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## SUMMARY

Pakistan faces dramatic environmental challenges as it comes to grips with the results of years of misuse and neglect of its forest and soils resources. Deforestation is an acute problem in Pakistan, a country where 60 percent of rural energy is derived from fuelwood, yet where forest cover is a scant 5 percent of the total area. Pakistan's population is growing and pushing onto fragile hillsides in some wooded areas. Timber extraction is further exacerbating the country's deforestation problem.

Farm forestry, or private tree planting on agricultural lands, is one strategy that the Pakistan Government has adopted to deal with this problem. Since 1983, the U.S. Agency for International Development (A.I.D.) has been assisting Pakistan in developing farm forestry through its Forestry Planning and Development (FP&D) project. With funding of \$27.5 million, the project has been fostering tree cultivation on marginal lands belonging to private farmers. The project represents one of the Agency's largest, as well as one of its earliest, experiences with such assistance.

In October 1992, A.I.D.'s Center for Development Information and Evaluation (CDIE) sent a team to Pakistan to conduct an evaluation of the Pakistan farm forestry program, itself a cornerstone in the country's larger social forestry effort. The evaluation team found that the farm forestry model has several important features:

- o It uses private sector profit incentives as an engine to sustain its activities.
- o It employs an emerging partnership between the Government and independent farmers to accomplish its objectives.
- o It introduces basic, low-cost technologies with quick and visible pay-offs to attract and hold the interest of participants.
- o It produces environmental benefits that help the entire country.

The team also evaluated whether a national farm forestry program could function on a sustainable basis after A.I.D. assistance ends and whether it could expand its reach beyond those initially participating in the program. It also examined whether the program could generate benefits to society that exceed the value of public, that is, A.I.D. and host country resources invested in making the program work.

At the time of the evaluation, the program was coming to the close of its start-up or demonstration phase. With A.I.D. support scheduled to end in about a year, the Pakistan Government increasingly showed a willingness to incorporate and help fund the program through its provincial forestry budgets. The Pakistani program managers were also seeking other donor funding to continue and expand the program's activities beyond the areas and beneficiaries reached with A.I.D. initial funding. The CDIE study concluded that the farm forestry development process set in motion with A.I.D. support, while not yet fully self-sustaining, could not be easily reversed. Farm forestry was taking off in Pakistan. But the program's market and profit orientation meant that the resulting environmental benefits became the program's secondary effects.

## BACKGROUND

The fourth largest country in Asia, Pakistan sits astride the rich Indus River Basin, which for millennia has endowed the country with a fertile arable land base. Pakistan has harnessed the Indus River to supply one of the most extensive irrigated agricultural systems in the world. By applying "green revolution" technologies to this irrigated land, Pakistan has kept food production ahead of its rapidly growing population.

Environmental damage, however, is mounting alarmingly, exacerbated by the burgeoning population. Deforestation is aggravating soil erosion and intensifying flood conditions, as soil sediments fill up riverbeds forcing water to overflow onto nearby agricultural lands and to damage transportation and communications infrastructure.

Only days before the CDIE evaluation team arrived in Pakistan, the country suffered major flooding from torrential late monsoon rains. Illegally cut logs left on hillsides were swept up in cresting waters and became battering rams that took out bridges and irrigation dams. This environmental disaster, to date the most dramatic manifestation of the country's neglect and abuse of its forest and soils resources, prompted a public outcry for significant sustained action on environmental problems.

The task is not easy. The forests of Pakistan, limited to begin with, face rising and competitive demands. Forest cover amounts to only about 5 percent of the national land area, and, with much of the remainder comprising desert, high mountains, or cultivated land, scope for forest expansion is limited (see Figure 1). At .05 hectare per capita, the nation's 4.6 million hectares of forested land constitute one of the world's sparsest forest endowments.

Pakistan's population has increased pressures on forested areas. Wasteful and uncontrolled harvesting and excessive grazing threaten these forests. A recent national energy survey revealed that fuelwood continues to be the major source of cooking and

heating fuel for 38 percent of urban and 58 percent of rural Pakistani households.

Given these pressures, total forest cover has declined in recent years, at a rate of between .2 and 1 percent annually. Where fuelwood is in short supply, cattle dung, crop residues, and other biofuels have been substituted at the expense of soil structure and fertility. Farm forestry, whereby private farmers plant trees instead of crops on agricultural land, is one promising, albeit indirect, approach to stemming the loss of forest cover. Already, trees grown on privately owned farmland account for 50 percent of Pakistan's timber and some 70-80 percent of its fuelwood. Still, planting has not proceeded at a rate necessary to ensure a sustainable supply of wood fiber in meeting Pakistan's needs.

One of the challenges facing the introduction of farm forestry in Pakistan has been a legacy of restrictive policies and practices inherited from the British colonial system. The British approach to forest management was to police local use of forests. Historically, foresters have been responsible primarily for Government plantations and publicly owned rangelands and forests.

#### A.I.D.'S ASSISTANCE APPROACH

In the early 1960s, A.I.D. initiated a program to help Pakistan tackle its forestry sector problems. For nearly three decades, A.I.D. directed funds to a research program at the Pakistan Forestry Institute. Since 1983, A.I.D. has supported farm forestry through the FP&D project. The FP&D project has two goals: (1) to help Pakistan increase its indigenous energy supplies and achieve energy self-sufficiency and (2) to reverse the process of deforestation in Pakistan and to expand the country's extremely limited forest base.

As a national project, FP&D faced a complex challenge. Not only was forestry extension and the idea of a partnership between foresters and local populations a novel concept, but a tradition of arbitrary government control over the cutting and extraction of trees on any land, public or private, forested or agricultural, had left a legacy of suspicion and resistance to be overcome. That foresters initially considered social forestry assignments as a punishment did not help either.

The FP&D forms part of the much larger A.I.D. energy program in Pakistan. The \$27.5 million FP&D grant originally emphasized the importance of fuelwood as a vital part of Pakistan's energy sector, but that emphasis has shifted toward timber products for commercial purposes. Overall, however, the project's major environmental objective has remained constant—to reverse deforestation through farm forestry in a way that is compatible with both energy and commercial tree production.

Beyond supplying domestic fuelwood and marketable wood, the project promotes tree planting to reclaim water-logged or saline farmlands, to control erosion on slopes and disturbed sites, to

improve the productivity and economic return from marginal and degraded sites, and to reduce the diversion of animal manure from fertilizer to fuel uses.

The Pakistan farm forestry program has several noteworthy features. In distributing tree seedlings for planting on private farmlands, it involves

- o Using private sector profit incentives as an engine to sustaining its activities
- o Employing an emerging partnership between the government and independent farmers to accomplish its objectives
- o Introducing basic, low-cost technologies with quick and visible pay-off to attract and hold the interest of participants
- o Produces environmental benefits that extend beyond the direct program beneficiaries

The program, which is national in scope, intends to reorient public Pakistani forestry institutions away from exclusive attention to public lands to a more balanced approach that gives due emphasis to tree production on private lands. One of the key aims of the program is to change the foresters' orientation with respect to rural resource users from one of enforcement to one that encourages economically and environmentally sound management. This reorientation requires new types of training, new forms of organization, and continuous exposure to relevant technical information. The FP&D project adopted four major strategies to accomplish this task:

- o Improving education and training of farmers and social foresters
- o Expanding forestry research
- o Developing a social forestry extension capacity
- o Strengthening forestry policy

The project functions as follows: The Pakistani Government's Office of the Inspector General of Forests transfers A.I.D. funds to the Provincial Forestry Departments and to the national research and training facility, the Pakistan Forestry Institute. Each Provincial Department operates an autonomous program drawing on A.I.D. or Government of Pakistan funds to carry out field operations, which include nursery and farm forestry outreach, as well as soil water conservation, watershed afforestation, and construction needed to accommodate social forestry staff and infrastructure. Training, research, baseline surveys, and institution-building activities serve to prepare both national and provincial forest departments, traditionally concerned only with public lands, to assist private farmers. Private farmers participate by planting trees on their own lands and by establishing and operating private tree nurseries. The wide range of program activities and institutional participants is organized and coordinated from the Office of the Inspector General of Forests, a central federal government office with a limited technical and administrative staff.

The Pakistani Government's approach to farm and social forestry has been fairly consistent across the three main participating provinces Punjab, NWFP, and Baluchistan. A fourth province, Sindh, has only just begun to use project funds to initiate a farm forestry program. The Government, with A.I.D. support, constructed and furnished housing and offices for social forestry staff, assigned and equipped staff, engaged and trained private nursery operators to produce seedlings, processed requests for free seedlings, and provided extension advice to seedling recipients. Seedling distribution began in 1985/1986 and continues to expand.

The major policy reforms A.I.D. has sought through the farm forestry program include

- o A regulatory climate that facilitates the transformation of farm forestry to a more service-oriented role for foresters
- o Incentive systems based on markets, not subsidies for private landowners participating in government-sponsored programs

To accomplish these goals, the Government of Pakistan, aided by FP&D, strengthened the public institutions that supported the private farmers' capacity to produce tree crops for multiple domestic and commercial purposes. At the outset, this was accomplished by establishing social forestry programs in public sector organizations: for example, planning and policy coordination at the national level through the Office of the Inspector General of Forests, creating project-funded social forestry "wings" in Provincial Forestry Departments, and expanding research, training, and curriculum development at the Pakistan Forestry Institute. Field operations have brought farmers into contact, largely via a program of free seedling distribution, with the newly created provincial-level forestry extension hierarchy.

## EVALUATION FINDINGS

Pakistan's private farm forestry model is effective at getting trees into the ground. Farmers are interested in planting trees where they perceive tangible benefits, particularly where they are assured of land tenure security, as was the case with the private holdings targeted by the FP&D project. Farmers appreciate access to free tree seedlings. To date, the project has provided seedlings to more than 120,000 recipients. In exceeding its own targets, the Pakistan Forest Service has proven capable of organizing a widespread system of private contract nurseries and seedling distribution, with more than 100 million seedlings distributed. A.I.D. estimates survival rates at 70-80 percent.

So far tree farm production has had no distinguishable impact on reducing overexploitation and loss of vegetative cover in communal and state woodlands and forests. Nevertheless, evidence suggests that pressures on old-growth forests from fuelwood gathering and overgrazing can be reduced by tree-farm production.

In numerous but isolated cases, the evaluation team observed evidence of improved soil quality, for example, reduced soil salinity and water logging on degraded sites. More systematic data collection will be needed, however, to fully validate these purported benefits.

Beyond supplying their own domestic needs for tree products, farmers enjoy strong local market demand for fuelwood and construction materials. The potential for linking producers with wood processing industries is also promising. The FP&D project fostered observational visits between industry and farmers and helped to establish the Pakistan Tree Farm Society, a local nongovernmental organization geared to furthering interchange between industry and producers.

By 1985, pressure to "show results" had led to a preoccupation with building nurseries and distributing seedling. The Government tripled annual planting targets from about 25,000 to more than 75,000 hectares. A 1991 mid-term evaluation pointed out that the program's focus on trees as a commodity had turned attention away from the social distributional dimension that was one of the original concerns of the program.

This change in emphasis may be well founded. A recent study (the National Household Energy Strategy Survey) indicated that only 7 percent of rural farmers expressed interest in tree planting for fuel only. The study suggested that programs focused on encouraging energy plantations were unlikely to succeed.

The new commercial focus of the program attracted and favored larger farmers, raising concerns about the market's capacity to bring about an equitable distribution of development benefits. For example, the program's effectiveness in reaching the smaller low-resource farmers of the country's rainfed agricultural belt, the Barani, was adversely influenced by the program's technological emphasis on eucalyptus (discussed below) and by the forest service's preoccupation with meeting quantitative targets rather than quality of service. Close monitoring, coupled with an affirmative social program, may be necessary to ensure wide adoption of improved environmental practices.

The commercial orientation of the program led to an emphasis on eucalyptus trees, a species that produces fewer ecological or agricultural productivity benefits than some of the alternatives. The advantages of eucalyptus (fast growing, tolerant of a wide range of soils and climates, easy to protect from livestock, and straight trunks) are better suited to larger farmers' interests in block plantings than small farmers' multiple objectives of shade, browse for animals, fuelwood, domestic construction, and occasional sale. However, until research and training functions evolve taking into account Pakistan's diverse social and environmental conditions, foresters will probably continue to rely heavily on the eucalyptus as the simplest option available.

The FP&D project's efforts have strongly advanced farmers' and forestry officials' awareness of social forestry, of the

environmental and economic importance of trees on private lands, and of the need to reform institutions. The shift in the forester's role from policeman to partner is beginning to take hold. Farmers appear to have less apprehension about forestry agents where the program's approach has been fully implemented.

The data collected by the evaluation team on the program's socioeconomic impact were used to calculate a "stripped down" estimate of program efficiency, that is, the returns expressed as the value of annual net benefits that can be attributed to the \$34.5 million program costs (\$27.5 million in A.I.D. and \$7.0 million in Government of Pakistan funding). When the estimated \$20 million annual flow of income benefits from farm tree crop cultivation is used as the return on the \$34.5 million investments, the resulting economic rate of return comes to about 60 percent. The overall program benefit-cost ratio is about 2.3:1

Another good indicator of efficiency in an exploratory effort such as the FP&D project is a steady rise in the ratio between benefits and fixed costs (see Figure 2). These projections reflect the future value of seedlings 7 years from their planting date and represent stump prices at fuelwood values on a current cost basis.

Institutional strengthening has had a significant impact both in developing replicable models and in making progress toward sustainability. Signs that social forestry is taking root include curriculum changes at the Pakistan Forestry Institute, proposals to establish permanent social forestry career tracks in the provincial services, and strong supportive policy declarations in strategic planning documents. Openings for contract nursery operators are oversubscribed despite a more than sevenfold increase over the number of nurseries envisaged in the project paper. The Government recently expanded the program's geographic coverage. A national forestry extension network has been established, which should further spread knowledge and defuse anxieties about farm forestry.

These advances are still inconclusive, and further donor support will be necessary for them to become self-sustaining.

## LESSONS LEARNED

- o Markets supply powerful forces capable of driving individual and institutional participation in farmer forestry programs. However, markets may require some regulation to ensure adequate attention to equity and environmental issues. Fuelwood shortages alone are not enough to induce farmers to undertake widespread tree planting. Farmers plant trees for a variety of reasons. Care must be exercised in deciding who will benefit, what kinds of production systems to choose, and what kinds of trees to plant and how to plant them. Because production for market commands so much attention and attracts rural elites, special efforts must be taken not to overlook the multiple and often noncommercial aims of many tree growers.

- o Encouraging tree planting on private land is an effective strategy when it capitalizes on existing conditions of land and tree tenure security. Despite the time lag between planting and reaping benefits, tree farmers who perceive their access to tree products as secure are willing to invest. But land ownership alone does not guarantee the requisite sense of security. For example, where land consolidation programs threatened to reorganize holdings, landowners were not interested in planting.
- o Farm forestry "sells" best when participants have access to low-cost technologies with reasonable pay-back periods. After only 2 to 3 years, households began to enjoy benefits from their investment in planting and protecting young seedlings. Older plantations had evidently been selectively thinned to meet ongoing cash flow and domestic requirements. Annualized returns to mature tree harvests were more attractive than those of annual field crops. That is, if a farmer could afford to wait until the trees matured, the net benefits from harvest would exceed what could have been earned by growing and harvesting annual crops.
- o Flexible project design permits program managers to respond effectively to new conditions and opportunities. Shifting from fuelwood to commercial objectives permitted the Pakistan program to continue to expand and respond to farmer demand despite the narrow conception outlined in the program's initial design.

## OUTSTANDING ISSUES

Subsidies and appropriate incentives. The FP&D project used subsidies to encourage farmer participation in the program. Tree nurserymen received subsidies for seedling production; the seedlings were then given to participating farmers or sold at subsidized prices. As late as November 1992, project managers continued debate over whether to continue the subsidies and if so at what levels and for whom. The case for continuation of subsidies rests partly on the fact that farmers' investments in farm forestry result in external environmental benefits to society in the form of better soil erosion control, improved water retention, and addition of vegetative matter into carbon and water cycles. Since farmers cannot capture these benefits, society may be justified in compensating farmers in the form of subsidies. However, subsidies must be used with caution to ensure that certain farmers do not get more than their due. Subsidized programs risk encouraging farm forestry solely to capture subsidies in areas where commercial tree farming might not be otherwise warranted. More influential farmers with more land may end up enriched at the expense of smaller farmers who are unable to influence decisions. Land that should be in food crops might be planted with trees if subsidies make tree farming relatively more profitable.

Program and project approaches. A.I.D. channeled its forest sector support almost entirely through a single project. However,

a performance-based-program approach that encompassed or complemented one or more "projectized" activities might have been more effective than a simple project framework for linking the different and disparate components. Coordinating national policy and planning, developing research and training capacity at the Pakistan Forestry Institute, and reorienting provincial forestry activities have strained the implementation capacity of the project framework and may mediate against transferring program ownership. With the publication of the National Conservation Strategy and that of the Forestry Sector Master Plan imminent, developing a viable and coherent national policy will take on new importance. Nonetheless, farm forestry operations remain very much a regional affair. Funding them through provincial governments could be more effective than passing all assistance through national financial and administrative structures.

Farm and community forestry. Finally, the FP&D project focused its tree planting on private lands where ownership and tree tenure were not in question. This approach avoided many difficulties inherent to a comprehensive social forestry program, but as social forestry becomes an integral part of each province's agenda, more contentious issues may arise. For example, the program aimed to meet the perceived fuelwood and timber needs of farmers residing in the Barani or rainfed areas of the northern plains and Potwar Plateau. Ownership of land there is not uniform. Absentee landlords seek ways of holding lands with minimum investment. In addition, such issues as tree rights in shared access regimes, intrahousehold allocation of benefits, displacement of landless farmers, and protection of farmers' investments in face of land consolidation pose challenges that the Pakistan model is not yet ready to meet. Other social and community forestry programs in the country have tackled these problems. Integrating farm forestry and community forestry activities will require new institutional solutions.

This Evaluation Highlights summarizes the findings of the Technical Report Assessment of A.I.D. Environmental Programs, Farm Forestry in Pakistan (forthcoming). Technical Reports can be ordered from DISC, 1500 Wilson Blvd., Suite 1010, Arlington, VA, 22209-2404 or by calling (703) 351-4006, fax (703) 351-4039.