

VI CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

To date, the green revolution has enabled increased food production through a package based on HYVs that are responsive to fertilizers and good water control. However, an investigation into production trends in Asia has found that the rates of production growth and yield growth of major food grains are showing declining trends. These trends are most obvious for rice, Asia's most important staple crop. This does not mean that the potential for further growth is necessarily exhausted. Wheat and maize still have a substantial capacity for further productivity gains. Their yield growth rates are still robust even after a recent slow down. For these three crops, considerable potential also exists for productivity gains to be achieved through increased efficiencies from improved crop management.

Increases in yield potential, however, may not necessarily translate into yield growth unless they are accompanied by an increase in net returns. Profitability or net returns from food crops has dwindled over time, driving farmers to alternative crops with higher margins, such as oil crops, fruits, vegetables, and sugar cane. Although this may not affect the overall productivity of Asia's cropping systems, it will certainly lead to a decline in food grain production.

In the livestock sector, especially the monogastric sector, production has been market driven. However, growth has been particularly rapid in urban centers and has resulted in an

intense concentration of production units in peri-urban centers, increasing pollution and health risks to the extent that long-term growth may not be sustainable. There is a role here for the public sector to coordinate production so that waste discharges can be recycled as an energy source or be put to more efficient uses.

The outlook is bleak for marine fisheries. Although growth has been strong, the long-term sustainability, especially that of coastal fisheries, is greatly threatened by overfishing and pollution. Coastal and inland aquaculture is threatened by pollution from outside sources. Coastal aquaculture, especially shrimp farming, may itself undermine the sustainability of other agricultural systems if not properly managed. In addition, inland aquaculture is constrained by the limited availability of water of suitable quality.

Environmental degradation related to agriculture is a product of technological and policy failures. High-input technology creates onsite second-generation effects, but they can be corrected by improved RD&E. In LFEs, the lack of appropriate technology is a major source of environmental degradation. A lack of appropriate policies and institutions and lax law enforcement are the main sources of external costs and the wasteful use of resources.

Second-generation problems related to the high-input technology package, as well as negative impact on human health and the environment, are also perceived as being detrimental to future growth. Intensification-induced declines in productivity growth have been suggested as a possible threat to future growth in crop production. Many of these problems, however, can be solved by improving field-level knowledge, better crop management, and better communication between farmers and R&D officials. The achievement of sustainable agriculture will also require that the current mode of crop-based and laboratory-oriented R&D is adapted to field- and farmer-based technology transfer systems. Agricultural R&D and technology transfer will have to be sufficiently adaptive and responsive to deal effectively with these problems as they arise. This becomes even more challenging when dealing with

agriculture in LFEs, which have only marginally benefited from the green revolution to date.

The sustainability of Asian agriculture will also depend on the prudent use of natural resources and careful consideration for the environment. The natural resource base of Asia is now under great stress, and this will become even greater as the population continues to increase. Investment in environmentally sensitive technology is needed to ensure sustainability. The current constraints related to natural resources are not the results of limits in supply but rather are managerial and institutional problems. The solutions to the current problems in sustainable agriculture no longer simply lie in technology, but also in institutional reform.

Sectoral policies, especially policies related to natural resources, are outdated and lag behind the socioeconomic changes that have altered the patterns of resource use. For example, throughout Asia water-resource management has been fragmented and project based. Both surface water and groundwater are mostly under open-access regimes that encourage wasteful usage, which in turn may lead to waterlogging and salinity problems. Water pricing has been adopted by many Asian countries, but mainly for the purpose of paying for the operation and maintenance costs of irrigation only, rather than as a basis for allocation purposes. Removing policy distortions and institutional constraints in the natural resource sector, while at the same time promoting participatory management, is key to developing the long-term sustainability of both the agricultural and the agri-based sectors.

Some of Asia's crop production is on fragile land. The mismanagement of fragile lands leads to rapid degradation (e.g. soil erosion, salinization, waterlogging, desertification) and is often not just due to simple mistakes of farmers, but is symptomatic of a set of complex social, economic, and ecological problems. Failures of national policies, trade, and investment, as well as sectoral regulations such as on soil erosion control, have all contributed to the degradation of natural resources and the environment. In the past, except for the socialist countries that have adopted market-based reforms, most Asian

governments opted for technical solutions. These are only a partial answer to the problems; policy and institutional reforms are necessary to tackle the problems in their entirety. In addition, the issue of poverty has not been appropriately addressed. Rather, it has been used as an excuse for handout policies or to implement price guarantee projects designed to win political support.

In the past, technology was used to circumvent the need for reforms that may have been economically and socially desirable but politically impractical. In the future, appropriately designed technology will remain a very important tool, but it cannot solve all the problems and sometimes creates problems of its own, especially when misused. More importantly, the green revolution has ignored LFEs, which make up a large part of agriculture in Asia. A wider and deeper understanding of the complex relationships between nature, technology, and institutions is necessary. For example, it must be remembered that a discovery of a sustainable agricultural cropping system does not by itself guarantee sustainable agriculture. It is sustained good governance that will result in performance that meets economically and socially desirable objectives.

STRATEGIES FOR SUSTAINABLE AGRICULTURE

Outlined here are prioritized strategies and sectors needed to achieve the long-term vision of greener growth and a hunger-free Asia, together with the necessary policy and institutional reforms to implement them. Other recommendations, mentioned or implicit in the earlier chapters, are included in Annex B. The policy and institutional reforms that are also necessary for the effective implementation of the proposed strategies are discussed. Three strategies are presented. They highlight the adjustments needed in the current directions of agricultural development. The first strategy calls for sustained support for investment in agricultural technology, requiring adjustments in the objectives and methods for both high

potential areas and LFEs. The second strategy focuses on LFEs and the need to incorporate institutional considerations, and on immediate ecosystem concerns. The third strategy highlights comprehensive river basin management, which will optimize both production and conservation objectives.

Strategy for Integrative Technology Production and Transfer

The analyses in this volume suggest that a new push for increased productivity, and hence a sustained investment in agricultural research, are necessary. This is especially so for rice for which there are early warning signs of weakening sustainability. This is important for policymakers in international agencies and national governments to recognize, particularly in the PRC where expenditures on agricultural research have declined. However, the increased and sustained support required will be effective, and will achieve both increased productivity and sustainability, only if the existing system of technology production and transfer is modified.

Much of the new growth will have to come from increasing the efficiency of the cropping systems, where there are still considerable opportunities for further productivity gains. The causes of existing inefficiencies are often complex, and cannot be overcome by simple, broad-based solutions (i.e. ready recipes) prescribed in a top-down method in the manner of the widely adopted HYVs.

To achieve sustainable development, a three-pronged approach to agricultural technology production and technology transfer is recommended: management for sustainable agriculture needs to be 1) oriented around natural resources and the environment (NRE), 2) participatory, and 3) based on science. Putting NRE objectives at the fore does not mean that output maximization is no longer an objective. Output must be maximized but full recognition needs to be given to NRE constraints and consequences. Participation means that there must be two-way communication between extension workers

and farmers, and between production-oriented and conservation-oriented agencies. Local knowledge and social capital must be harnessed. This does not mean that the agricultural system will be less scientific in its approach. In fact, it means that the system will be more science and technology based, bringing science to the fields and adapting it to better benefit local users. It means that successful systems will be less centered around a particular crop and more oriented to particular locations.

Asia's most productive land is already being intensively cropped. There is usually more than one or even two crops per year. High inputs are used that provide high yields, which results in high rates of nutrient removal from the soil. New problems that will threaten sustainability are inevitable. Location-specific solutions will have to be devised for each situation. Considerable gaps remain between the yields produced at experimental stations and those produced on farms located in favorable environments. There is already a readily discernable yield gap separating the more favored and the less favored environments. More emphasis will have to be given to crop management R&D and biotechnology. This will require capacity building for local research facilities and development. Environmental impact assessments should be included as part of the technology assessment, as well as for management practices such as crop management.

The above suggestions require nothing less than institutional innovations that will incorporate the all-important feedback mechanisms between the technological innovators and the technology users. Future development strategies will have to emphasize knowledge-based production systems that focus on users rather than researchers. The experience of agricultural extension in the PRC could be emulated and adapted. Productivity increases can be enhanced by fine-tuning activities rather than by large-scale public investment programs.

Research objectives will have to focus more on cost aspects that emphasize a reduction in the use of chemicals and fossil fuels, as well as of renewable natural resources. New plant

breeding innovations and biotechnology offer opportunities for sustained increases in yield and for prevention of crop losses from pests and diseases, but require input from existing genetic resources and a free flow of genetic material.

The current multilateral genetic exchange system has functioned relatively well, although the US Patent for basmati rice lines and grains has created a feeling of mistrust and unfairness among providers of genetic resources. An international management system or code of conduct that recognizes and protects traditional or prior users' rights while providing sufficient incentive for private R&D initiatives is required in order to maintain the free flow of genetic material to international research centers.

In place of a simple plant-breeding objective, such as doubling the yield potential by modifying the plant type, crop breeding programs now have to be concerned with a diverse range of issues related to gene management. In order that these issues are addressed in an integrated manner, the CGIAR's Third System Review (CGIAR, 1998, p. 26-27) has recommended an "integrated gene management" approach as a basis for activities in international agricultural research centers (IARCs) and national agricultural research systems (NARS), which includes:

- patenting processes for new varieties, and placing their use under free licensing;
- a legal entity that could hold CGIAR patents;
- the conservation of agrobiodiversity and its sustainable and equitable use;
- research on genomics and molecular breeding for the purpose of supporting NARS to enhance the productivity of major farming systems in an ecologically, economically, and socially sustainable manner;
- strict adherence to the equity and biosafety provisions of the Convention on Biological Diversity and national government regulations;

- a central coordinating and servicing unit for advising both IARCs and appropriate NARS;
- a widened food security basket through the inclusion of minor and under-used millets, legumes, tubers, and other crops;
- the use of Mendelian and molecular methods of breeding in an integrated manner;
- an effective public information and communication system, with total transparency and accountability for work in the field of biotechnology; and
- a (CGIAR) system-wide review of plant breeding efforts, with the aim of freeing up resources for new priorities while accelerating the introduction of modern marker-assisted breeding and bioengineering technologies.

The NARS will have to face most of these issues at the national as well as the international level. This expansion in scope means increased demands for research funding and personnel. As recommended for the CGIAR System, there will be attempts to “free up” resources in NARS in order to establish new priorities. Asia-wide discussions and debates on these priorities would be very useful, especially for the smaller NARS.

In addition, biotechnology and genomics will now play a major role in the future growth of Asian agriculture. A considerable proportion of the region’s R&D resources is now being redirected to build biotechnology capacity at the expense of research in other areas. The potential of biotechnology, however, cannot be realized without understanding the genetics controlling important traits. Mechanistic explanations of how certain traits are expressed, especially quantitative traits such as yield, nutrient efficiency, and tolerance to drought, acidity, and salinity, will be essential for the identification of major genes. Asia-wide collaboration and networking in these essential research areas could create significant savings. A sustained level of increased investment in R&D by the public sector along with international support is necessary in areas where biotechnology can benefit small farmers and resource-

poor regions. Otherwise, the fruits of biotechnology research will only be available to wealthy farmers and private corporations, further aggravating income distribution inequities.

Strategy for Less Favorable and Fragile Ecosystems

Asia's less productive cropland has been bypassed by the green revolution. The LFEs are not homogeneous in terms of their characteristics, and include poor and degraded lands in highlands, uplands, and lowlands, with each area having its own particular difficulties. Public policy on improving the livelihood of people in these areas needs to be based on assessments of investment costs and potential returns for each particular location. The first step towards the sustainable development of LFEs would be to classify them according to investment potential. It is imperative, however, that social and environmental goals as well as economic goals be considered in such classification.

In addition to improving traditional food crops, such as cereals and pulses, new development activities might include alternative products such as nuts and palms, berries, fruit, wild game, tree crops, livestock, and fishery activities. Nonfarm and off-farm activities such as ecotourism, agro-processing and manufacturing are also possibilities. Another essential element of any LFE policy is that it should be flexible enough to be able to adopt new institutional and technological changes as these become available, and to be able to respond to new problems as they emerge.

Many of the new innovations that will be necessary for increasing the productivity of LFEs will be highly location specific. Local capacity building is therefore an indispensable component of any effective RD&E effort. Asia-wide R&D, however, still holds some of the most promising returns to public investment for certain major food crops, such as rice, wheat, and grain legumes. This research remains vital because these crops will continue to be the most important production activities in many of Asia's LFEs. It is possible to breed crop varieties that are tolerant of or

adapted to conditions in LFEs, and such solutions would help to increase productivity to a certain extent.

Recent progress in plant breeding is already demonstrating promise for improved rice cultivation in rainfed lowlands (through drought tolerance) and in flood-prone areas (through tolerance to submersion) in many countries. New breakthroughs in breeding for nutrient efficiency, especially for phosphorous in rice and soybean and boron for wheat and pulses, are also occurring. These will not only decrease production costs (by increasing yields while reducing fertilizer use) but also eliminate the need to transfer complicated fertilizer management technology.

The case for breeding boron-efficient wheat provides an example of how potential crop improvements in LFEs might be addressed. Boron deficiency is a real and widespread limitation to wheat production. It can lead to 100 percent yield loss in, e.g. Bangladesh, the southwestern provinces of the PRC, the northeastern states of India, Nepal, and possibly also areas of Myanmar. Farmers with boron-deficient soil are also prevented from adopting newer varieties that are higher yielding and disease resistant but that are more susceptible to boron deficiency. A potential solution has already been identified. Boron efficiency has been found to be a genetically controlled trait in wheat; more efficient varieties can deliver 100 percent grain yield under the same conditions that prevent less efficient varieties from giving any grain yield at all. Also, boron deficiency is a regional problem, which provides the opportunity for economies of scale through an Asia-wide R&D program. The total area affected is some 2–3 million ha, located in small wheat growing countries whose technical capacity is limited (Bangladesh, Nepal, and Myanmar) and in marginal areas in larger countries with greater technical capacity (India and China).

For many situations in the LFEs of Asia and especially in fragile ecosystems, tolerant varieties will only be a small part of the solution. Such situations are generally characterized by one or more of the following conditions: (a) the social and economic circumstances of farmers as well as the physical conditions demand that technical solutions be tailor-made for each specific

case; (b) social and institutional solutions are essential, in addition to and in conjunction with, or instead of, technical solutions; (c) problems require management at a level beyond that of individual farms. Attempts to increase the productivity of cropping systems in a sustainable manner will call for an integrated approach to natural resource management (INRM).

INRM has three important elements: (a) a holistic focus on the entire ecosystem rather than on individual fields; (b) farmer participation in the R&D process; and (c) recognition that social/institutional solutions are often required in conjunction with, in addition to, or instead of technical solutions.

To increase the productivity of cropping systems in irrigated lands with salinity/waterlogging problems (PRC, Central Asia, India, Pakistan), salt-tolerant varieties of crops (wheat, for example) can make significant contributions. Salt-tolerant varieties alone, however, will not be enough. The management of the water table is an essential element of the management of land with both salinity and waterlogging problems. The water table has to be managed on the basis of the catchment, which may or may not fall within the boundary of individual farms. Where the catchment is within a single farm, the farmer will still have to manage on a farm-wide basis, not on a field-by-field basis. The areas most affected by salinity, that are too saline for even the most tolerant varieties of wheat or other grains, should be set apart for salt-tolerant fodder species such as Kalar grass or saltbush. Salt-tolerant deep-rooting trees (e.g. eucalyptus) may have to be planted at strategic locations to draw down the water table. Collaboration between neighbors for water table management will be essential where one catchment covers many farms. In addition to the availability of salt-tolerant varieties of crops, fodder species, and deep-rooting trees, technical knowledge such as the identification of the catchment boundary (which does not always follow the external contours of the land) as well as social organizations that could facilitate collaboration among neighboring farmers would be required. The ecosystem under consideration in such a case would be on the scale of the individual catchment, in which the water table has to be managed, and farmers'

participation would directly determine the form of collaboration through which water is to be regulated.

The sustainable management of cropping systems on steep slopes prone to erosion in the uplands and highlands requires not only an increase in crop productivity, but also a minimization of adverse offsite effects on those living in the lowlands and society at large through the various services provided by the uplands/highlands. These services range from the regulation of the water supply (from watersheds), the control of wild/forest fires, the conservation of forests and biological diversity, to carbon sequestration and the prevention of siltation in rivers, reservoirs, waterways, and irrigation canals in the lowlands.

The measurement of, for example, stream siltation, forest cover, biodiversity, stream flow (amount and seasonal distribution), and the incidence of forest fires, would provide quantitative indicators with which the success or failure of management could be judged. It is, however, essential that an appropriate set of such criteria be made available to each level of management, whether it be at the level of the farm, community, catchment, or watershed. Where cropping systems are sufficiently productive (e.g. hybrid maize, high-value vegetables, fruits, and flowers), the cost of minimizing the various adverse impacts may not be overly burdensome. However, in general, cropping systems in fragile ecosystems produce barely enough to feed the local population; any expectations that the latter could also work to save the environment and natural resources would be unrealistic. It is essential to all INRM projects characterized by major offsite impact that farmers' contributions and trade-offs to environmental conservation be fully recognized.

There are already some basic innovations in crop and land management that have proven successful throughout Asia in improving the performance of cropping systems on steep slopes. These include land allocation according to grade (degree of slope) for different types of cropping systems (according to their potential to cause soil loss), e.g. rice on flat lands with water, upland crops on milder slopes, and woody perennials on steeper

slopes. There are also various erosion control measures, including some that are relatively low cost such as contour vegetation strips. Crop management may benefit from genetic improvement such as traits for tolerance (e.g. to acidity, disease) and efficiency in use of major limiting nutrients (e.g. phosphorus). However, in contrast with the uniformity of conditions required by green-revolution technology, the diverse conditions in LFEs and fragile ecosystems require that technology be adapted to local conditions for its effective transfer, and a prerequisite for adapting R&D is farmer participation.

It is a widely held view that investments in LFEs tend to reap lower returns than do similar investments in favorable environments. Investigations of soil and climate conditions of public investments in India in 20 agro-ecological zones over the period 1970 to 1994 suggest that the contrary may be true (Hazell and Fan, 1998). The low-potential rainfed systems demonstrated the highest marginal returns to production (measured in rupees per unit input) when compared with investments in canal irrigation, roads, market developments, and education in irrigated and high-potential rainfed areas. The returns from adoption of HYVs to low-potential areas were almost as high as those to high-potential rainfed areas, and both earned higher returns than did investments in irrigated areas. These very favorable results are believed to be a consequence of spillover effects.

Strategy for Natural Resources and Environmental Management for Sustainable Agriculture

In the long term, natural resources and the environment are necessary components of all the three priority strategies for the achievement of sustainable agriculture. The difference is that in the first strategy, natural resources and the environment are included as one of the objectives of R&D, with the expectation that new technological packages involving onfarm practices will minimize both onfarm and off-farm environmental impact, and that technological innovations will be environment

enhancing. In the second strategy, the technological management package addresses management at the landscape level, for example small watershed management. It also requires local institutional support recognized by law. In the third strategy, management takes place at a broader scale, e.g. at a bioregional level such as a river basin. This level of management addresses cumulative impact within and between sub-basins. Using this approach, the interaction of different resource uses is taken into account, which renders trade-offs more transparent. An example of large-scale bioregional planning is the development plan for the Mekong River basin under which transboundary impact can be managed.

Achieving the aims of the third strategy requires a longer time frame than do the other two strategies, and a few preparatory steps are necessary. First, the present system, which is based on administrative boundaries, must be readjusted to one based on biophysical or bioregional boundaries for the purpose of gathering information related to natural resources and local environments, their interrelationships, and interactions. Second, the identification of critical areas is necessary (Khan, 1996). Critical areas are of two types: those important to long-term agricultural sustainability, e.g. spawning grounds, biodiversity-rich habitats, and fragile ecosystems where potential degradation and multiple-use conflicts are imminent; and those of high growth where sustainability indicators are showing early warning signs of degradation. Once this information is in place, planning at the bioregional level can proceed. The planning process has to encompass simultaneously economic, social, and environmental considerations.

Presently, environmental planning is often a stand-alone process with the ministry of environment acting as the sole protector of natural resources and environment. Under the proposed strategy, growth and sustainability issues, and the corresponding growth-oriented development and conservation projects, are juxtaposed, prioritized, selected, and scheduled. Environmental and social impact assessments also have to be undertaken at the planning level, prior to implementation.

Using this approach, the management of natural resources will occur at the bioregional level, for example by river basin committees consisting of representatives from sub-basins. The organization should be bottom up, i.e. starting with sub-basin committees from the lowest level. Each country should start with the region of highest economic and environmental priority, or with highest level of multiple-use conflicts.

This approach, as proposed, would comprise participatory planning, the establishment of principles for the allocation and use of natural resources and their management, zoning, and development of land-use plans. The issues relating to rights to the use of natural resources and the protection of these rights would have to be specified and established.

Wherever the capacity for effective local government and social organizations exists, the devolution of some responsibilities, e.g. local water resources, fire protection, and community forest management, has proven efficient and effective for both allocation (in the case of water) and conservation practices. The principle of the devolution of rights to and increased responsibilities for local communities and governments for different resources would have to be specified, acknowledged, and legalized.

Where local organizations and social capital do not exist, the identification of existing constraints and capability building are necessary for the achievement of long-term growth. In either case, a check-and-balance system from the central government continues to be necessary in order to assure transparency and accountability at the local level.

POLICY AND INSTITUTIONAL REQUIREMENTS

The natural resources that support agriculture will not be adequately conserved if they are undervalued. Environmentally friendly technology, such as biogas energy, will not be adopted if the use of fossil fuels continues to be subsidized. Investment in conservation practices will not be worthwhile if land

ownership is not suitably defined. A package of necessary policy requirements and reforms is therefore recommended.

Agricultural RD&E Policy

In order to combat hunger, maintain productivity in irrigated areas, and raise productive capacity in the LFEs, more investment is needed in R&D for agriculture, with the main priority being the raising of yield ceilings for rice. LFEs have to be the acknowledged target area for productivity improvements. The main priority in LFEs is the acid sulfate soil ecosystem. A national consensus on priorities may have to be developed through the media and through discussion.

The current top down RD&E system will have to be reversed to one that starts locally, with commensurate funding increases to local agencies. A farmer-focused RD&E system will have to be designed at the district level. Local agricultural colleges could be drawn into collaboration with the local RD&E system. Rewards for scientists and extension officers would be based on the field performances experienced by farmers. R&D funding may not be limited to public agencies but could be extended to learning institutes, NGOs, and private companies on a competitive basis.

A pilot project, in which extension activities are open to competition between the private sector, NGOs, and relevant government agencies, could be undertaken in agriculturally advanced areas. It would be under the supervision of local governments, farmer cooperatives, or water users' associations, as appropriate. In such a situation, a block grant may be provided to the implementing organization. In the longer run, the contributions of farmers to the extension system would gradually assume more importance than government grants. The willingness of farmers to pay would also serve to measure the value of the extension system.

Continuous capacity building is one of the indispensable components of an effective RD&E system. Scientific staff need to upgrade their skills constantly to keep up with international

progress. Distance education and extension through television and radio could be introduced for junior, senior, and female farmers. Farmer-to-farmer transfers could also broaden the perspectives of not only other farmers but also extension officers. Integrating scientific knowledge with traditional and indigenous wisdom would have to be promoted through innovative means, for example district competitions of agrobiodiversity of genetic sources.

Natural Resources and Environmental Policy

Natural resource policies tend to be among the most outdated policies of many developing Asian countries. The first priority for reform is to reflect fully the scarcity value of natural resources in costs to users. This includes the value of natural resources both as inputs and as sinks. In other words, the open-access regimes that prevail despite resource scarcity will have to give way to systems where resources are properly valued and priced. Costs of such activities as pollution, which are currently external, will have to be internalized.

In Asia, two natural resource sectors that are priority sectors for reform are water and coastal and ocean resources. At present, the instruments used to correct for market failures in these sectors are mainly legal and regulatory instruments, implemented under command-and-control regimes. The continuous deterioration of natural resources and the environment to date demonstrates that these regimes are no longer effective in achieving both growth and sustainability objectives concurrently.

Other instruments such as economic instruments, concessions and property rights, pricing, charges, fees, and transferable development rights, need to be employed appropriately (see below under priority sectors). Social instruments can also be very useful in attracting public attention to sustainability issues and, especially where voting is important, in creating the grassroots demand for reform that is essential for affecting reforms. The first step is to promote public

demand for good governance, without which development efforts often prove costly and futile. To this end, educational institutions, mass media, and social organizations provide important means for communicating with the public. However, at present, education and information on sustainability tend to lack focus and an adequate scientific basis; social organizations need both scientific and financial support from the government in order to undertake these activities.

Other Policies

Equally important is the need to remove price distortions created by other policies that favor the use of environmentally unfavorable practices, for example, State subsidies on fertilizers, and subsidies for agrochemicals, fossil fuels, and electricity. The removal of these distortions would decrease the wasteful use of resources, encourage the use of greener energy, and increase the incentives for using integrated pest management, soil and water conservation, and the search for alternative technologies. Similarly, distortions in output prices through protection, export taxes, price guarantees, and income-support programs that encourage the expansion of environmentally unsound practices need to be removed. Much has been accomplished in these areas so far, but there is still more to be done. New national priorities and public expenditure policies will need to incorporate environmental considerations. Impact assessment should become an integral part of national and sectoral policies as well as of project implementation.

With few exceptions, notably the PRC and Viet Nam, which have implemented drastic policy reforms following their open-door policy, past development efforts in Asian countries have emphasized infrastructure development rather than the policy reforms that may improve the effectiveness, transparency, and accountability of government machinery. Technical solutions are preferred to social and economic instruments. The current practice of international lending agencies requiring policy reforms as part of sector loans should be continued. For some countries, this has

become the only channel through which sensible policies can be implemented against resistance from groups with vested interest in preserving the status quo. However, the pros and cons of policy reform and the likely impact should be made more transparent to those concerned if not to the general public.

Project Implementation

The reforms described above require action at the policy and institutional levels. Reform is also required at the project implementation level. First, cost-benefit analyses should be rigorously applied during the project inception phase. Second, the potential environmental impact must be fully accounted for and included in the cost-benefit calculation. Third, public participation must be a component of the approval process.

PRIORITY SECTORS

Water and coastal resources are the two natural resource sectors that require immediate action in order to rehabilitate them and to prevent further degradation. Both sectors share similar problems of multiple-use conflicts and overextraction owing to the open-access regimes usually governing their use. Although the crux of these problems is mainly institutional and managerial in nature, investments in rehabilitation and irrigation infrastructure in order to improve irrigation efficiency may be necessary.

For both sectors, development objectives need to be established that are consistent with the goals of long-term ecological balance and sustainability by seeking input from a wide spectrum of stakeholders. The planning and management of these resources should follow the directions given by the third strategy above. Participatory management systems need to be developed that connect the agencies and organizations involved, such as sectoral agencies, local governments, and communities.

Sectoral administrations need to be streamlined in order to eliminate overlapping mandates and jurisdictions. To this end, coordinating mechanisms such as river basin or watershed committees connecting sectoral agencies need to be established.

Coastal areas that are highly crucial for the preservation of biodiversity and ecological balance need to be identified, zoned, and assigned appropriate conservation status. Government agencies in charge of coastal and fisheries resources generally possess expertise that is mostly production oriented. Capacity building in the area of conservation needs to be strengthened.

Appropriate economic instruments, such as transferable quotas, community fishing rights, and concessions should be explored; open-access regimes in coastal and oceanic waters should be replaced. Revised fees for licenses and permits for fishing gear need to reflect the actual economic value derived from the rent of aquatic resources. The number of fishing vessels needs to be regulated to be consistent with sustainable fishing yields, and the use of destructive fishing methods needs to be prohibited. Land-based sedimentation and pollution, as well as the destruction of mangroves, should be controlled and prevented. Strict enforcement of legislation relating to trawling and pushnetting in inshore waters should be implemented.

Research and development of ecologically sound methods of aquaculture, methodologies for fish stock assessment, and the standardization of methodologies and techniques for the domestication of cultivable wild species should all be promoted. Technologies are needed for reducing bycatch, fish discards, and postharvest losses; and landing and primary processing facilities need to be developed.

In the water sector, allocation principles for the use of water in the dry season should be established. For countries where water stress is becoming chronic, demand management will have to be introduced while supply management will have to be strengthened. The polluter-pays principle must be strictly enforced through a combination of economic, legal, and social instruments.

Where the capacity exists to regulate and monitor development and extraction activities, resolve conflicts, and protect coastal and water resources, the appropriate rights and management responsibilities should be devolved to local governments and communities.

Finally, two other priorities beyond the scope of this volume need to be pursued in order to support agricultural sustainability. These are poverty alleviation and human resource development for rural populations. If these two priorities are neglected, it will be difficult to implement successfully the strategies proposed above.

The rapid economic growth of Asia in recent years, especially in the manufacturing and service sectors, has driven some policymakers, both in national governments and international lending agencies, to ignore agriculture and to treat the sector as a sunset industry. Such an attitude in itself is detrimental to the sustainability of agriculture, because reform and rehabilitation require administrative energy and political will. It should also be remembered that since agriculture is very closely related to natural resources and the environment, unsustainable agriculture is often linked to irreversible environmental impact or impact that involves enormous recovery costs.