. The results from the Fan and Hazell (1996) India study summarized above show that these kinds of public investments in less favored lands can yield favorable growth as well as poverty alleviation payoffs. As such, these investments do not have to be a net drain on the national economy.

Investment in rural infrastructure should be closely linked to other agricultural policies (such as development strategies and provision of credit) as well as to other sectoral programs in education, health, and communications. Priorities for targeting investment by geographic area and type of infrastructure should be guided by at least three criteria: population density, agricultural development, and potential market integration (Wood 1998; Pender, Place, and Ehui 1998).

Provide the Right Policy Environment

Market reforms, including price and trade liberalization, are necessary to ensure that prices provide the right production signals to farmers and that production and input markets can be competitive and work well. Available evidence suggests that, prior to recent reforms, LFAs were typically penalized along with the rest of the agricultural sector by distorted macro, trade and sectoral policies (see Chapter VII). As a result, many of the ongoing policy reforms have improved the terms of trade for less favored areas and have increased their market opportunities.

In order to take advantage of these new opportunities, however, adequate investments in rural infrastructure are needed to improve market access and to reduce transport and marketing costs. If market reforms are not matched by appropriate levels of investment in local infrastructure, they can actually be quite destructive for many rainfed areas. For example, market reforms have reduced the availability of inorganic fertilizers and increased their costs in many backward areas; the resulting reduction in their use (often from modest

levels to begin with) is now contributing to worsening soil fertility problems. The associated reduction in food production also adds to the food insecurity problems of the poor. Transitional policies, sometimes including targeted subsidies, may be necessary in some LFAs to manage some of the negative impacts of market reforms, at least until such time as the required infrastructure investments have been made.

Strengthen Public Institutions

Many of the public institutions that service agriculture and rural areas have tended to neglect LFAs; moreover, they are often poorly positioned to address the unique problems of these regions. Agricultural research and extension systems, for example, have been structured to serve the needs of irrigated and high-potential rainfed areas, and while reasonably efficient at promoting green-revolution technologies in these areas, they are much less able to deliver the kinds of multidisciplinary or farmer-oriented natural-resource management approaches needed in most LFAs. Similar biases have existed in rural credit and insurance institutions. Public agencies with resource mandates (such as forestry and rangeland departments), on the other hand, have often been very active in LFAs, but have taken top-down approaches to the management of these resources. Not surprisingly, by excluding local users from any real stake in the ownership and management of these resources, these approaches have resulted in resources being exploited and degraded, while the relevant public departments are hamstrung by their inability to regulate resource use effectively on the ground.

The development of LFAs will require significant changes in the objectives and operational modalities of many public agencies. More participatory approaches that build on the interests and abilities of local people to manage resources are needed; this calls for very different incentive structures within public institutions, with greater accountability to intended beneficiaries.

Another problem that has plagued the effectiveness of public institutions has been their seeming inability to coordinate relevant activities in rural areas. Key functions are compartmentalized within different ministries and at different levels (local, regional and national) of government; only rarely is there an effective institutional mechanism for coordinating their plans and activities. Integrated development projects attempted to overcome this problem, but with few exceptions, they failed to move the coordination beyond the planning stage. Coordination units at the highest level of government (as in the prime minister's office) have rarely worked in practice; more effective solutions probably require greater devolution of authority to local governments.

CONCLUSIONS

In order to promote economic growth and redress poverty and environmental problems, Asian policymakers will need to pursue appropriate and sustainable methods of agricultural intensification for both high- and low-potential regions. This dual strategy will be particularly challenging if government budgets for investment in agriculture and rural areas continue to remain tight; striking the right investment balance between irrigated and rainfed regions, and between high- and low-potential rainfed areas, will be particularly important. Investments in irrigated and high-potential rainfed areas cannot be neglected, because these areas still provide much of the food needed to keep prices low and to feed growing urban and livestock populations.

On the other hand, the poverty, food-security, and environmental problems of many less favored areas are likely to remain serious in the decades ahead as populations continue to grow. While out-migration and economic diversification should become increasingly important in the development of areas with low agricultural potential, agricultural intensification will often offer the only viable way of raising incomes and creating

employment on the scale required in the near future. Even when the investments needed to achieve this growth yield lower economic returns than investments in high-potential areas, they might still be justified on the basis of their significant social benefits in the form of poverty alleviation and improved environmental management. Moreover, with worsening income disparities between many favored environments and LFAs, policymakers are likely to come under increasing pressure to invest more in low-potential areas.

The size of the potential tradeoffs between investing in favored environments and LFAs has yet to be widely quantified in Asia and it is possible that it may be changing. Productivity levels in many high-potential areas have reached a plateau, while at the same time recent agricultural research in some low-potential rainfed areas is suggesting new avenues for increasing these regions' productivity (Scherr and Hazell 1994). Results from an IFPRI study of the returns on public investment in India raise the tantalizing possibility that greater public investment in some LFAs could actually offer a "win-win" strategy for addressing productivity and poverty problems.

The successful development of less favored lands will require new and improved approaches, particularly for agricultural intensification. These will require stronger partnerships than needed in high-potential areas, between agricultural researchers and other agents of change, including local organizations, farmers, community leaders, NGOs, national policymakers and donors. It will also require time and innovation; new approaches will need to be developed and tried on a small scale before they are scaled up and their testing will take time to assess and evaluate, particularly given the noise introduced by climatic variability. All this will require patience and perseverance on the part of policymakers and donors, perhaps more than the current aid culture allows.