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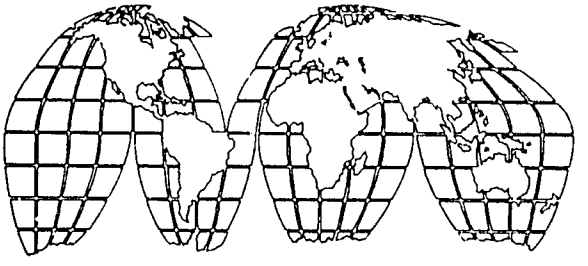

Forestry and the Environment

Pakistan Case Study

November 1993

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

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FORESTRY AND THE ENVIRONMENT
PAKISTAN CASE STUDY

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by

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November 1993

This Working Paper is one of a number of case studies prepared for CDIE's assessment of USAID Forestry and the Environment programs. As an interim report, it provides the data from which the assessment synthesis is drawn. Working Papers are not formally published and distributed, but interested readers can obtain a copy from the DISC.

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PREFACE

A.I.D. development assistance has supported a broad spectrum of environmental and natural resources programs worldwide. The goals of these programs are environmentally sustainable economic development and an enhanced natural resource base on which it depends. A.I.D. has formulated its environmental strategy around five general problem areas:

- Deforestation and loss of biological diversity
- Loss of sustainable agriculture systems
- Inefficient energy production and use
- Industrial and urban pollution
- Degradation of coastal and water resources

Pakistan is one of the countries where A.I.D. has provided support for two important areas of environment and natural resources management: forestry development and energy conservation. This report summarizes findings from an examination of Pakistan's forestry program. A separate companion report covers the environmental impact of Pakistan's energy conservation program.

In addition to forestry and energy, future studies in this series of assessments of A.I.D. environmental programs will examine the environmental dimensions of A.I.D. sustainable agriculture, coastal resources management, biological diversity and urban-industrial waste management programs. These program assessment studies are results-oriented in nature and seek to determine what difference A.I.D. assistance programs have had on environmental and natural resources conditions.

Over the thirty-year span of its assistance programs in Pakistan, A.I.D. has supported a range of development initiatives with environmental benefits. A.I.D. programs with direct environmental and natural resources management objectives are only of relatively recent vintage in Pakistan which, itself, has only had an official environmental program, the National Conservation Strategy (NCS) since 1991. This study focuses on the period from 1983 to 1992.

CDIE wishes to thank the staff of USAID/Pakistan for its support in conducting the field study work. CDIE also extends its thanks and appreciation to the scores of Pakistani technicians who contributed to this effort.

FOREWORD

Only days before the CDIE evaluation team arrived, Pakistan was hit by torrential late monsoon rains, "the worst in fifty years," according to local authorities and the press. Pakistan, like its south-Asian neighbors, is accustomed to the arbitrariness of weather. But the country was not prepared for the environmental disaster that followed.

Rain waters quickly washed down from hillsides denuded of forests and vegetative cover. With their river beds already filled with sediments accumulated from earlier rains, the mighty Indus river and its tributaries rapidly swelled and overflowed. The government and media issued daily reports of the river's crest as it traveled its 1,200 kilometer route toward the sea taking with it livestock, homes and in some cases entire villages. Illegally cut logs, left on hillsides to be floated down the rivers during normal spring rains, were swept up in cresting waters and became battering rams that took out bridges and irrigation dams.

This environmental disaster was the most recent and to date most dramatic manifestation of the country's neglect and abuse of its forest and soils resources. The flooding precipitated a public outcry for action, significant sustained action, to cure the country's festering environmental ills. Pakistan's leaders -- in both government and private circles have begun to come together to hammer out programs for immediate remedial attention.

Fortuitously, a new environmental strategy for Pakistan has just been completed in a unique two-year effort by the government and local non-governmental organizations. Pakistan must now find the political will to make the investments and changes in practices necessary to get the country on an environmentally sustainable course of economic growth.

The authors of this report believe Pakistan can overcome its environmental perils. This report identifies some of the tentative steps -- visible, low-cost, quick pay-off and self-sustaining steps -- that the people of Pakistan have already begun to take. What Pakistan can show the world, and itself, are the ways that positive environmental forces can be released for achieving sustainable economic development.

Phillip E. Church

GLOSSARY

ADB	Asian Development Bank
A.I.D.	Agency for International Development
FP&D	A.I.D. Forestry Planning and Development Project
FSMP	Forestry Sector Master Plan
GOP	Government of Pakistan
HESS	National Household Energy Strategy Formulation Project
IGF	Inspector General of Forests
O/IGF	Office of the Inspector General of Forests
PECC	Pakistan Energy Conservation Council
PEPA	Pakistan Environmental Protection Agency
PFI	Pakistan Forestry Institute
NCS	National Conservation Strategy of Pakistan
UNCED	United Nations Conference on Environment and Development
UNDP	United National Development Program
Rupee	25 Rupees = $US 1.00

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Forestry in Pakistan

Development Alternatives, Inc. (1994)
(Source: Digital Chart of the World)

1. INTRODUCTION

This report examines a model of "environmental management" that appears to work. The model stems from A.I.D. support to forestry development in Pakistan and focuses on farm forestry.

The Pakistan farm forestry model has several noteworthy features. It: uses private profit to drive its activities and spread its impact; employs an emerging partnership between the government and independent farmers; introduces basic, low-cost technologies with quick and visible pay-offs to attract and hold the interest of participant; and produces environmental benefits that can be enjoyed by people beyond direct program beneficiaries.

At the time of this evaluation, the Pakistan farm forestry program was coming to the close of its "start-up" or "demonstration phase." Changes in public and private attitudes toward the program were apparent, new institutions were in place; new technologies and practices had been introduced, tested and adopted; and increases in the capacity of farmers to produce tree seedlings and tree crops commercially were apparent.

With termination of A.I.D. funding less than one year away, the Pakistan Government was showing signs of willingness to consider officially incorporating the program into its budget processes. The Pakistani managers of the program were also seeking other donor funding to continue and expand activities beyond the areas and beneficiaries reached with A.I.D. start-up support.

This report summarizes the findings of a field study into the Pakistan farm forestry program and the conditions that appear to make it work. Section 2 examines the country setting in Pakistan where the farm forestry program is being carried out, and describes the program and the strategies employed to project it toward a sustainable and effective public and private undertaking. Section 3 presents findings from this evaluation of the program's impact and performance. Section 4 lists lessons learned from the Pakistan farm forestry program that might have application in other developing countries. Finally, in Section 5 the report discusses some outstanding issues that have emerged from this evaluation in Pakistan and merit further examination under other developing country settings.

2. FORESTRY IN PAKISTAN

Country Setting

With a population of nearly 110 million in 1992, Pakistan is the 10th most populous country in the world, and the fourth largest, after China, India and Indonesia in Asia. It has an area of 803,943 square kilometers (about the size of California), excluding Jammu and Kashmir provinces, whose territorial control is disputed with India. Pakistan borders on the west, northwest and north with Iran, Afghanistan, and China respectively and shares a 2,000 kilometer eastern border with India.

Pakistan sits astride the rich Indus River basin which over the millennia has endowed the country with fertile arable land. Bracketed by the high Karakoram, Himalaya and Hindu Kush mountain ranges to the north, and dry desert areas to the east and west, 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's food production exceeds the needs of its rapidly growing population. Pakistan's irrigated agriculture system also provides rural jobs, generates investable surpluses for infrastructure and industrial expansion and creates domestic markets for new manufactures.

Since the mid-1970's the economy of Pakistan has grown at about 6 percent annually, a respectable rate for a developing nation. The small industrial sector (20 percent of Gross Domestic Product in 1990) has grown at about 9 percent annually during the period and brought about significant structural change, notably greater urban population concentration. The agriculture sector, which now accounts for about 25 percent of Gross Domestic Product, still employs over 50 percent of the population and contributes one/third of the country's export (foreign exchange) earnings.

Declining illiteracy rates, increased life expectancy and expanding social institutions have formed the foundation for gradual but steady improvements in Pakistanis' lives. The return of trained technocrats and business leaders from abroad and a growing force of skilled labor have helped position Pakistan to join the ranks of the newly industrialized countries "NIC's", of Asia. However, per capita income in Pakistan remains low -- about US$ 375 annually in 1990 -- and about 30 percent of the population lives in poverty with limited or no access to social services -- health, education, family planning, housing and potable water. A high population growth rate of 3.0 percent annually continues to

strain food supplies, social services and natural resources.

Politically, Pakistan is a federation of four provinces -- the Sind, Punjab, Balochistan and the Northwest Frontier Provinces. Federally administered tribal areas also extend along much of Pakistan's border with Afghanistan. While national defense, trade and monetary matters are the domain of the federal government, the provincial governments exercise considerable autonomy within their territories over management of water, mineral and forest resources and administration of health, education and agricultural services.

During the 1970's and 1980's, Pakistan received large amounts of U.S. foreign economic and military assistance, particularly for developing its energy, infrastructure, agriculture and social sectors. This support began to decline in 1990 with the imposition of the Pressler amendment which prohibits foreign assistance to countries with nuclear arms development programs.

Pakistan still remains an important South Asian ally and key contributor to maintaining the region's political and economic stability and growth. Today, Pakistan, faces an array of challenges: nurturing a fragile democratic system of government; sustaining its economic growth performance in the face of growing population pressures; and reversing environmental degradation and natural resource depletion.

The Problem

By international standards, Pakistan is neither a major polluter of the environment nor a major consumer of natural resources. The average Pakistani, for example contributes less than one-fifth of his or her proportional share of global carbon emissions and less than one percent of sulphur dioxide emissions. Pakistan does not produce CFC's, and its energy consumption is one/fourth the per global average (UNCED 1992).

However, at the local level, environmental damage is tangible and mounting. Natural resource depletion and environmental degradation are hindering country's development. Deforestation is one particularly troubling problem that A.I.D. and the Government of Pakistan have sought to address.

Behind Pakistan's outwardly encouraging economic performance, some disturbing environmental processes are at work. Large areas of agricultural land lie idle because of soil salinity build-up and water logging from poor drainage and irrigation system maintenance. Soil erosion, aggravated by deforestation, is silting up reservoirs behind hydro-electric dams, reducing their useful life spans to only a few decades. The same deforestation aggravates flooding as silting fills river beds, forcing water to overflow onto nearby agricultural lands and to damage roads and brides.

Pakistan's forests which are limited to begin with, face increasing and multiple pressures. Forest cover amounts to a scant 5.2% of the national total (see Figure 1), and, with much of the remainder comprising desert, high mountains, or cultivated land, there is limited scope for expansion (NCS 1992). At .05 ha per capita basis, the nation's 4.58 million hectares constitutes one of the world's sparsest forest endowments. Much of what is officially classified as forest is in poor condition or consists of open woodland with limited potential; however, recent resource inventories suggest forests may be more extensive than previously estimated (NCS 1992).

Forests and woodlands begin with alpine scrub and coniferous associations of the northern Himalaya, Hindu Kush, and Karakoram mountains and continue southward through a variety of upland, riverine, and semi-arid thorn forests to end in the mangrove areas along the Indus Delta and the Arabian Sea. Sizeable areas are under natural forest cover, but a significant and growing portion is planted either as irrigated plantation or managed timber.

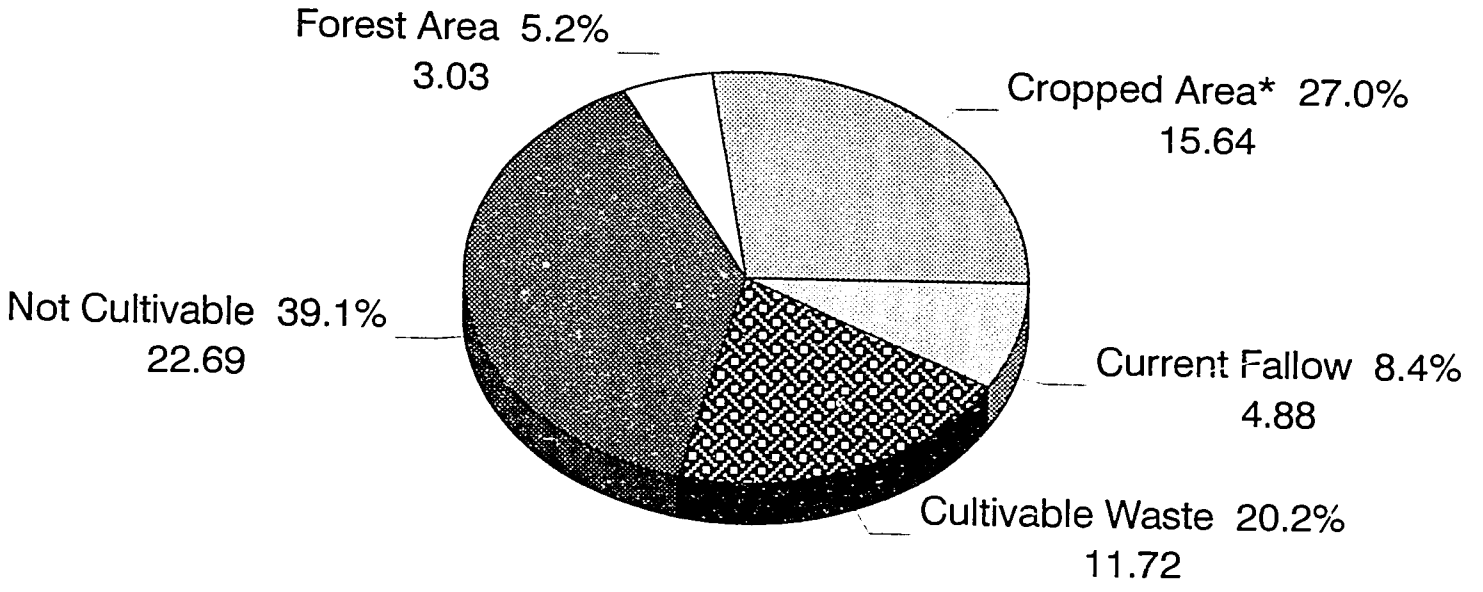
Pakistan's remaining old/growth forests are important for wildlife habitats, for safeguarding the capacity of watersheds and for reducing soil run-off and siltation. The Northern coniferous forests are an important source of commercial timber. Wasteful and uncontrolled harvesting of these forests, compounded by excessive grazing, threaten their sustainability. Fuelwood continues to be a major source of cooking and heating fuel for both urban (38 percent) and rural (58 percent) households.

Consequently, forest cover has begun to decline in recent years. Rates of reduction are variously listed at between .2 and 1 percent per annum. Where fuelwood is in short supply, cattle dung and other bio-mass fuels have been substituted at the expense of soil nutrient. Timber for construction, furniture and other wood products have further depleted forest reserves. Today, Pakistan imports nearly all its wood pulp and paper products and about 30 percent of its commercial/industrial timber requirements -- often at the expense of tropical forests in neighboring asian countries.

Trees from public lands alone can only meet a small share of the demand. Potential exists, however, to encourage private tree farming as a source of commercial timber and household fuelwood supplies while restoring forest vegetative cover and rebuilding soils under a range of agro-climatic settings. Farm forestry is one promising approach to stemming the loss of forest cover. Already trees grown on private farmland account for 50% off Pakistan's timber and some 70-80% of its fuelwood. Still, planting has not proceeded at a rate necessary to insure a sustainable supply of wood fiber.

One of the challenges facing farm forestry in Pakistan has been a legacy of hostile policies and practices which Pakistan's

Figure 1. Pakistan: Land Cover, 1982-1987



Source: Pakistan National Report to UNCED 1992.

*Includes some areas which are multi-cropped.

provincial forest services inherited from the British colonial system. From the beginning, the objective has been to restrict and police local use of forests. Historically, foresters have been responsible primarily for government plantations and publicly owned rangelands and forests. To the extent that trees in agricultural areas were an issue at all, fining and prohibitive restrictions on cutting were the rule. This heritage has left little upon which to build extension and outreach programs for promoting farm and social forestry.

In addition to this public perception of foresters as policemen, the bureaucratic context in which forest resources are managed poses substantial development challenges. Following partition with India in 1947, the new Government of Pakistan determined that forestry would be a "provincial subject." However, the regional specialization did not alter the underlying emphasis on a top-down, command/driven approach to rural policing and protection of territorial forests. Communication and coordination with other technical services (e.g., agriculture, mining, transport) at the regional and sub-regional levels was virtually non-existent. Given the country's meager forest resources, the power and influence of forest services within the government had become minimal.

The A.I.D. Assistance Approach

With forests under pressure, farm forestry has attracted increasing attention in recent years. Farm forestry is an important part of A.I.D.'s program of support for improving environmental and natural resource management in Pakistan. Box 1 briefly describes this program. A more detailed discussion is included in Appendix C.

In the early 1960's, A.I.D. initiated a program to reinforce Pakistan's capacity to define and tackle the challenges to its forestry sector. For nearly three decades, PL-480 funds were directed to a research support program at the Pakistan Forestry Institute (PFI). By 1983, when the Forestry Planning and Development Project was designed, the GOP was beginning to introduce farm and community forestry programs. Today farm forestry is an integral part of Pakistan's forest sector program.

A.I.D. has also funded tree planting as part of other rural development projects such as the Northwest Frontier Province Area Development Project (391-0485). It has also supported forestry research in Pakistan under the centrally funded Forestry and Fuelwood Research and Development Project and indirectly through the National Agricultural Research Center and the country's agricultural universities.

BOX 1: USAID/PAKISTAN'S ENVIRONMENTAL PROGRAM

Pakistan today is experiencing an irreversible and growing popular awareness about the need to address its environmental problems. Limited public sector financial resources and technical capability will constrain the Pakistani Government in its efforts to remedy these environmental ills. Pakistan faces the challenge of discovering how to unleash incentives that will encourage more sound environmental and natural resources management practices with only a limited government support or regulation. A.I.D. assistance has helped to identify, develop and test promising approaches, among them:

- *The **Energy Planning and Development Project** which began in 1983 is a 10-year effort that includes a major component to help Pakistan launch a nationwide energy conservation program.*

- *The **Forestry Planning and Development Project** also began in 1983 as a 10 year undertaking aimed at helping Pakistan reverse deforestation and expand Pakistan's forest resource base by generating interest among farmers to plant trees.*

- *In 1988 USAID/Pakistan and the United Nations sponsored a National Seminar on the role of the media in public environmental awareness to identify techniques of environmental journalism, and to launch a sustained dialogue between the media and the various actors on the environmental scene.*

- *In 1991, USAID/Pakistan assisted the Pakistan Government to summarize and analyze current legal aspects of environmental management to identify legislative and regulatory approaches to environmental protection at provincial and national levels.*

- *In 1992 USAID/Pakistan and the GOP have collaborated in the pilot production of an environmental docudrama video film to demonstrate that environmental messages can be delivered through a human interest approach to increase awareness of: the extent and nature of environmental problems in Pakistan; the need to maintain environmental quality and biological diversity; and how environmental problems can be corrected and sustainable development achieved through self-help.*

- *To mobilize domestic attention to environmental problems that threaten Pakistan's potential to sustain future agricultural growth, USAID/Pakistan collaborated with the Pakistan Government in 1990-92 to sponsor a series of provincial and national workshops designed to obtain consensus on the critical issues affecting agricultural sustainability and to evolve an agenda and action plan for the next decade.*

These USAID/Pakistan environmental initiatives were undertaken with a view toward building the foundations for a comprehensive long-run environmental program. When Pressler Amendment regulations suspended U.S. assistance to Pakistan in 1990, that process was disrupted, and with it the pace of converting awareness into action has slowed. Fortunately, today, Pakistani official and private concern fostered by earlier A.I.D. support appears inextinguishable.

* * * * *

Forestry Planning and Development Project

The Forestry Planning and Development Project (FP&D) forms part of a $200 million A.I.D energy program in Pakistan. Unlike previous USAID/Pakistan and other donor-financed forestry projects, which have emphasized the production of forest products, it began by addressing the importance of wood as a source of energy. The FP&D project's primary goal "is to help Pakistan increase its indigenous energy supplies and achieve energy self-sufficiency". The secondary goal is to "reverse the process of deforestation in Pakistan and to expand the extremely limited forest base".

The primary purpose of the $27.5 million grant (1983-1994) is to "increase the capability of federal, provincial, and local institutions to design, implement, and evaluate policies and programs for increasing the production of fuelwood and timber in Pakistan". The secondary purpose is "to demonstrate the economic, technical, and social feasibility of producing tree crops on privately-owned farm and range lands". These purposes have remained valid throughout the life of the project despite a shift in emphasis from fuelwood to timber products. The original design casts the FP&D project as an "alternative energy program", and, from an environmental evaluation perspective, it might be viewed that way. However, this evaluation focuses on farm forestry as a strategy to arrest deforestation that is equally valid for both energy and commercial tree production.

The FP&D project is a complex and multi-faceted undertaking with $27.5 million in funds budgeted for a range of expenditures and activities:

- $7.5 million for a U.S. technical assistance in forestry policy, outreach and extension, institution building, management systems, research and training, and socio-cultural analysis[1];
- $4.25 million for in-country and overseas training in technical forestry fields and in program administration;
- $3.4 million for commodity procurement -- vehicles, laboratory equipment, farm machinery, etc.;
- $11.9 million for field operations, research support, local contract construction of dormitories and offices, local forestry NGO creation and support and for other costs; and

---

[1]Phase I included a socio-cultural analysis unit staffed by a U.S. anthropologist and local sociologist. Local hire positions for policy and management and training logistics were added later. Long term staff were supported by an array short term consultants.

- $0.45 million for A.I.D. to use for program evaluation.

In addition to the A.I.D. funds, the Government of Pakistan committed Rps. 178,000,000 -- $7.12 million -- to cover some local training costs and a share of field operations expenses. An additional $5 million for agricultural equipment, e.g. tractors supplied to District Forest Offices, was provided through a separate A.I.D. funded Agricultural Commodities and Equipment Project.

As a national project, FP&D faced a complex challenge. Not only was forestry extension and the idea of a collaborative partnership between foresters and local populations a novel concept, but the tradition of abusive fines and expropriation of land and tree use rights left a legacy of suspicion and resistance. It did not help that foresters initially considered social forestry assignments an administrative punishment.

The FP&D project implementation plan proposed a sequence of complementary and coordinated project activities. The first two years (1983-1985) intended to build a solid base for field activities through training, planning, research, and monitoring. Tree planting was to begin only in 1986. The Office of the Inspector General of Forests (O/IGF) and an A.I.D. funded technical assistance team of U.S. and Pakistani advisors were to provide coordination and continuity.

The wide range of program activities and institutional participants is organized and coordinated from the O/IGF, a central federal government office with a limited technical and administrative staff.The Pakistani federal government Office of the Inspector General of Forests, (O/IGF) transfers A.I.D. funds to the Provincial Forestry Departments and to the national research and training facility, the Pakistan Forestry Institute (PFI). Each Provincial Department operates an autonomous program drawing on A.I.D. or GOP funds to carry out field operations, these include nursery and farm forestry outreach, as well as soil water conservation, watershed afforestation and construction 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 original FP&D project strategy emphasized serving small low-income farmers who form the majority of the rural population. The project design emphasized planting species that produce multiple benefits such as shade, fodder, wind protection, and fuelwood. Field operations originally concentrated in the rainfed (barani) areas of the northern Punjab and southern Northwest

Frontier Provinces, where much land is owned by low-income farmers who depend upon collected wood and cow dung for fuel, where rainfall is adequate to allow afforestation without irrigation, and where fodder is scarce.

In 1989 a FP&D project amendment added and rescheduled activities without explicitly altering the philosophy, goals, or purpose of the program. The Amendment added rainfed and irrigated areas in all four provinces, a watershed management activity with the World Food Program, more building construction, and a program of grants to non-governmental organizations. The FP&D project strategy has also more explicitly emphasized commercial markets for tree products, the planting of eucalyptus, and the involvement of all farmers irrespective of farm size.

Environmental objectives and farm forestry operations

Pakistan's farm forestry approach subsumes various environmental objectives and is based on several assertions:

- The production of additional fuelwood will lessen the pressure to cut natural vegetation, especially that found in old growth forests and highly pressured scrub forest and rangeland.

- Additional fuelwood will also reduce the burning of cow dung which then can be retained to improve the fertility and structure of agricultural soils.

- The trees planted under the program will ameliorate local microclimates by disrupting surface winds and by providing shade.

- Some tree species fix nitrogen and thus improve soil fertility while others will be well-adapted to the reclamation of saline and waterlogged soils. These soil improvements will help increase agricultural productivity saving in the use of additional chemical fertilizers and energy consumption.

- Increases in agricultural productivity will reduce pressures to clear forested land for agriculture.

The program, national in scope, intends to reorient public Pakistani forestry institutions away from exclusive attention on public lands to a more balanced approach that gives due emphasis to tree production on private lands. Operationally, the program aims at changing the orientation of foresters from enforcement to encouragement, from policemen on public lands to partners in private tree cultivation.

This reorientation requires new types of training, new forms of organization, and continuous exposure to relevant technical

information. The program has four inter-related operational thrust insure the availability and adoption of farm forestry technologies and management practices that reverse deforestation:

- improving education and training of farmers and social foresters;
- expanding forestry research.
- developing a social forestry extension capacity;
- strengthening forest policy.

The Pakistani government's approach to farm forestry has been fairly consistent across the three main participating provinces -- Punjab, NWFP, and Balochistan. A fourth province, Sindh, has only just begun to use project funds to initiate a farm forestry program. With A.I.D. support, the Pakistani government constructed and furnished housing and offices for social forestry staff, assigned and equipped staff, trained private nursery operators to produce seedlings, processed requests for free seedlings, and provided extension advice to seedling recipients. Seedling distribution began in 1985/86 and continues to expand.

It is primarily in scrub forests and woodlands and not old growth coniferous mountain stands where the impact of A.I.D.'s assistance to Pakistan in reversing deforestation can be expected. This more closely reflects the program's actual environmental purpose, namely, to increase the availability of fuelwood through expanding the forests on private farm lands. As such, the farm forestry program aims to mitigate destructive exploitation of the scrub forests near areas of program activity. At the same time, tree planting was encouraged as a means to improve management of low potential and degraded private farmlands.

Scrub forests, because they are near villages experiencing fuelwood shortages, offers a realistic alternative to on-farm biomass fuel sources (such as manure and crop residues). Scrub forests are composed of dry sub-tropical broad leaved and tropical thorny species which survive harsh conditions on lands with little potential for other use. These scrub forests are environmentally important not only for their wood resources but also for protecting watersheds, harboring wildlife and providing browse. The forests near productive agricultural areas are increasingly pressured by a growing human population. These forests and woodlands that are under threat of overuse by the populations targeted by the program. To the extent that "farm forestry" reduces demand in these areas, it can be considered an environmental forestry strategy.

The Evaluation Procedures

Pakistan represents an interesting case for the CDIE forestry assessment because commercial incentives were used to encourage farmers to grow trees as "cash crops". The CDIE assessment challenges the logic implied by the environmental objectives outlined above. This is accomplished by first gaining a more precise understanding of the farm forestry model, then by documenting to what degree the original goals have been transformed or lost, and, finally, by preliminarily judging the program's impact and performance relative to its environmental objectives.

This analysis measures the impact by examining the extent of adoption of practices which improve management or stem the loss of existing forest resources.[2] The lag between tree planting and environmental change means that it is too early to draw definitive conclusions. The analysis nonetheless frames these new practices in terms of their implied effect on the extent and quality of forest/woodland cover in the country. The assessment asks whether farmers associated the FP&D/supported programs have improved their resource management practices and then traces the effectiveness of A.I.D. support in creating the conditions leading to these improvements.

This evaluation examines how the A.I.D. has assisted Pakistan in fostering tree cultivation on marginal lands in the hands of private farmers. The central operating hypothesis of the evaluation is that pressures on deforestation in Pakistan can be reduced by fostering the adoption of market driven farm forestry among private cultivators. The basic evaluation questions are:

- How important are the following strategies in fostering farm forestry?
  - Strengthening institutional capacity to plan, coordinate and conduct research and extension programs;
  - Conducting education and outreach programs to raise awareness and transfer information about farm forestry;
  - Developing or transferring information about tree farming conservation technologies;
  - Reforming policies to remove market distortions and other disincentives to including tree cultivation within farm production systems.
- Can a national farm forestry program:
  - Function on a sustainable basis after A.I.D. assistance

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[2] Appendix A provides a more detailed explanation of the evaluation methodology and how it relates to the logic of the farm forestry program.

is terminated?

- Expand its reach beyond those initial direct participants in A.I.D. support activities?

- Generate benefits to society that exceed the value of public -- A.I.D. and host country -- resources invested in making the program work?

In addressing these questions data were collected by the evaluation team at the levels of conditions, practices and impact (bio-physical and socio-economic). The fieldwork was conducted in October 1992 by a four-member team of environment and economic development specialists. During their one-month stay in Pakistan, the team members worked in Islamabad and traveled to Lahore, Karachi and Peshawar, as well as sites around these cities, to meet with public and private sector organizations and individuals. Over 200 farmers were surveyed in addition to individuals and organizations interviewed.

3. EVALUATION FINDINGS

Over and above timber, fodder, food/medicinal, and environmental benefits, trees supply more than half of Pakistan's non-commercial energy needs. It is not surprising, then, that A.I.D. support to Pakistan's forestry sector was largely set in terms of meeting the country's present and future energy needs. Individual economic gain, whether for firewood or other products, provides the underlying thrust to the Agency's forestry program in Pakistan.

Program Implementation

This evaluation examines the role of four A.I.D. strategies in determining or contributing to farm forestry program performance. This section describes the four strategies, and the conditions they are meant to create, as part of Pakistan's farm forestry program:

- Institution building;
- Awareness and Education;
- Technological change;
- Policy reform;

The following description of these intervention strategies, their implementation and the conditions they hav created is based on GOP and USAID project reports and publications, on in-depth interviews with program technicians and staff and on surveys of farmer participants. (Data collection methods are further discussed in Annex 2 and Annex 3).

Institution building

The principal government strategy supported by FP&D is to strengthen those public institutions which support the private sector's capacity to produce tree crops for multiple domestic and commercial purposes. Initially, support was geared primarily to social forestry programs in public sector organizations: planning and policy coordination at the national level through the Office of the Inspector General of Forests (O/IGF); the creation of project-funded social forestry "wings" in Provincial Forestry Departments; and expansion of research, training and curriculum development at the main national technical training facility, the Pakistan Forestry Institute (PFI) with some decentralized activity at research stations and provincial forestry schools.

Energy supplies, including fuelwood, are a **national**

responsibility in Pakistan. As a national level office, O/IGF is designated as the lead host-country agency. Forests, however, are provincial resources under local control. Each regional component of the farm forestry program required provincial level approval, a process which consumed two years and, on the host country side, created, administratively, four distinct but interlinked programs. The national and provincial governments, moreover, raised the project planting targets from 26,483 acres to 76,718 acres and the number of nurseries from 191 to 1,550. The position of Inspector General, which also entails serving as project coordinator, was in flux until 1985.

As it became clear that market incentives motivated tree planting, a direct linkage between producer and commercial users was required. With this third leg, "communication of market quality standards, quantity requirements, species needs, and prices can develop" (Naughton 1991). The shift toward industry participation in farm forestry de-emphasized multi-purpose tree production that focussed on subsistence fuelwood and conservation.

As a principal source of technical and financial support to Pakistani public forestry organizations, the FP&D project has been involved in and affected by many of the opportunities and difficulties that this shift entailed. By 1985, pressure to "show results" led to a preoccupation with building nurseries and seedling distribution. According to the 1987 A.I.D. Mid-Term Evaluation "the Forest Departments became more concerned with the quantitative than the qualitative dimensions of their work". This concern with targets, coupled with a characteristic government service orientation toward wealthier and more influential land owners, diverted the farm forestry program emphasis away from small, low-income farmers (Catterson, et. al. 1987).

The 1987 Mid-Term Evaluation reiterates concerns expressed by the project anthropologist:

> The intended emphasis of the FP&D project is to assist small farmers in meeting household needs for fuelwood, fodder, timber and cash, <u>not</u> to assist large farmers in establishing commercial tree plantations [it] should be supported by revising ..... yearly provincial targets in terms of the number of households planting trees, <u>not</u> acres or numbers of trees planted (Catterson, et. al. 1987).

The 1991 Mid-Term Evaluation pointed out that "focusing on trees as a commodity has turned attention away from social distributional dimensions that were originally to be addressed". In fact, the project evolved toward and continues under conscious strategy shared by USAID/Pakistan, the technical assistance team, and the government of Pakistan, of emphasizing commercial forest products markets and trees as market commodities (U.S. Agency for

International Development 1991).

This change in emphasis may be well-founded. A recent study indicated only seven percent of rural farmers expressed interest in tree planting for fuel only and suggests, "that programs which are focussed on encouraging energy plantations are unlikely to succeed" (Leach 1992). Similarly, Blair (1986) suggests, for farm forestry programs in neighboring India, that despite their well-intentioned concern with perceived fuelwood shortages, "planners should expand the purpose of the program to take local [profit driven] needs and wants into account."

Education and Awareness

An important strategy in Pakistan's farm forestry program has been to increase awareness of the value of tree farming. The program strategy hypothesizes that institutional changes will prove sustainable only if local officials and actors in the wood production and marketing system are committed to and have developed a sense of ownership of the farm forestry initiative. Conditions for this include: 1) permanent commitment to the creation of social forestry wings in the provincial Forestry Departments, 2) industry awareness of the utility of locally produced raw materials and of the capacity of local growers to produce a stable supply, and 3) farmers becoming aware of their production and marketing options. Overall, the result is expected to be manifest as permanent demands on social forestry service providers of the type being developed under the program's institutional strategy.

Education activities designed to raise awareness dovetail with a formal program of curriculum reform at the Pakistan Forestry Institute (PFI). The PFI training program has two main initiatives: introducing a social forestry curriculum and supporting the training of women foresters. This is complemented by a series of outreach visits with farmers in each of the provincial program regions. Female graduates are beginning professional work but have yet to assume official government posts.

Observational study tours have contributed to diffusing the concept and knowledge of farm forestry practices. More than 850 individuals have, for example, participated in inter-departmental or international study tours. Another approximately 80,000 farmers have received direct training through the outreach program.

The GOP has promoted the concept of forestry extension by establishing multiple channels of information exchange including a social forestry network (which includes other donors), publishing a farm forestry newsletter, involving national and international study tours and organizing formal visits to wood industries and research facilities.

At the field level, farmer-to-farmer visits and the placement of "farm forestry extension" signs where the program has intervened have significantly raised awareness. The farm forester logo found on these signs is repeated in bumper stickers, banners, sew-on patches publications and elsewhere, contributing to a general awareness of the new farm forestry movement. More general A.I.D.-supported awareness raising efforts complement the specific farm forestry program. Examples include policy dialogue, national and regional level sustainable agriculture seminars, educating the media, and the video production described elsewhere in this report.

Technological change

The introduction of new farm forestry technologies is perhaps the most controversial of the program's strategies. The species and cultural practices being extended exert a strong influence in defining the beneficiary population. The program design proposed farm forestry techniques based largely on local multi-purpose species, especially the Acacia nilotica, commonly known as kikar or babul in Pakistan. Null (1987) reports this species exhibited unforeseen weakness; susceptibility to frost damage in certain environments, relative intolerance of saline soils, lack of support from forestry extension agents for a species indistinguishable from non-program trees, and low expectations of its value in the commercial market. These weaknesses have combined with market and institutional factors to engender an unchecked drift toward block plantings of Eucalyptus camaldulensis as the favored and predominant model.

As a visible and rapidly growing species, eucalyptus propelled the forest service model beyond projected planting targets and has raised expectations of performance and economic gain in farmers' minds. E. camaldulensis and its appropriateness to meeting program objectives is discussed in Appendix C and elsewhere in this report. Over-reliance on a narrow range of technological options in a country as ecologically and culturally diverse as Pakistan may jeopardize development of a comprehensive and sustainable national social forestry program.

Despite this risk, the introduction of rapid growth trees with good coppicing or pollarding[1] characteristics into the farm context is a key element of the FP&D strategy. As momentum and commitment to social forestry developed, a project research component was to support the refinement and diversification of the tree farming

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[1] Coppicing is the process of regrowth after basal cutting and pollarding is regrowth after trunk cutting. Both characteristics allow new growth to develop without the need for replanting. A. nilotica tolerates periodic lopping of branches which corresponds to current fuelwood gathering practices.

models being extended.

The research effort was designed to combine social research emanating from the O/IGF program headquarters with a systematic applied research program directed out of the PFI and operating across a network of provincial and departmental research institutes and stations. The social research effort was to provide monitoring and evaluation capability to program management and feedback to the more technical research program of the decentralized forestry research and training institutions. A socio-cultural unit carried out baseline studies. In the applied research program, three studies had been completed and 28 others were ongoing. Alternative commercial packages based on such species as mulberry and cricket willow were under consideration.

Policy reform

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

- A regulatory climate which facilitates the transformation of foresters' roles from policemen to partners;
- Reduced subsidies to private landowners who choose to plant trees under government sponsored programs .

The intervention strategy to achieve these policy reforms is not clearly spelled out in the project design. The main mechanism employed consisted of placing an advisor to work directly with the GOP officials responsible for policy coordination. This approach may facilitate access to insider information but at the same time is subject to the risks of loss of perspective and lack of leverage.

The FP&D technical advisors conducted market policy studies and an international symposium on forest policy issues. These contributed to social (including farm) forestry being given a higher profile and more substantial role in the National Forest Policy 1991. The 1991 FP&D Mid-term Evaluation praised the project for this accomplishment while noting that it was rather late in coming. The reigning official legislation governing forestry, summarized below in Table 1, underscores the persistence despite trends toward change of a control oriented system.

The GOP experience of implementing the farm forestry program has been defined by the shift in forest policy emphasis from the traditional focus on relatively small areas of public forests to large areas of private farmland. Without formalizing a "social forestry wing" it will be difficult to enact needed changes in traditional methods of operation, training, and linking government and producers. Such change depends, moreover, on an expanded

scientific basis for establishment and management of new species on new kinds of sites. All these factors depend on a supportive administrative, fiscal, and regulatory policy environment, and all are critical to the long term viability of the farm forestry model. If policies are not in place, Pakistani foresters will have difficulty adopting the new attitude of partnership over policing, of encouragement over enforcement.

TABLE 1: FORESTRY LEGISLATION

Problems	Legislation	Enforcing Agency	Offence	Penalty
Forest Conservation	The Forest Act. 1927	Ministry of Food and Agriculture, Forest Division	Clearing of forests for cultivation, grazing, hunting, removing forest produce, quarrying, felling and lopping and tapping of trees, branches etc in reserved or protected areas	Maximum imprisonment of 6 months and/or fine up to Rps. 500
			Defacing trees and timber, and altering forest boundary	Maximum imprisonment of 2 years, and/or fine
	West Pakistan Firewood and Charcoal (Restriction) Act, 1975		Burning of firewood and charcoal in factories, brick kilns & lime kilns	Maximum imprisonment of 1 month and/or fine up to Rps. 500
	The Cutting of Trees (Prohibition) Act, 1975		Cutting and felling of trees in the five mile belt along the external frontiers of Pakistan without written approval of local formation commander	Maximum imprisonment of 3 years and/or fine
	The NWFP Hazara Forest Act, 1936	NWFP Forest Department	Similar to Forest Act, 1927	Similar to the Forest Act, 1927
	The NWFP (Conservation & Exploitation of Forests in Hazara Division Ordinance, 1980	NWFP Forest Department	Extraction of timber and forest produce without government approval	

Source: PAKISTAN NATIONAL REPORT TO UNCED 1992

Program Impact

The most visible change resulting from the intervention

strategies is the presence of Pakistan's "Social Forestry" program with its cadre of social foresters trained in extension techniques. The active participation of farmers in the program is also easily verified by visits to the nursery's and fields where seedlings and trees are being cultivated. The existence of new PFI farm forestry research programs and of newsletters and publications on farm forestry practices reflect changing awareness and technology. This section examines the impact of these changed conditions on farm forest management practices, on the environment, and on the economic well-being of farmer participants.

In order to gain a reasonable understanding of the adoption of farm forestry practices, CDIE sought data from multiple sources. Two major field surveys of farm trees had just been completed (FSMP 1992, Amjad et. al. 1990, 1992). A third released preliminary results just as the CDIE evaluation team left the field (Leach 1992). CDIE complemented these secondary data sources with a brief survey to "ground truth" the adoption of farm forestry practices directly attributable to the A.I.D. supported portion of the program. The survey results refine and in large measure substantiate the qualitative data derived from informal and focus group interviews. The results are highlighted throughout the findings section. Data on bio-physical and socio-economic impact are drawn from secondary sources. The analytical framework for examining impact and the approaches to collecting data on indicators of impact are discussed in Appendix B. The survey methodology is elaborated in Appendix C.

Impact on Practices

Government forests in Pakistan supplied only 2 percent of wood consumption in 1991 (Leach, 1992). Due to their relatively small area and to the obstacles to efficient environmentally sound management, the scope for increasing their production is limited. The Pakistan government has recognized, therefore, that Pakistan's private farm lands present the only possibility for meeting growing demand for wood (National Forestry Policy 1991). To bridge the gap between concept and reality required visible demonstration. The Pakistani government effectively leveraged FP&D support and accomplishments to provide this demonstration.

Trees planted under the project occupy 39,989 acres of plantations and 7,360 miles of linear plantings. The total number of trees produced in project nurseries through March 1992 was 96 million.[2] Neither the project monitoring system nor the Pakistani institutions collect systematic data on the types of plantings and

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[2] More recent unofficial figures place the total at over 120 million seedlings distributed.

the profile of planters and their holdings.[3] Local forestry offices record the number and species of seedlings distributed, but FP&D project efforts to aggregate and synthesize these figures were incomplete, thus CDIE could not generalize from this information. A better understanding of what became of the vast number of project seedlings is, however, essential to interpreting the program's impact. The best proxy indicator available to the assessment team for determining biophysical and development impact derives from aggregating the figures regarding the adoption of farm forestry practices by project beneficiaries and complementing this information with the reporting of direct observations made by farmers residing in the zones affected by the social forestry program.

How many farmers adopted the new farm forestry practices? At the farmer level , two main groups of actors were needed to make the package "take off." On the supply side, a small group of farmers were required to operate the privately-owned contract or kissan nurseries. The government reimburses Kissan nursery operators for providing a timely supply of seedlings. From the farmer's perspective, these contract nurseries were profitable and, although dependent on government funding, reasonably predictable as an income source. Because of the market guarantee, nursery applications were oversubscribed.

The kissan nursery system was effective in supplying private holdings. Not only were large numbers of nurseries established, but the evaluation team's direct comparative observations of 9 private kissan and 7 publicly managed territorial forestry nurseries revealed that they were visibly better-run and more efficient activities. Two issues were relevant to determining the impact of this contract production program: 1)the tradeoffs between rotating contracts to spread benefits and maintaining a core of knowledgeable operators, and 2) the equity concern of whether to favor larger better capitalized operators over smaller farmers who are more in need of the additional income.

The second and more critical group of actors is the private farmers classified as **seedling recipients**. Here, the program had done an exceptional job of harnessing and building upon an inherent demand. Farm forestry was growing at an exponential rate and spreading beyond the set of immediate project beneficiaries. In spite of the Forest Service tendency to increase planting targets from those suggested in the A.I.D. Pakistan Mission planning documents, the numbers of farms, seedlings, and nurseries

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[3] Appendix C highlights some of the principal farm forestry systems to which project seedlings are destined.

consistently exceed expectations. The 120,409 farms[4] reached by 1992 is 141 percent of the end of project target of 85,240. The reporting of farmers adopting tree planting depicted in Figures 2 and 3 refers to all recipients irrespective of what use they made of the seedlings. (Virtually all reported planting in lines or blocks.) The CDIE field team visited over 20 holdings and carried out focus group interviews involving nearly 40 farmer-adopters.

The cumulative total of seedlings was counted variously as falling between 84 and 120 million. The low-end figure coincides with the Pakistan government's target. The seedling distribution works out to an average of approximately 700 trees per recipient. (The CDIE survey farmer recipients reported an average of almost 1400.) If Sheik's (n.d.) optimum of roughly 100 trees per hectare of scattered plantings in the rainfed barani zone is accepted, an average distribution would be sufficient to cover the needs of a 7 hectare farm. In reality, most larger plantings are in concentrated block plantations where planting densities sometimes reach several thousand per hectare.

This brings up questions concerning the nature of the practices being adopted. The issue centers on whether the program has included large numbers of small farmers planting multipurpose species or small numbers of large farmers planting commercial stands. The latter scenario implies fewer environmental benefits.

The technical assistance team's forestry extension advisor judged that any farmer receiving more than a few hundred seedlings almost certainly planted with a commercial intention. The CDIE survey results confirmed that the high levels of adoption were motivated by the commercial orientation. Eucalyptus is planted largely for commercial reasons and can be taken as a proxy indicator for the increased focus on market objectives in planting. Figure 4 presents evidence of a shift in the later (post 1988) project years toward an increasing focus on eucalyptus. The survey data indicate 60 percent of all seedlings received were eucalyptus, a figure higher than the 55.2 percent reported by the FP&D (October 1991) for the entire project area. Project data also indicated that of the farms receiving seedlings, two-thirds included at least some eucalyptus.

How well has the commercial strategy functioned in meeting the

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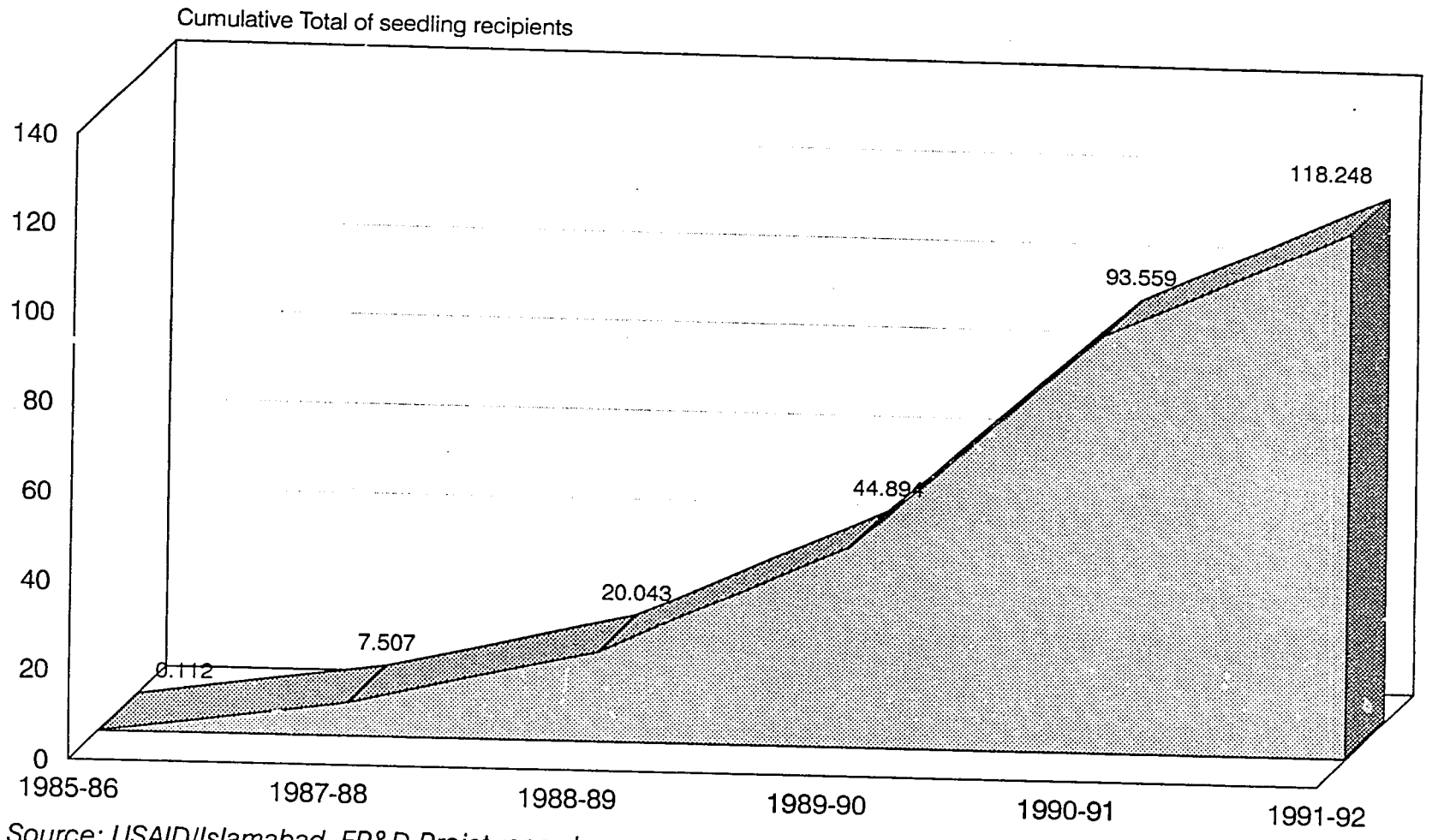
[4]The number of farms or farmers receiving seedlings is tallied annually. Since there is no way of knowing how many of these same farmers participate in subsequent years, they are referred to in the text as "seedling recipients." Moreover, for plantings exceeding the 5,000 free seedling planting incentive, it is widely acknowledged that numerous recipients present themselves for a single farm.

Figure 2

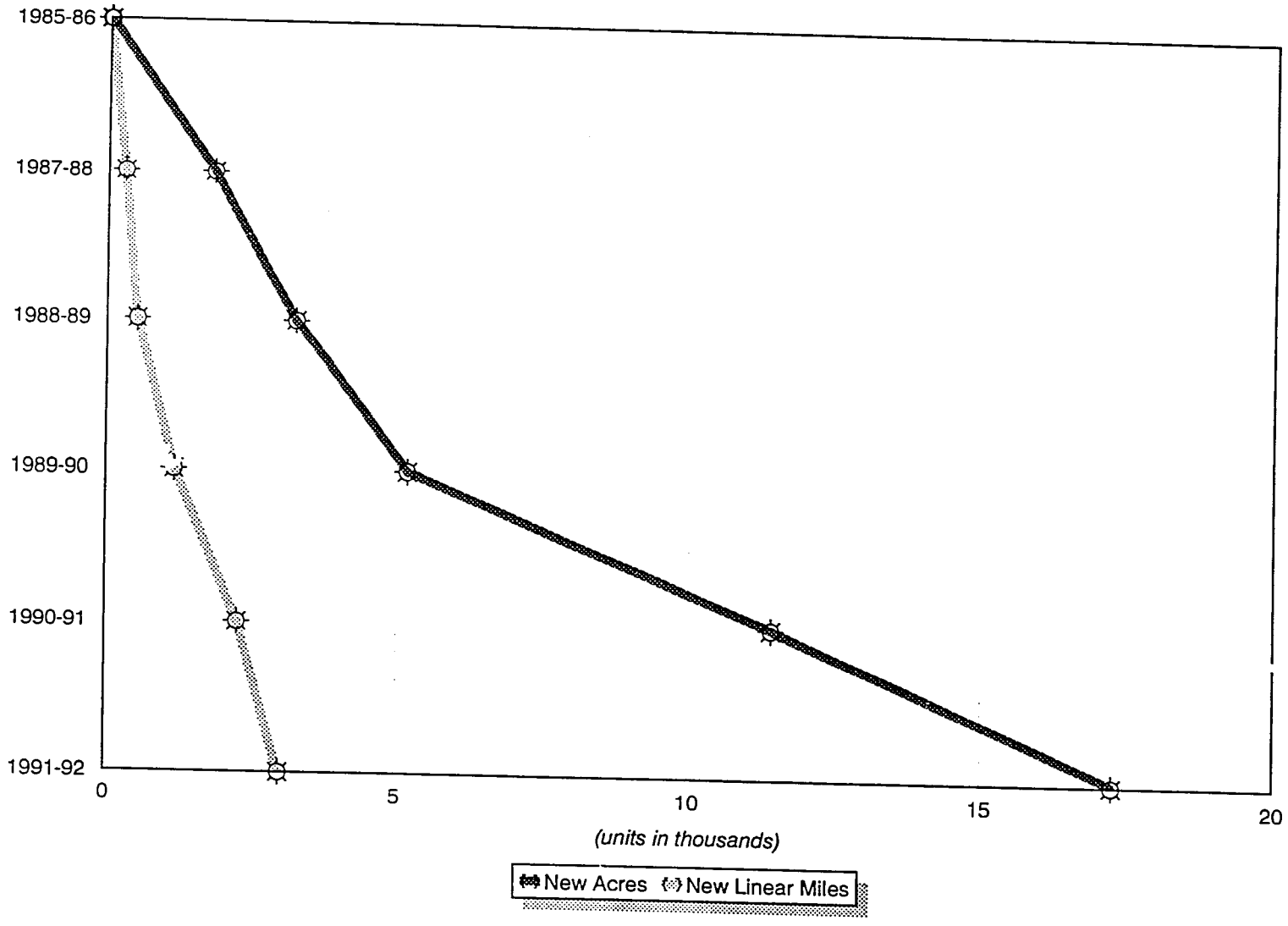
Adoption of Farm Forestry Practices



Source: USAID/Islamabad, FP&D Projet records

Figure 3

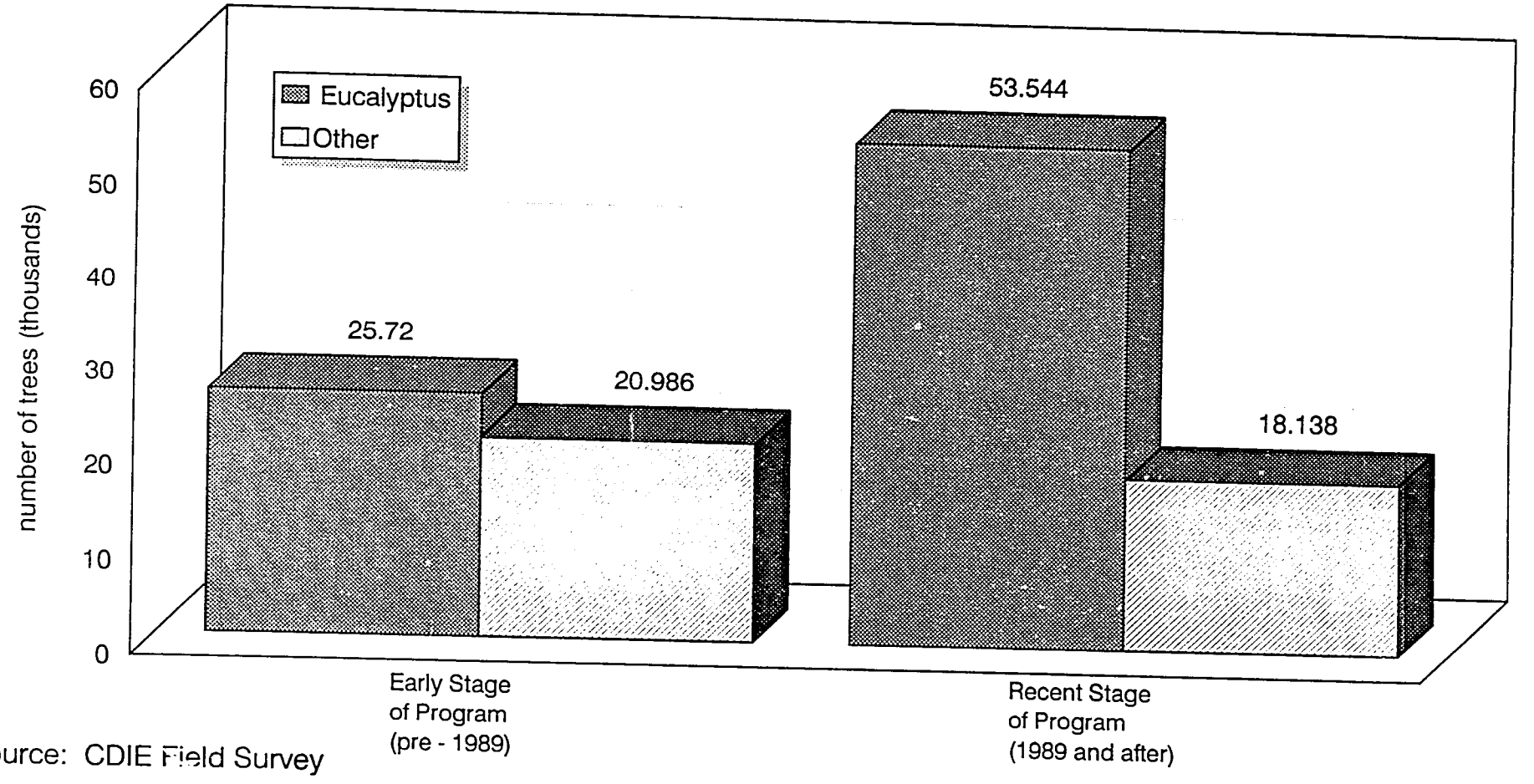
A.I.D. Support to Farm Forestry in Pakistan: Extent of New Plantings



Source: USAID/Islamabad

Figure 4

Relative Importance of Eucalyptus versus Other Seedlings



Source: CDIE Field Survey

valid social and environmental goals foreseen in the original design? Does meeting commercial demand provide a vehicle for simultaneously fulfilling the project intent to supply small farmers with a domestic stock of fuelwood and thereby serve to reduce pressure on surrounding state and communal woodlands? The baseline surveys suggested that although small farmers were less likely to express interest in receiving seedlings, their cumulative numbers and total hectares under cultivation made them the most important target group (Jan and Dove 1989). Table 2 illustrates that actual adoption rates compare favorably with interest expressed the baseline surveys.

Biophysical Impact

Pakistan's social forestry program is only now gaining sufficient maturity to expect measurable biophysical changes in affected areas. The FSMP has just completed the first comprehensive survey of forest cover and production for Pakistan. When the results are officially published, they will provide a baseline for future macro-level monitoring. The initial results, portrayed in Table 3 indicate that the country's forest cover may be far more extensive, perhaps up to 15 percent, than the five percent range currently reported. They underscore the importance that farmlands already play in supplying fuelwood and timber. More than ten of the estimated 14.4 million metric tons originate from agricultural zones.

In addition, to the extent that they are accurate, the inventory results sound an alarm regarding pressure of fuelwood demands on the resource base. The HESS survey reinforces the case that **woodfuel demands exceed the current annual rate of production.** If their calculations are accurate, annual productivity accounts for less than one-third of the annual consumption. This implies that **"forest capital"** is being consumed or mined at a rate of more than 27 million tons per annum. At this rate forests would be depleted by the end of the decade.[5]

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[5]Obviously, the real rate must not be this high. If this rate is projected back six to seven years and then brought forward, Pakistan would be left today with absolutely no forest and trees. Even the most pessimistic observers of deforestation in Pakistan would not venture forth that within the decade all of the country's forests will be consumed. When CDIE made further inquiries, HESS survey analysts indicated uncertainty with regard to assumed growth rate assumptions, but not sample methodology. Sensitivity analysis indicated that small upward adjustments in the estimated growth rates translated to substantial increases in overall production. HESS technicians are very confident of their fuel consumption/wood demand figures. The figure of about 40 million tons per annum is under but close to the 43 million calculated by the FSMP.

Table 2

Participation in Farm Forestry Program by Size of Holding

Farm Size (acres)	Planted Before 1989	Planted 1989 or After	Repeated Planting Before and After	Total Participants	Total Nonrecipients	Reported Level of Interest 1986 Baseline
0 - 5	5	5	9	53%	47%	45%
6 - 10	4	4	4	48%	52%	55%
11 - 20	3	4	1	50%	50%	71%
21 - 30	1	2	1	57%	43%	85%
30+	3	4	3	83%	17%	90%
TOTAL	16	19	18	55%	45%	-

Source: CDIE Field Survey 1992 and Dove and Qureshi (1989)

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Table 3

Agro-ecological Zones and Forest Productivity

Description	Area (sq km)	Percent cover	Timber from trees	Fuelwood from trees	Fuelwood from shrubs	Timber from trees	Fuelwood from trees	Fuelwood from shrubs
High productivity irrigated (Punjab and NWFP)	91845	10.47	23.0	25.8	5.9	1.9	2.4	1.5
High productivity irrigated (Sindh and Baluchistan)	19872	2.27	2.9	3.3	0.5	0.2	0.2	0.1
Moderate/marginal prod irrigated (Punjab and NWFP)	31863	3.63	10.0	10.0	1.4	0.8	1.2	0.3
Moderate/marginal prod irrigated (Sindh and Baluchistan)	44609	5.09	2.3	3.1	2.7	0.2	0.3	0.7
Sub-tropical rain-fed agriculture (barani)	27878	3.18	0.3	3.1	0.7	0.0	0.2	0.1
High mountain valleys, scrub and forest areas, and foothills	129967	14.82	30.2	42.8	4.3	1.1	1.8	0.5
Transitional, moderate and high productivity semi-arid	253832	28.94	4.2	5.5	0.3	0.2	0.4	0.0
Hot, hyperarid desert and arid desert	252342	28.77	0.2	1.3	2.4	0.0	0.1	0.3
Balance: permanent snow	25019	2.85	-	-	-	-	-	-
Total Pakistan (including AJK)	877227	100.00	73.2	94.9	18.1	4.4	6.4	3.6

Source: Household and Energy Strategy Survey (HESS 1992) Data derived from NOAA AVHRR Satellite Imagery

Increase in forest/tree cover

How important is farm forestry in combatting this environmental challenge and what has been the relative importance of A.I.D. support to Pakistan's program of on-farm tree planting? To answer this question it is necessary to put the quantitative accomplishments of the program into the overall context of tree planting and fuelwood demand in Pakistan. Longitudinal data on overall tree planting in Pakistan from 1985 to 1992 are not available, but a single year comparison can be made. This helps establish the parameters upon which biophysical impact of the estimated 100 million project seedlings can be extrapolated.

The total number of farm families in Pakistan is 5,558,000 (Leach, 1992). The FP&D project records show planting supported on 120,409 farms from 1985 through 1991/92. Assuming that none of these farms were counted more than once, the program worked on approximately 2% of all Pakistan farms during the period 1985 to 1992. According to the HESS survey 41% or 2,278,780 of all farm families planted trees in 1991. The FP&D supported farm forestry program assisted 48,665 farms to plant trees in 1990/91 or about 2% of all the farms that planted trees in 1991.

The program has concentrated its work in Punjab and the Northwest Frontier Province and in certain districts of these provinces. Data from the HESS study are available by province. In 1990 55 million trees were planted in Punjab and 40 million in the NWFP (Leach, 1992). The FP&D planted 14.8 million trees in Punjab and 8.0 million in NWFP in 1990/91. In Punjab, therefore, the program planted about 27% of all trees that were planted, and in NWFP it planted about 20%. The HESS survey shows 12.1 million trees planted in Balochistan while the program planted 2.1 million, or about 17% of the total.

The HESS survey provides information on tree planting during 1990 that can be compared to the FP&D planting data for 1990/91, assuming that each covers a twelve month period. For 1990 the HESS survey indicates that 112 million non-fruit trees were planted on private land. A.I.D. support to the program accounts for just over 25 million trees planted on private farms in 1990/91. The FP&D project, therefore, apparently contributed to over **one fifth of all private non-fruit tree plantings** in the period 1990-91.

In recent years, other projects have adopted the on-farm planting model pioneered with FP&D project support. When indirect impact is considered, it is likely that the project accounted for an even larger proportion of trees planted than is suggested by the above data. **In short, the total number of trees planted since the program began is significant for the country overall and is especially pronounced in those farming areas where the program has been most active.**

How far will the trees planted with FP&D project support go towards supplying Pakistan's demand for wood? Because many of the seedlings are young, and as section 3.1 made clear, adoption of private tree planting is only now at a take-off point, the most appropriate tack available in estimating future biophysical impact is to place this tree growing in a framework of meeting energy demand. The total 1991 wood consumption in Pakistan was 43 million cubic meters (FSMP,1992). Assuming a 70 percent survival rate[6], about 67.2 million of the 96 million trees raised in the kissan nurseries are still alive and growing. Using this figure and accepted growth rates[7], trees planted under the program produce between .45 and 1.4 million m3 to 1.7 million cubic meters per year or about 4% of Pakistan's present annual consumption of wood.

Not all growth is destined to be used as fuelwood. Producing trees for industry reduces deforestation and contributes to increased vegetative cover only to the extent that part of the production enters the local economy. This contribution might be 25-50 percent of harvest dry weight but varies by species and commercial tree use. This replaces wood that would have otherwise been taken from forests and scrublands.

To what extent has the A.I.D. supported program contributed to increasing supplies of wood energy, its principle goal? HESS found that about 50 to 60 percent of the volume of lopped and felled trees is used for fuel. Using the same production range, trees planted under the A.I.D. funded program are supplying between .6 and 4 percent of the present firewood requirements of Pakistan. A stocking of 100 trees/ha growing at .05 m3/trees on 16 million hectares with 50 percent of the wood being used for fuel would satisfy Pakistan's present firewood requirements. Using reported area covered, the program has directly encouraged planting of the equivalent of about 4 percent of the trees necessary to satisfy Pakistan's present firewood requirements. Since some fuelwood can be sustainably harvested from natural forest and scrub, the more important measure is what percent of the annual shortfall (the portion being mined) is met by program related plantings. Since current estimates are so uncertain, CDIE did not estimate this contribution. It would certainly be higher than the contribution

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[6]Project technical staff estimate this figure or higher. Leach (1992) assumes a similar figure, and the mean survival rate reported by CDIE survey respondents is about this level as well.

[7] As pointed out by Leach (1992) the growth rates for these trees are difficult to predict, especially as the program has kept no record of the quality of the site on which the trees have been planted and does not separate out the number of trees planted by species. The Forestry Sector Master Plan estimates, however, that the average yield for farm trees is .021 to .025 m3/tree/year (Leach, 1992).

to the overall total.

Improved management of degraded sites

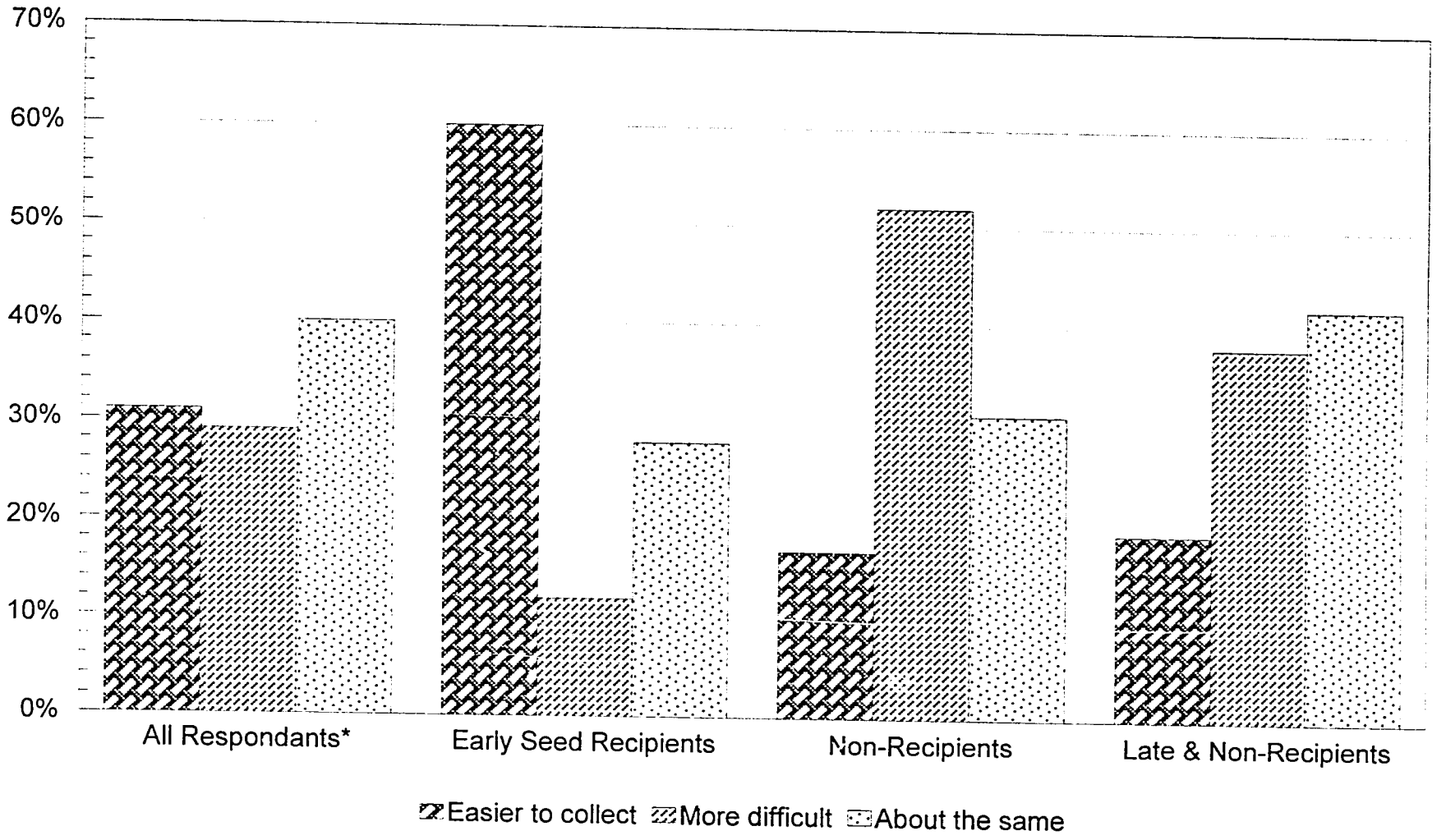
The farm forestry program has carried out land development on 14,281 hectares and treated 2,870 with soil conservation improvements. An important, but unmeasured, contribution to improving the environment follows from the reclamation of saline, sodic, and waterlogged soils. Such plantings are common and much is made in FP&D project documentation about the strategic importance of this reclamation to the program's mission. The areas of in which such soil conditions are found are abundant in Pakistan. The NCS points to the millions of hectares of saline and of waterlogged "agricultural wastelands" located in irrigated areas of high potential production. Existing records make it impossible to determine the extent of additional hectares of private lands where farmers improved the management of saline, waterlogged, or other marginal holdings by planting trees. Field visits indicated that many farmers indeed made such environmental investments. Nevertheless, A.I.D.-supported accomplishments in this area can be considered tentative and secondary to the farm forestry program's main thrust. It is, for example, the only program area where the government did not meet its own targets.

Perceived environmental impact of tree planting.

Since environmental impact is impossible to measure directly at this stage, CDIE used its survey instrument to ask farmers whether and how they perceived environmental changes associated with tree planting. When asked if they thought that the number of trees had increased since the program was initiated, about half reported visible increases. Seedling recipients, not surprisingly, were more likely to report increases in tree cover than non-adopters. Of the total, 49 percent reported a higher number of trees, but results varied greatly between villages. In the three of six villages where the program had taken hold, 80 percent of the respondents reported more trees than when the program was initiated. The majority (64 percent) attributed the rise to the availability of free seedlings which was followed in importance by greater awareness of the value of trees (14 percent).

As the trees from program distributions become integrated into the agricultural environment, farmers are developing practical opinions of their perceived impacts on soil moisture, soil fertility, on local climate and temperatures, and on competition with crops. Concerning soil moisture and fertility, opinions were mixed but generally benign. Many farmers recognized crop competition as an issue, especially when land was a limiting factor. From these questions the most striking finding was a reported climatic benefit -- increased "freshness" especially in summers.

Figure 5. Difficulty Experienced in Gathering Fuelwood



Source: CDIE Survey 1992

*Except control village

Another proxy indicator for biophysical impact centers on the degree of difficulty encountered collecting fuelwood. As shown in Figure 5, farmers whose seedlings were planted in 1988 or earlier were about four times more likely to report fuelwood gathering to be easier than for the period prior to program implementation. Although it is a rough indicator and the respondents were males, the implication is that fuelwood is being obtained as planted seedlings mature. Eventually, this in turn would lessen pressures on surrounding scrub woodlands. The process is still too nascent to show visible measurable impact.

Woodfuel and Dung.

Has the FP&D project helped to bring about a reduction in the use of dung as fuel rather than fertilizer, a principle economic and environmental benefit? Most of the trees are too young to have yet altered the domestic fuel mix, and in some cases, farmers prefer dung as a fuel. While 77 percent of all households report dung supply insufficient for fertilizer needs, Table 4 suggests that seedling recipients are already beginning to substitute domestically grown fuelwood for dung. As dung is transferred to fertilizer uses, the assumption is that soil improvements will lead to increases in productivity and income.

Table 4

Mean Use of Dung as Fertilizer and Fuel

	% Fertilizer	% Fuel
Seedling recipients	47	53
Non-recipients	30	70

Source: CDIE Field Survey

Socio-economic impacts

The six to seventeen year lag between planting and realization of all benefit flows means that at this stage much of the project's impact must be imputed. Evidence of socio-economic impact comes from several sources. Secondary data measuring net incomes for different tree farming systems provide an indicator of benefits at present prices. CDIE survey data attest to the preliminary nature of the conclusions about development impact but point to the importance of market orientation to the farm forestry model of

environmental management. It is telling to note that of the 85 seedling recipients included in CDIE household sample, only one reported having sold timber as of November, 1992. Eight had already marketed at least some firewood. Seedlings quite simply have not yet matured. When asked about intended future sales, a majority, as can be seen in Figure 6, plan both timber and fuel sales (with timber clearly favored).

Leach (1992) analyzes the distribution of tree planting based on the results of the HESS survey. He points out the sharply skewed distributions in tree planting: "Most households or farmers who plant trees plant few of them; and most trees are planted by a small proportion of households or farmers". The experience of the FP&D reflects the HESS findings that most trees are planted by a small proportion of farmers. Although the FP&D supplied 20% of all trees that were planted it worked on only 2% of all the farms that planted trees. According to Hatch (1990), at least until September of 1990, the "overwhelming majority of the project produced trees were being planted by the larger and relatively resource-rich landowners".

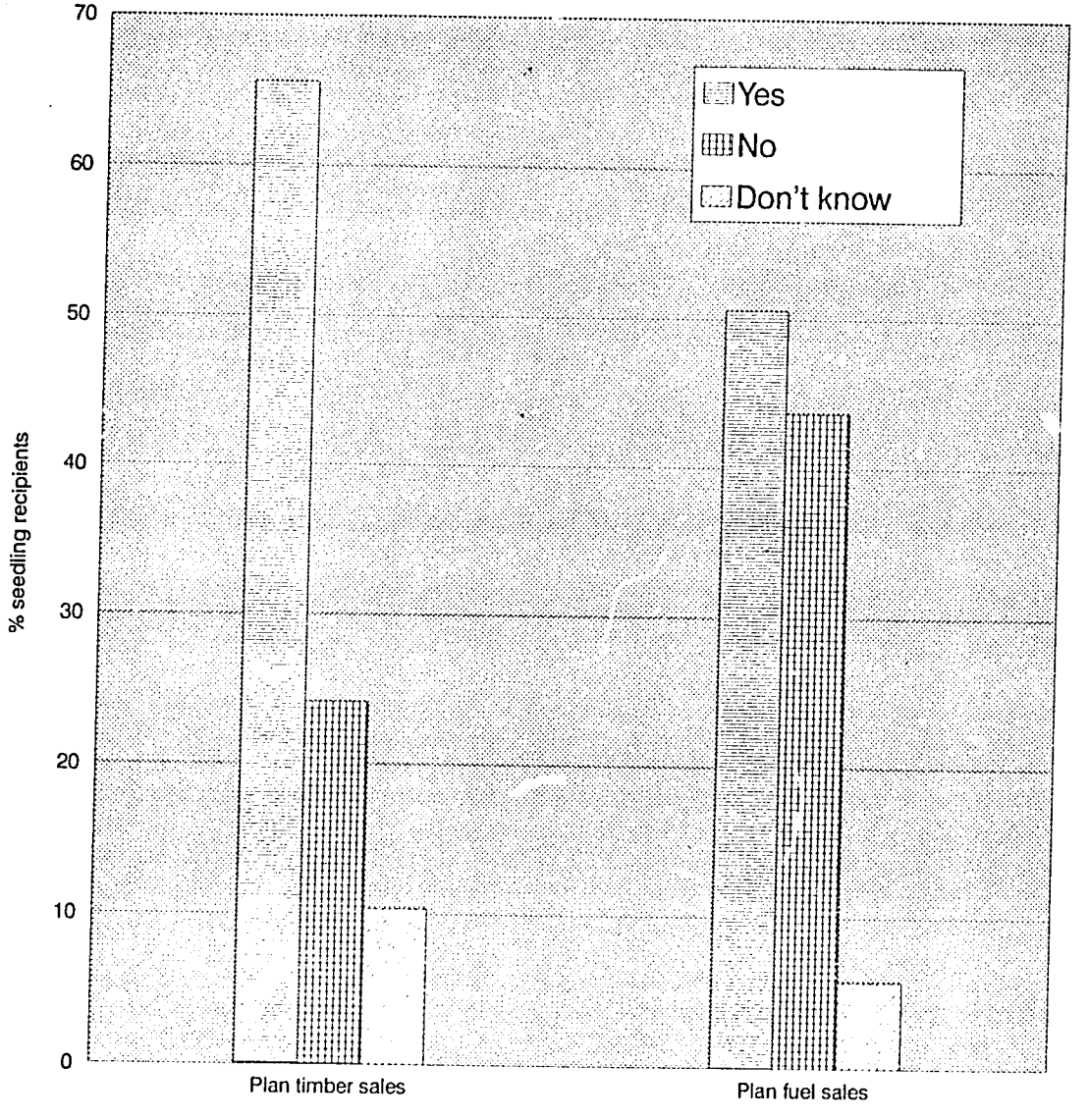
Leach (1992) points out that "when considering the future potential of farm forestry, a major question is the extent to which smaller farmers are constrained by lack of land (or other factors) from growing more trees, or whether, as with many other agricultural practices, they will in time begin to follow the example set by the largest farmers". The FP&D program design put considerable emphasis on small farmer participation, not only in an attempt to assure an equitable use of program resources but because smaller farmers control a majority of the land. The two Mid-Term Evaluations, and several reports by the technical assistance team (Dove, 1987) also conclude that the overall impact of the program will be much greater if smaller as well as larger farmers are involved. Figure 7 underscores the fact that while market orientation has become more important, farmers still view tree planting with multiple objectives in mind.

The program's economic impact is manifested mainly in the added incomes and employment generated from the value of tree crops themselves rather than in added income from higher yields of other crops or livestock that could be indirectly attributed to the incorporation trees into traditional production systems. This evaluation examines only the value of added net income from trees planted between 1986 and 1992. Other benefits -- from tree seedling nursery development to soil and watershed improvements are recognized to exist. They are not, however, quantified and included in estimates of program benefits.

FP&D monitoring staff collected cost of production data for a range of farm tree cultivation systems introduced by the farm forestry program during the period of A.I.D. FP&D project support. Annex 5 presents calculations of farm level net benefits, expressed

Figure 6

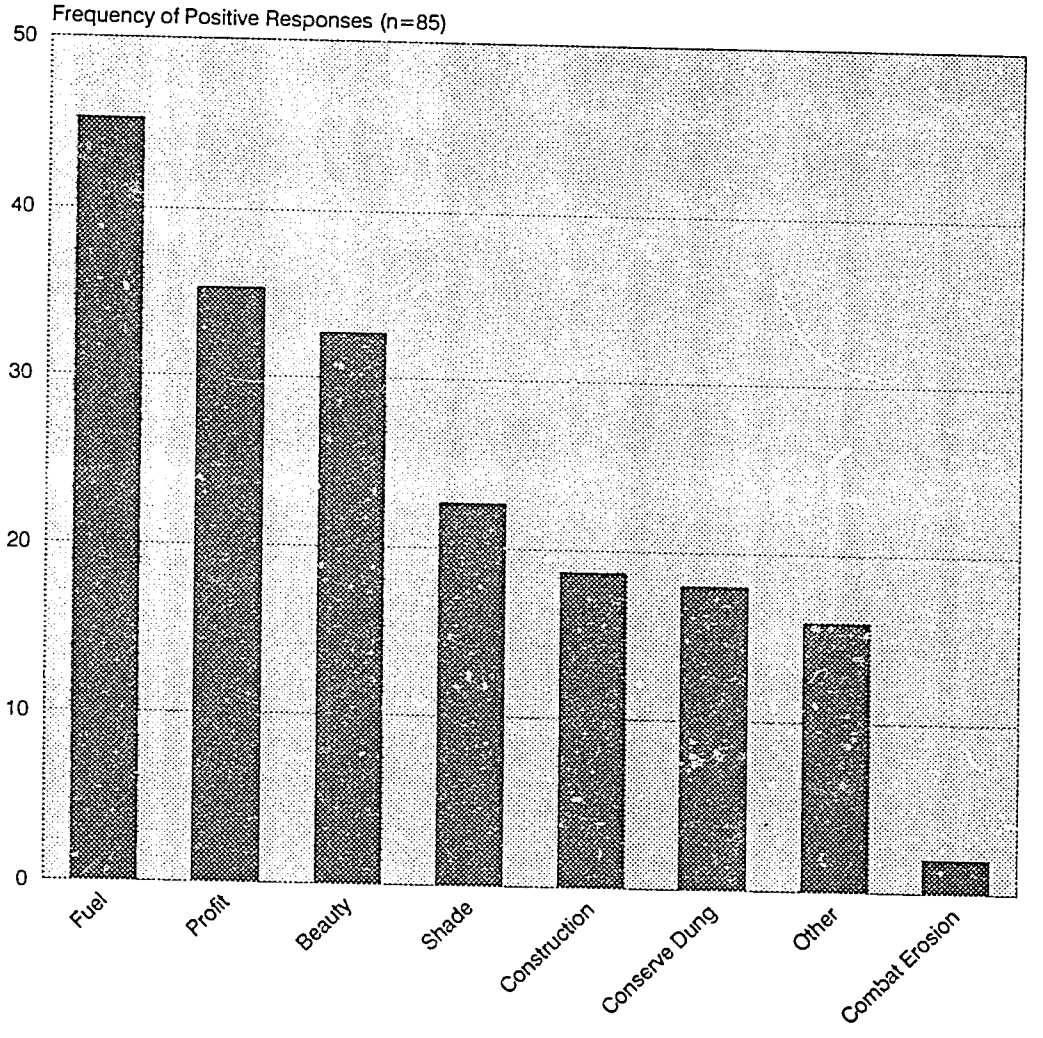
Anticipated Timber and Fuelwood Sales



Source: CDIE Survey, 1992

Figure 7

Benefits Cited for Planting Seedlings



Source: CDIE Survey, 1992

in terms of per acre farm forestry enterprise budgets for five different tree planting systems and for one "control" crop, rainfed wheat. These enterprise budgets illustrate the range of benefits in terms of total net present value (NPV), equivalent annual income (EAI), benefit/cost ratios (BCR), and internal rates of return (IRR) for each enterprise. Table 5 below summarizes these benefit measures for the six farm enterprise budgets. (Net benefits, costs and internal rates of return attributable to the A.I.D. FP&D project investments are discussed in Section 3.3.1).

Table 5 : Economic performance of selected farm enterprises

Farm enterprise activity	NPV	EAI	BCR	IRR
Eucalyptus 5-year cycle #1	3,732	996	2.17	81.9%
Eucalyptus 5-year cycle #2	18,300	4,885	4.96	109.0%
Eucalyptus-waterlogged soil	16,688	3,610	2.19	32.7%
Eucalyptus as windbreak	7,924	686	1.79	20.4%
Acacia nilotica - seeded	29,870	4,736	10.76	59.7%
Rainfed wheat (10-year cycle)	5,550	702	2.09	---

NPV and EAI are calculated in $ per acre; IRR is calculated as a percent.

Table 5 reveals that the economic returns from all of these farm forestry enterprises compare favorably with traditional rainfed wheat cultivation, the only alternative use for most of these lands. Some of the farm forestry enterprises show income flows and rates of return greater than many cash crops grown on better irrigated lands under intensive cultivation conditions. Clearly, it pays individual farmers to invest resources into bringing marginal lands under tree cultivation.

Of course, the promising benefit picture shown by these farm forestry enterprises, results in no small measure from the strong market demand for wood products that currently prevails in Pakistan. The extensive practice of farm forestry would no doubt bring prices down and with lower prices, incomes and rates of return would more closely approach those of many cash crops.

Eventual market saturation is sufficiently remote that it does not diminish the argument that farm forestry is profitable. Moreover, demand, like supply, is dynamic and ample scope exists in

Pakistan for new wood products industries -- pulp and paper mills, particle board, etc. -- once there are reliable and sufficiently abundant supplies of timber from farm forestry production. Fuelwood prices are subject to different market factors than other wood commodities and provide some price stability to farmgate wood prices.

Total gross economic benefits attributable to the FP&D project and its counterpart GOP contributions can be estimated roughly by multiplying per acre estimates of the value of standing trees cultivated under the farm forestry program by the total estimated number of acres reached by the program. FP&D project records estimate that the GOP supported private farm planting of about 40,000 new acres (in block planting) and 7,360 new miles (of linear planting). About 60 percent of the trees have been eucalyptus and 40 percent in other tree varieties.

An accurate analysis of benefits would require a breakdown of the 40,000 new acres by tree variety, soil condition and type of cultivation. FP&D project records do not contain information that would permit this. Therefore, this analysis uses only the most conservative five-year eucalyptus planting system -- Eucalyptus five-year cycle #1 in Table 5. Also excluded are the benefits from linear plantings and tree nursery operations. These exclusions result in a more conservative estimate of benefits but one which can be made with greater confidence.

Gross equivalent annual income over five years for eucalyptus block planting is $ 996 per acre according to FP&D project calculations (Table 5). With a benefit cost ratio of about 2:1, resulting net annual income is $ 500 per acre or about $20,000,000 per year when spread over the entire 40,000 acres reached by the program. The net present value of this net income benefit stream over the five year period of eucalyptus cultivation is about $80,000,000.

There are several important assumptions about this $80,000,000 estimate of the present value of tree products from Pakistan's farm forestry program:

- First, the $80 million estimate excludes all other benefits from farm forestry -- improved soil quality, reduced soil run-off, more crop and livestock residues returned to soils. While these contributions may be small for any one farm, in the aggregate they can have measurable impacts on aggregate crop yields, output, incomes and employment demand.

- The flow of benefits from nursery stock production and from newly stimulated wood products industries is not included in the analysis for lack of data on the costs and returns from these operations. The labor and land

intensive nature of seedling production and wood products industries make them import "by-products" of the farm forestry program and should be recognized as an additional indirect program benefit.

- Many farmers are likely to benefit from multiple harvests or replant trees and therefore continue the flow of benefits beyond the five years used in the calculations. Moreover, the net income figures generated from the farm forestry enterprise budget data are probably conservative to the extent that farmers during early farm forestry program implementation were just learning how to incorporate tree crops into their farm systems. With added experience and skill, farmers can be expected both to improve yields and reduce costs from farm forestry. The analysis excludes net income gains from added experience and skills, because they are too speculative.

- The analysis makes no allowance for regressing to the old ways. This may be overly optimistic if some local markets might become saturated with trees or if government policies in the future turn hostile to farm forestry practices or the free commerce of tree products.

The above calculations justify concluding that the Pakistan farm forestry program has introduced a significant number of farmers to a new source of cash income, employment and low-cost tree products for home use and sale. It has also stimulated support activities in seedling nursery operation, in custom tree harvesting and in wood products trade and fabrication. However, while these activities may have had significant impact on the target farmer population, at this stage their impact at the national level has been less dramatic. The importance of Pakistan's farm forestry program to date lies more in its demonstration of the potential of farm forestry than in its impact on national timber production.

Program Performance

This section examines the performance of the Pakistan farm forestry program from the standpoints of its efficiency, effectiveness, sustainability and replicability. A discussion of the evaluation's analytical methodology in Appendix A defines how each of the performance measures is used.

Program Efficiency

The data from the discussion of the program's socio-economic impact above are used here 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 -- the $27.5 million in A.I.D. and $ 7.0 million in GOP funding. When the estimated $20,000,000 annual flow of income benefits from farm tree crop cultivation is used as the return on the $34.5 million in farm forestry program investments the resulting economic rate of return (ERR) comes to about 60 percent. The overall program benefit-cost ratio is about 2.3:1

This calculation of program economic rate of return makes two important assumptions:

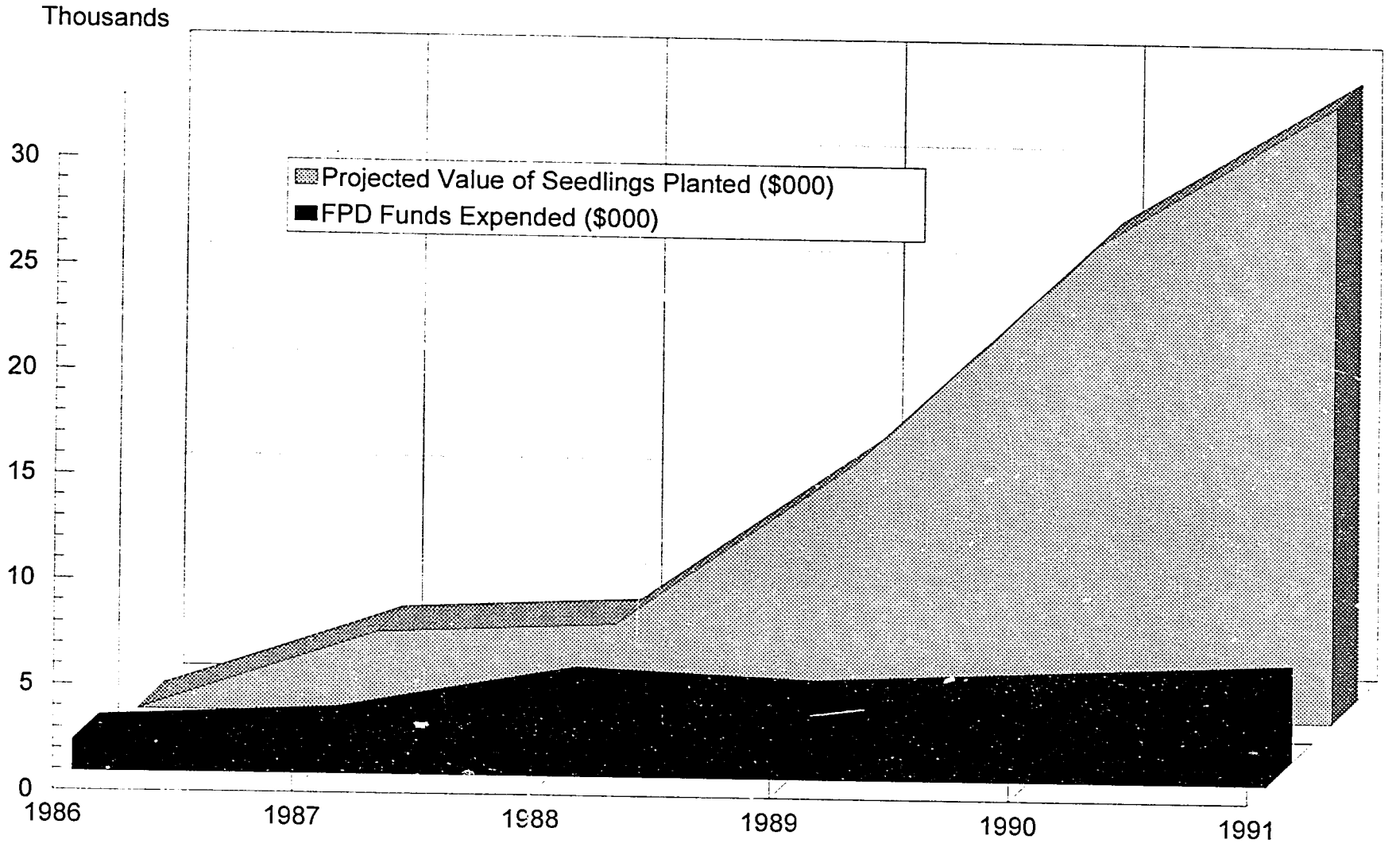
Benefit flows. The analysis assumes a constant stream of net income benefit flows over five years from farm forestry practices which participating farmers and nursery operators have adopted. Furthermore, there would be not relative shifts in crop prices or in crop cultivation technologies that might make farm forestry less attractive in future years. Also it assumes that the opportunity costs of land put into tree crops is zero, an unrealistic assumption if some land might be used, say, for livestock pasture. But given the marginal income likely from the poor lands on which many of the tree crops were planted, assuming a zero opportunity cost does not lead to much over-estimation of net benefits.

Investment costs. The analysis is based on the assumption that farmers pay the full value of tree seedlings even though the program subsidized most of the costs of seedlings distributed under the program. Thus the program's economic rate of return is understated to the extent these subsidies are not also netted out of the project cost side of the equation.

Another good indicator of efficiency in an exploratory effort such as the FP&D is a steady rise in the ratio between benefits and fixed costs. Figure 8 shows in an unrefined but striking fashion that this is indeed the case. The projections in Figure 8 reflect the future value of seedlings seven years from their planting date and represent stump prices at fuelwood values on a current cost basis.

It remains to examine whether A.I.D. funds could have yielded even greater benefits by supporting other forestry activities. Had $ 34.5 million been invested instead in reforestation of public lands in critical watershed areas, would Pakistan have more forest inventory and tree products at its disposal after five years? Reforestation activities are very costly and have very high tree failure rates associated with them. Whether a greater area would be reforested is highly speculative, but direct observation of watershed programs indicated that they were costly and met limited success. What a reforestation program would not provide, however, is the added capacity among farmers to operate nurseries and cultivate tree crops thus leveraging public resources over a

Figure 8. Forestry Planning and Development Project Expenditures versus Projected Revenues from Tree Sales



Source: USAID/Islamabad

broader planting area. Public reforestation programs also would not reach the large areas of marginal lands in private hands that could benefit from tree cover.

A final question relates to how well the $ 34.5 million was used for supporting farm forestry activities. If A.I.D. and the GOP had simply put all project funds into subcontracting the production of tree seedlings and tree crops, could an even greater rate of return been achieved? Had a technical assistance contractor carried out its own tree farming activities instead of institution building, training and consciousness raising, the short-run area planted might have been greater. In the absence of outreach services, of changes in public policies toward farm forestry and of changes in attitudes of farmers toward engaging in tree crop cultivation, it is unlikely that farm forestry activities would spread or be sustainable.

Program effectiveness

According to the principal advisor to the FSMP, the FP&D project has been effective because, it has "proven that farm forestry is viable," it continues to be a "dynamic project," and because "farmers are interested." Despite these positive dimensions, CDIE raises concern that the strategy of relying on market incentives has produced mixed results regarding equity among beneficiaries and meeting environmental objectives. The following section examines the issue of effectiveness in terms of how well the A.I.D.- supported effort has created or built upon enabling conditions in each of the each of the four cross-cutting implementation strategies described in section on "Program Implementation".

Generally, the GOP was able to build its capacity to undertake a number of farm forestry support activities. By this measure, the evidence suggests that the program has progressed in improving its effectiveness both at managing its program resources and at bringing about changes in capacity and practices of participating farmers.

A number of factors have also acted to limit the effectiveness at spreading farm forestry activities:

- Limited early project ownership and commitment of staff and resources at the provincial level.
- The cost of the tree seedling incentives and a social forestry infrastructure;
- Limited tree variety and planting technologies developed and disseminated by the program.
- Lack of effective local level organizations

Weak or ambiguous linkages to market and wood processing

sector may become important as the volume of wood coming to market increases.

Institutional Change. The evaluation team uncovered clear evidence that strengthening institutional capacity was beginning to show payoff. Yet as these changes were not sufficient to conclude that a sustainable level II condition had been achieved. Donors have played a major role in facilitating the Pakistan government's evolution away from a singular orientation of policing and protection, and the institutionalization of social forestry in Pakistan seems to be at a take-off point. The recently drafted Forestry Sector Master Plan (1992) suggests that "virtually all future increase in wood supply would be on private lands." The HESS study (Leach 1992) speaks of a boom that amounts to a "tidal wave of farm tree growing." The Inspector General of Forests who also directs the Forestry Planning and Development Project, writes:

> Policy makers and planners have come to the realization... that in order for Pakistan to meet its future needs...without causing irreversible damage to the environment, farmers and farmlands will have to play a more central role in... vastly expanded social forestry programs and socially-oriented programs [about which] very little is known [and] Foresters and other natural resource officers in Pakistan are still like small children playing with pebbles on the shore of the ocean of knowledge. (in Dove and Carpenter 1992)

Knowledge and awareness among decision-makers of social forestry's central role in meeting wood needs was behind a recent NWFP Provincial Forest Department initiative examining the feasibility of formally establishing a social forestry wing. Already, the country is beginning to commit modest budgetary resources to social forestry. Its budget share is increasing relative to territorial forestry. Though incipient, these trends are readily visible in Figure 9. Recent social forestry initiatives in both Sindh and Punjab Provinces confirm institutional spread.

The USAID Mission rates the major beneficiaries of its institutional strategy (Provincial Forest Services, O/IGF, and PFI) on their capacity to "institutionally undertake training, research, and outreach programs in farm forestry." The Mission's "proprietary" index has registered a modest improvement in institutional effectiveness, reflected in a cumulative rise from 67 to 84 in the USAID , over the period of FP&D project support to the Pakistan social forestry program.[8]

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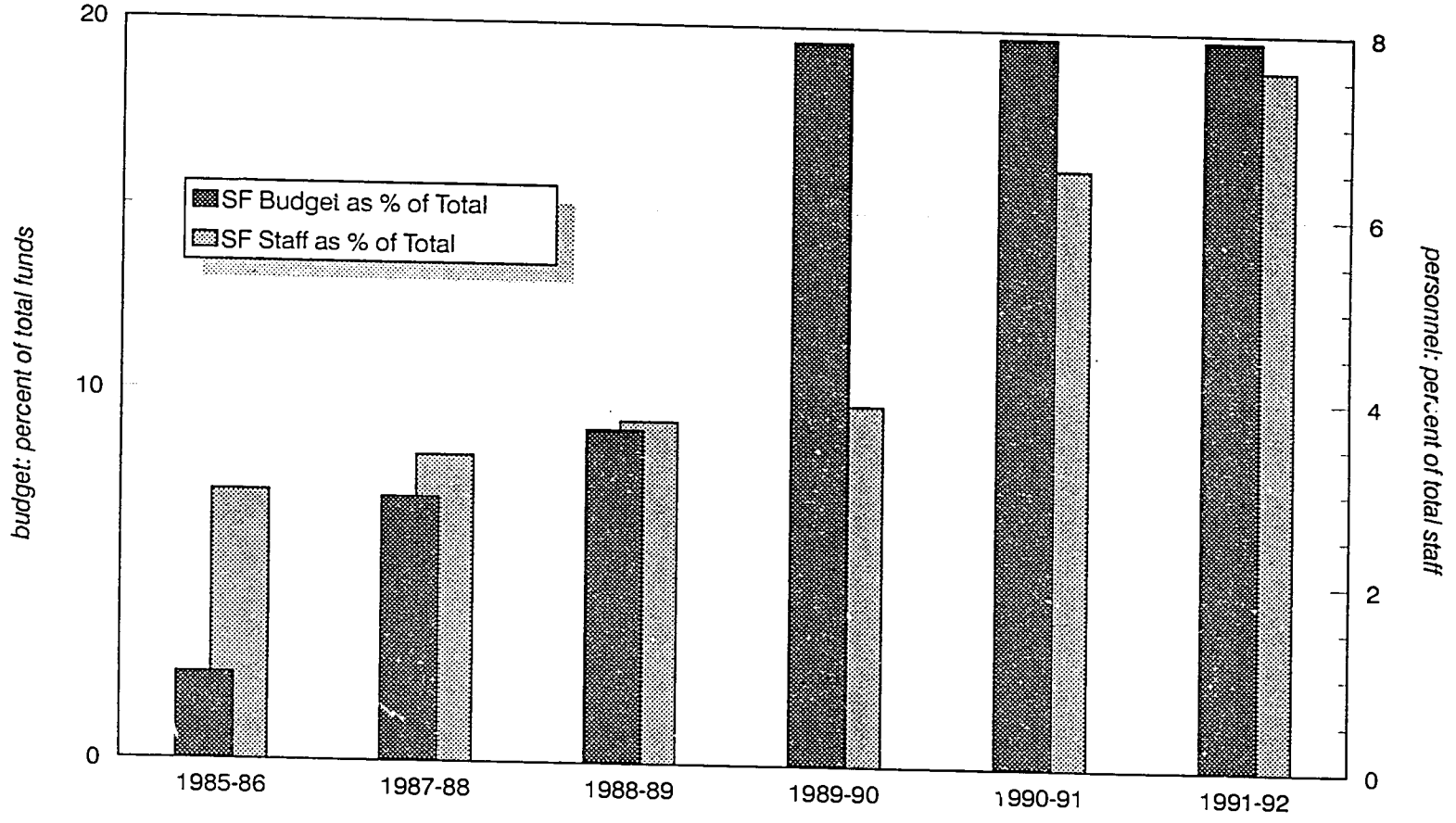
[8]The index includes such variables as staff retention, ability to carry out strategic planning. It has been applied to O/IGF, PFI, the Provincial Forestry Departments and the Punjab Forestry

Figure 9

Pakistan: Social Forestry as Percent of the Total Forestry Program



Source: USAID/Islamabad

Four condition level outcomes have contributed to improved program effectiveness:

- Target farmers are less suspicious of forest service intentions and more willing to accept advice.
- Social forestry has gained credibility as a legitimate service.
- Standing tree crops with strong market demand provide visible demonstration of benefits.
- Social forestry extension officers have gained experience through on the job training.

Forestry Extension Agent Motivation. Although the situation concerning forestry extension capacity has improved dramatically many foresters remain inept and uninterested in social forestry. In the absence of a well-defined career path and reward structure, personnel problems will continue to beset forestry outreach. Direct observation of rural foresters in Sindh compared to those in Punjab and NWFP revealed progress where efforts were the most longstanding. Sindh, for example, resisted social forestry and invested FP&D funds to upgrade and manage a government plantation in the Lower Indus Valley. Its newly launched social forestry effort is plagued by many of the staffing problems (rapid turnover, assignment to social forestry positions as a sanction, etc.) characteristic of the earlier stages of the farm forestry experience in Punjab, NWFP, and Balochistan.

As progress is made a self-selecting process in both field service and training programs is producing more competent and motivated staff. The uneven establishment of the infrastructural base in rural areas hampers the effectiveness of social forestry institutions. The inability of A.I.D. and the Pakistan government to coordinate office and housing as new areas were brought into the program is symptomatic in this respect. Tension between new and old program staffs was evident from evaluation team discussions with forestry officials and will continue to operate until clear career paths in social forestry are institutionalized.

Pakistan Forestry Institute. An extended focus group interview and individual discussions with key staff confirmed observations that the research and training components have had what appears to be only a minimal impact on the field (environmental) activities of the program. The technical packages extended by national and provincial social forestry programs have not been significantly

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Research Institute. The life of project target is 119.

modified by the results of research funded through the FP&D project. CDIE found no signs of an impending breakthrough.

The technical assistance team helped develop a social forestry curriculum that now offers an option in the Institute's MSc. program. So far 84 MSc. an 104 BSc. students have been enrolled, thus meeting training targets. The Director of Curriculum claims that this option will be maintained even when project funding ceases. It is perhaps telling that these students are often scholarship or self-financing and are not, in contrast to most students in the other options, slotted for automatic government employment upon graduation. According to the Director of Curriculum, many of the 1990 social forestry graduates have been unable to secure employment; he saw creation of permanent social forestry wing within the Forest Services as the only solution.

On a more positive note, environmental awareness and corresponding curricula changes pervade the program. A new course on Environmental Science was recently added. In addition, over 400 farmers made visits to PFI in 1991. Provincial meetings of tree farmers were held to encourage farmer feedback into the social forestry process. The minutes of these meetings each contained a section containing recommendations to research. Such feedback to the research agenda setting process is overdue and necessary if the program is to become more relevant to the needs of Pakistan's farm foresters.

One of the tangible benefits of the FP&D projects ambitious construction program entailed facilities for women students and faculty. Women are beginning to make a difference at PFI. The head of sericulture is a woman, and 14 students, under program funding, are now enrolled in the program. The employment opportunities are mostly found in NGO and donor-financed, social forestry projects.

Role of Women. The program has not fully met its expressed concern to develop institutions that are more responsive to the concerns of women involved in the tending, harvesting, and use of trees and tree products. The need is recognized, and the program embarked on the construction of facilities for the training of women foresters at PFI. Training facilities constructed and the existence of a cadre of forestry agents trained to assist women as responsible and informed users of forests and wood products mark encouraging but tentative progress.

For example two women forestry graduates from PFI have been hired to work on social forestry programs in Puinjab Province. One of the two female agents reports having made, "deep inroads in the here to fore [sic] male dominated forestry domain." In her first two years, she successfully accomplished, under women's control: 10,000 trees planted, seven nurseries established, and 275,000 seedlings in production. The general picture presented in Table 6

indicates a modest but growing involvement of women in farm forestry. PFI employs a women forestry instructor, and 14 female students are currently enrolled in the program. As local organizations and NGOs come to play more and more active roles in the country's social forestry programs, these tentative initial accomplishments may stand as landmark contributions to long term change.

TABLE 6: Participation of Women in Nurseries/Plantations

Year	Women Owners
1987-1988	101
1988-1989	104
1989-1990	109
1990-1991	125
1991-1992	200

Source: USAID/Islamabad, Mission Monitoring Unit

Awareness and education. The social forestry program's efforts to raise awareness of farm and social forestry among Pakistani stakeholders have been successful in many of the villages affected. One indication of this success lies in the ability of the government to consistently exceed planting targets in every region and to do so year after year. Financial and administrative barriers, not lack of participant interest, have limited adoption and the spread of farm forestry practices. The program has consistently contacted and worked with opinion leaders and innovators among the rural population as a means of "opening the door" in those regions where the program now operates. By early 1992, the farm forestry program had trained 75,848 farmers and 594 staff. Nearly one thousand individuals had participated in observational study tours at many levels including international. These efforts contributed to better feedback from farmers to research staff, nascent linkages between wood producers and industrial users, easier spread and more rapid learning of farmer-adopters, and increased job satisfaction for social forestry staff. Progress has been uneven both in extent and in quality of coverage as evidenced in the contrasting remarks drawn from different villages included in the CDIE survey.

Greater involvement of local groups of tree growers could play an important role in promoting coverage. An indigenous NGO, the Pakistan Tree Farm Society was spawned by recent efforts to use NGO financing as a means to raising awareness. The Society is a non-

profit organization whose aims include assisting industry to take an active role in developing processes that would use locally produced farm forestry products as raw materials.

Technological change. In discussions with the evaluation team, the Inspector General of Forests claimed that despite the GOP consistently exceeding planting targets, farm forestry had only begun to meet potential demand. His belief was that Eucalyptus was the only species that could consistently succeed in the difficult growing conditions found in the Barani areas. He cited the willingness of some farmers to circumvent bureaucratic delay and directly pay for seedlings as an indicator of the technology's effectiveness. For whatever reasons, private tree planting technologies were being diffused to large numbers of farmers.

The preoccupation with meeting seedling distribution targets has tended to downplay the technical dimensions of farm forestry systems. CDIE observed that aftercare and effective management of tree plots was very inconsistent between farmers, fields, and extension districts. The CDIE survey found that only 36 percent of seedling recipients had an experience of follow-up contact with forestry agents following distribution. Setting targets in terms of number of seedlings as opposed to number of farmer participants favors larger farmers and discourages alternative technologies such as direct seeding and managed natural regeneration. It may also contribute to the excessive planting densities observed by the CDIE field team and confirmed by the FP&D technical assistance team's forestry outreach advisor.

The contract team's chief of party explains the skewed distribution of tree planting toward larger farmers by noting that these farmers have larger landholdings that can absorb larger numbers of trees, have more disposable resources to pay for site preparation and maintenance, can more easily absorb failure, can get preferential treatment from government officials, and are useful to government officials in meeting their planting targets. Leach, by contrast, says that smaller farmers have a different interest in trees than larger farmers: "It seems that very few farmers who are growing trees are doing so as a major business. For most, trees are grown and felled in small numbers to provide useful products for the home and perhaps some cash income." (Leach 1992) They are an agricultural sideline: supplements and not competitors to field crops, crop lands, and agricultural inputs such as water and fertilizer.

At least two conditions, therefore, would encourage more of the smaller farmers to increase tree planting and thereby contribute to the environmental goals of the program. Hatch (1990) argues that trees must be made readily available to smaller farmers who "would take 10 to 100 seedlings and plant them, if all they had to do is to walk up to the nurseryman, pay a small amount of cash,

and carry away the seedling for planting". One way to do this is to establish small, easily accessible private nurseries free of government red tape. Respondents in the CDIE survey echoed this sentiment in making their own suggestions for better coverage:

> "Only three of my fifty trees survived. You [project people] come again and again, but I receive no help. I was not allowed to have a nursery. The plants are only distributed among the large landlords..."

Choice of species is also a critical factor. Field oriented research and training components are required to support tailor farm forestry approaches to the diversity of social and environmental conditions in Pakistan. In their absence, forestry extension will continue to be pulled toward the simplest option, which in the case of the FP&D project implies an over-reliance on eucalyptus monocultures. Often there are trade-offs between maximum commercial value and multiple use species. Because needs are diverse, technical options available to farmers will eventually need to be broader. The technological trade-offs hold important considerations for gender and inter-household concerns with which the program has not yet grappled. These concerns are explored in Appendix C.

Policy reform. The objective of developing sound afforestation and fuelwood policies consistent with the realities of Pakistan's rural development has been largely realized over the course of the FP&D project. The A.I.D. supported effort has played an important catalytic role. During this time, the GOP has adopted a National Conservation Strategy which effectively situates the forestry sector within an overall blueprint for sustainable development. A Forestry Sector Master Plan has also been drafted which draws inspiration from the FP&D experience. This new plan substantiates the fundamental policy shift from emphasizing state lands to private lands in order to meet the country's present and future forestry and fuelwood requirements.

As mentioned earlier, the policy reform strategy appears to have been directed to targets of opportunity than it was systematic. That is, much of the force for policy change has come by virtue of the program's central institutional base within the O/IGF. During the course of the CDIE team's evaluation, for example, a draft report of the recently submitted Forestry Sector Master Plan was being circulated within the government and among donors. On the one hand, the USAID Project Officer expressed regret that the FSMP technical team had not worked more closely with the Mission, the technical assistance team and the Pakistan government itself. When, on the other hand, it came time to review the document and to increase a sense of Pakistan ownership of both the content and process, the same project officer was very much involved and in consultation with local forestry and natural

resource policy decision makers. The opportunity was there, at least in part, because of A.I.D. reliance on an experienced host country national and former official in the forest service as project officer.

The program's design called for the creation of a "Data Base Cell" to centralize data and carry out policy related analyses. Although a number of economic studies and a review of past forestry policy had been carried out, no evidence was found that these functions were being institutionalized on a permanent basis. With the FSMP, the NCS, the 1991 Forest Policy statement being actively debated and adopted, a more explicit strategy of policy dialogue would have been a logical outgrowth. This would have helped the program to capitalize on its successful 1989 farm and social forestry seminar.

A final concern relates to the potential negative impact of the program's subsidized tree seedling distribution activities on further private nursery development. To the extent that farmers would come to depend on program subsidized tree seedlings, they would avoid commercial nurseries trying to make a business. The practice of subsidized tree seedling distribution established during FP&D project implementation raises an important issue with regard to the role of subsidies in conducting environmental and natural resources management programs. (For further discussion see Section 5.0 "Outstanding Issues").

Program sustainability and replicability

Evidence of sustainability comes from three sources: farmer commitment to tree planting, institutional commitment to social forestry, and net benefit to the environment. As the preceding sections have hinted, considerable progress toward developing a sustainable model of farm and social forestry has been registered and supported by the FP&D over the past eight years, yet these accomplishments remain tentative.

A.I.D. support to Pakistan's farm forestry program ends in mid-1993 when funding under the FP&D project terminates. At this point Pakistan has a fledgling agency and social forestry program and, a few new regional buildings, some vehicles and equipment, a modest extension staff. There is also new capacity, experience and interest among tree seedling nursery operators and among farmer tree cultivators themselves. Finally, new research and training systems have been initiated. The evaluation team has attempted to determine how sustainable all these conditions will be after A.I.D. funding terminates.

Quite aside from the questions of effectiveness and achieving desired environmental and development impacts, the **replicability** of the FP&D farm forestry model is an issue of paramount importance.

The CDIE team collected evidence of replicability from a number of sources which can be classified into two major categories, spontaneous and induced. Spontaneous replicability can be characterized by the adoption of essentially similar practices by rural producers who were not direct beneficiaries of the program. Induced replicability implies adoption of the FP&D supported farm forestry model by other external funding sources. Although determining attribution must be based on informed judgement, the weight of evidence in the case of farm forestry in Pakistan strongly supports the contention that a replicable extension model, capable of being improved upon to be sure, and the conditions for its spread are largely in place. As the project enters its final years, attention is focused on transferring project responsibilities and financing to another international organization(s).

Farmer commitment. At present, farmers are planting eight to ten trees for everyone they cut. If this trend continues for a decade, farm forestry will supply the bulk of domestic fuelwood and pressure on forest areas will abe greatly reduced. The decision to plant trees is made at the household level. This decision is the critical factor in sustaining the farm forestry initiative. The HESS survey, the PFI research, and CDIE focus group interviews with farmers all point to the importance the economic incentives offered through wood markets, especially where it is a question of large numbers of plantings. Recalling that 67 percent of the farmers planting trees planted less than five percent of the total, it is clear that large farmer participation is key to driving the overall movement. What will be the impact on fuelwood and timber markets which have skyrocketed relative to agricultural crops since the 1970s? At what point will the market become saturated and fall into a slump?

While fuelwood demand will certainly increase with population, prices are high relative to conventional energy sources. Leach (1992) reported a flattening in urban prices for fuelwood. Data in Table 7 suggest that fuelwood may be pushing its upper limit relative to alternative fuel sources. Obviously, dependence on market forces makes farm forestry's sustainability largely a function of stable lucrative markets. FP&D's strategy of exploring and expanding high value products and developing government-producer-industry linkages in this regard is sound, but it is far too early to determine if the strategy will indeed work in the long run.

Mohamed Nawaz Kahn's farm forestry undertaking illustrates how the large farmer focus of the program may be producing sustainable results, albeit for a different target group than the original design specified. Kahn had planted 7 acres of eucalyptus monoculture (13,000 plants) and some five acres of hybrid poplar clones. He had developed an active relationship with the Forest Department stating that they "have become his family." High

Table 7

Competitiveness of Alternative Household Fuel Sources

FUEL	RS/UNIT	CONV.UNIT MJ/UNIT	RS/MJ*	USEFUL ENERGY FOR COOKING	
				EFFICIENCY %	RS/USEFUL/MJ*
TRAD FUELS					
FUEL WOOD	0.98/Kg	16	0.06125	13	0.47
DUNG	0.58/Kg	12	0.04833	13	0.37
CROP RESIDUES	0.70/Kg	15	0.04666	13	0.36
CHARCOAL	4.40/Kg	31	0.14193	20	0.71
MODERN FUELS					
ELECTRICITY	0.69/Kwh	3.6	0.19166	70	0.27
NATURAL GAS	31.00/Mcf	1030	0.03009	60	0.05
KEROSENE	6.62/Litres	35	0.18914	40	0.47
LPG	5.70/Kg	45.5	0.12527	60	0.21

* Price in Pakistan Rupees per milajoule

Note: Fuel Prices Actual Prices Paid by Household in 1991

Source: HESS 1992

returns couple with lower labor costs (his trees were in fields formerly planted in tomatoes) and the capacity to wait the 5-6 years for benefit flows led him to claim, "if the project disappears, I have already learned the technology and will do just fine putting in my own nursery." (Field interview, October 7, 1992). Various views are recorded in the accompanying text box.

********** TEXT BOX **********

If the new forester were gone, would your village continue to plant trees?

Yes, it is a profitable activity and we can add beauty to the village. Alizai Village, NWFP

Motivation will stop. They have motivated farmers through group meetings and seminars. Farmer, Sukkah, Punjab Province

"The majority of people in this village are not interested in planting trees. They earn more with vegetables." Farmer, Uchali, Punjab

Only those who have connections with the foresters can receive seedlings. So it does not matter whether they go or not. Farmer Sukkah, Punjab Province

They only visit big landlords who have enough land for block plantations. Small landlords do not know foresters. Farmer Longay, Punjab Province

Majority of people do not know about this project, yet they have planted trees with their own resources. Farmer, Sukkah, Punjab Province

It is easy and convenient to get free seedlings. Before this project, it was impossible for small farmers to get seedlings even at a price. Farmer Longay, Punjab Province

Private nurseries would stop without new foresters. Farmers will not take seedlings by paying money. Farmer Haroon, Punjab Province

********** END BOX**********

<u>Institutional commitment.</u> Institutional strengthening has had significant impact both in terms of developing replicable models and in making progress toward sustainability. Social forestry's roots in the country are deepening as witnessed through curriculum changes at the Pakistan Forestry Institute (PFI), proposals to establish permanent social forestry career tracks in the provincial services, and through strong supportive policy declarations in strategic planning documents. A forestry extension network has been established which should further diffuse knowledge and defuse anxieties about farm forestry.

However, the sustainability of Pakistan's social forestry program remains uncertain. At the time of the evaluation, the social forestry program had yet to gain recognition from the Pakistan treasury as an activity worthy of regular core funding at levels sufficient to attract qualified staff and to operate effectively. Currently, budgetary decisions lie at the level of

the Chief Conservators of Forests in the Provinces. Personnel policies and programs are still overseen by "old guard" foresters. On a more optimistic note, the limited funds available to forestry are increasingly allocated to "forestry on private lands" activities which include various afforestation and farm forestry activities. Table 8 lists the expenditure in Punjab where it is clear that this category has obtained high relative importance, garnering over 20 percent of the annual development plan budget.(Punjab excludes donor funds from its presentation.) NWFP allocated over 60 percent of its 1991-92 budget to "forestry on private lands" category. Slightly over half these funds, however, are derived from outside sources including the FP&D project (Rs. 22 million of Rs 61.1 million).

At the time of the evaluation the OIG/F farm forestry program was supported almost entirety by FP&D project funds. The pending termination of FP&D funding brings to a close what might be characterized as the start-up and demonstration phase of farm forestry activities. A re-examination of farm forestry accomplishments in five or more years after termination of A.I.D. funding would offer a better measure of the growth and spread of its impact.

The Political Structures and Organization. Statements such as that quoted earlier by the IGF were echoed by Forestry Officials at all levels throughout the country. While such foresters may still be in the minority, their increasingly vocal presence adds to the evidence that the Government of Pakistan has developed a sense of ownership with relation to this new emphasis on a policy framework emphasizing social forestry.

Another healthy sign for the future of farm forestry is the recognition it has received within the Pakistani bureaucratic and political milieu. The assessment team saw evidence of this in the role farm forestry has been assigned in Pakistan's Forestry Master Plan and as part of Pakistan's eighth five-year plan. The redirection of PFI to include farm-level research and social forestry training is another hopeful sign.

The reliance on the profit motive to attract farmer participants and maintain their interest offers obvious advantages to the forestry agencies. Meeting targets is facilitated, and this is an important aspect of the institutional culture especially given the low esteem with which social forestry was held. As the benefits become obvious to an ever larger segment of the rural population, the program tends to become self-perpetuating. The need for intensive government involvement through its outreach programs, awareness campaigns, and incentives (seedlings) correspondingly diminishes.

Environmental sustainability -- net benefit to the

Table 8

Forestry Programs in the Punjab Annual Development Plan

	1991-92 COST	
	mill Rs	%
Wildlife	17.644	24.9
Forestry on private land	15.000	21.1
Parks and Recreation	7.990	11.3
Forestry on Government Land	11.475	16.2
Linear Plantations	5.162	7.3
Buildings and Infrastructure	2.994	4.2
Range and Watershed Management	8.172	11.5
Research and Education	0.875	1.2
Sericulture	1.682	2.4
TOTAL	70.995	100.0

Note: No foreign assistance is included.

Source: Forestry Sector Master Plan 1992 (Vol 6)

environment. Positive and lasting environmental benefits can be expected from the generally beneficial effects of trees on the soil and micro-climate. Interestingly, many of the survey respondents in the CDIE study reported improved "freshness" in their villages as a reason for tree planting. The only dimension in which farmers expressed negative reactions to planted trees was in terms of their competitiveness with field crops. Reclaimed lands are clearly benefitting from tree planting and are visible manifestations of positive change from the farmer's perspective. The ease with which saline and waterlogged soils can be brought back into production was impressive. Millions of hectares lie idle for one or the other of these factors.

Evidence of Spontaneous Replicability. Attention is also focused on how to assure the continuation of the private nurseries as private, unsubsidized enterprises.

The evaluation team found scope for cautious optimism that the Pakistani farmers will continue to engage in and perhaps share among themselves farm forestry practices and techniques. Farmer interviews surfaced strong interest in farm forestry as a commercial enterprise. Others saw the savings in fuelwood and construction materials costs for their own use as a major reason for tree cultivation on a sustained basis. Awareness of the beneficial contribution of trees to soil improvements and other crop and livestock systems varied considerably from place to place,

The evaluation team also noted that farm forestry had taken hold somewhat unevenly among farmers with the larger more commercial operators in the lead. This suggests that the program of targeted extension and subsidies may need adjustment to sustain the spread to producers with more limited resources.

Evidence of Induced Replicability. When FP&D was designed, farm forestry in the neighboring Indian State of Gujarat had entered an explosive growth stage. In 1983 alone, the Gujarat farm forestry programs distributed more than 200 million free seedlings. As with FP&D, the original program intent had been to increase production and income by encouraging farmers to grow fuelwood on the poorer marginal areas of their farms. In fact, the same forces took hold in Gujarat as were observed in Pakistan: croplands are being converted to more profitable and less management intensive tree growing.

The farm forestry program's ability to survive and to spread its impact will be enhanced by its successes at attracting financial and technical support from other donors to underwrite some of the on-going activities of greatest benefit, e.g., outreach services. So far farm forestry is included in proposed ADB funding for implementing the Forestry Master Plan.

Farm forestry has been a powerful catalyst to the overall Pakistan social forestry program. The success of FP&D in demonstrating the viability and profitability of the enterprise was cited by World Bank officials as being fundamental to their decision to proceed with the design of an ambitious program of social forestry that will explicitly build out from a farm forestry focus. Already various provincial governments are negotiating with donors to avoid geographical overlap in their plans to launch widespread farm forestry initiatives.

In Punjab, for example, the Asian Development Bank is focussing on hillside programs in the upland pine belt while the Bank is gearing itself toward the Barani areas. Even in those programs where the focus was on community forestry and planting trees on common property or under other shared access regimes, the farm forestry model had made an impact. The Malakund Social Forestry technical assistance team and their counterparts had clearly shifted from an exclusive focus on participatory community forestry and participation to a mixed strategy encompassing farm forestry. Senior forest service officials remarked that the country had learned that where community forestry was the prevalent model, as in the Kalam Integrated Project and in Agha Kahn program, advanced extension skills coupled with heavy time and human resource commitments were necessary for even modest success. Spread in Pakistan's community forestry programs was minimal while farm forestry seemed more in tune with institutional and social realities. The facile nature of its spread had caught the attention of a number of NGO's. AID and other donors were channelling funds to these groups whose future role in the spread of farm forestry may be instrumental.

4.0 LESSONS LEARNED

The following lessons are noteworthy for their broader application to A.I.D.-support for farm forestry efforts elsewhere

- **Market forces can drive individual and institutional participation in a farm forestry program.**

However, the market incentive requires some regulation to insure that equity and environmental issues are addressed. Reliance on market incentives is a double-edged sword. An important lesson that comes from the FP&D experience is that **fuelwood shortages alone provide insufficient incentive for farmers to undertake widespread tree planting.** Instead farmers plant for multiple reasons implying that careful definition of beneficiary groups and production systems need to be coupled with equally careful selection of tree species and sylvicultural practices being extended. Because production for the market commands so much attention and attracts rural elites, program designs call for special effort not to overlook the multiple and often non-commercial aims of many tree growers.

- **Flexible project design permits program managers to respond effectively to new conditions and opportunities.**

Shifting from fuelwood to commercial objectives and from acacia to eucalyptus permitted the Pakistan program to continue growing and responding to private farmer demand despite the more narrow conception outlined in the program's design documents.

- **Encouraging tree planting on private land is effective when it capitalizes on pre-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 being secure are willing to invest. Land ownership alone does not guarantee the requisite sense of security. Where land consolidation programs were active, landowners were not interested in planting. There may be scope for including landless operators in farm forestry schemes if they are assured of sharing in the benefits of their investment.

- **Farm forestry "sells" best when participants are given access to low-cost technologies with reasonable pay-back periods.**

After only two to three years, households began to enjoy benefits from their investments in planting and protecting young seedlings. Older plantations showed evidence of thinning to meet ongoing cash flow requirements. Returns to mature harvest were more attractive than those of annual field crops.

- **Farm forestry programs benefit from separating their policy and operational components.**

While conducting policy research is feasible, it is difficult to reform policy when the assistance effort is situated within the organization whose policies are at issue. Policies affecting seedling subsidies or the official administrative status of social forestry could be identified but not easily changed through the FP&D project. Complementary program instruments may be necessary to maximize the effectiveness of technical projects. Design constraints make it difficult to implement policy change from within a project structure. The FP&D project approached policy dialogue and change have been approached indirectly. Land and tree tenure policy, personnel and organizational policy questions have implications for the spread of on-farm tree production practices. Should social foresters have the right to impose fines? At what point should their status be formalized? Should there be regulation of frequency of personnel transfers? These as well as policies affecting incentive structures to encourage the private sector (tax on transport, import tariffs, producer subsidies, etc) cannot be treated as easily in the project mode as through other vehicles of policy dialogue.

5. OUTSTANDING ISSUES

The Pakistan farm forestry experience raises policy and strategic issues of potential benefit to program implementation in Pakistan and other countries. These issues will be studied during other CDIE forestry evaluations as part of this series of assessments of A.I.D. environmental programs. Among the more important:

- **Should large farms or small be favored?**

The equity issue was important in the early phases of the project and it certainly will continue to be as farm forestry evolves within the country's economy. If the benefits are to reach small farmers, a policy of affirmative action will likely be necessary. Because small farmers exert most of the pressure on forests and woodlands, a purely growth oriented strategy will not insure that environmental objectives are met.

The CDIE survey revealed wide variation among villages. Overall, farmers with smaller holdings appear fairly represented. But two villages of the six demonstrated that widespread distribution was possible, but in other villages, most farmers conceded that the program was exclusively "owned" by an elite group of large farmers and that they obtained few or no benefits. Further study could pinpoint what differences in forestry extension and seedling delivery help determine the contrasting performance.

- **How should responsibility for social and farm forestry programs be situated and formalized?**

The farm forestry program is yet to be fully institutionalized. There is general agreement on the need to establish a separate social forestry wing, but the when and how have not yet been resolved. Without permanent formal structures, accomplishments remain tentative. The eventual complementary roles of industry, NGOs and other local organizations such as growers' associations or silk cooperatives call for immediate attention.

The program, moreover, pursued diffusion of tree planting by focusing on private lands where there was little question of ownership and tree tenure. As basic social forestry becomes integrated into each province's forestry institutions and agenda, the more contentious issues, heretofore avoided, will require attention. The program aimed to meet the fuelwood and timber needs of farmers residing in the barani or rainfed areas of the Northern plains and Potwar Plateau. Varying tenure conditions including sharecropping, renting and land-owning arrangements give rise to

conflict. Absentee landlords try to hold lands with minimum investment. Land consolidation of highly fragmented holdings creates uncertainty. The current model is seriously challenged by tree rights in shared access regimes, intra-household allocation of benefits, displacement of landless farmers, and insuring investment where land consolidation undermines tree tenure security. Integrating farm forestry and community forestry activities will require new institutional solutions.

Part of the solution may lie in a greater reliance on user associations or other NGOs. The O/IGF may not need have been the only institutional mode through which farm forestry was fostered in Pakistan. This report has called attention to the budding role of NGOs and other local associations. This world is made up of a range of farmer organizations and associations to which many of the programs target participants belong. Had the A.I.D. funded program chosen to do so it could have worked earlier and more directly with local farmer associations. There seems to have been little attention given to these networks of farmer groups during FP&D project design and program implementation.

- **To what extent are subsidies needed?**

Appropriate incentives can be powerful catalyst in encouraging the adoption of farm forestry practices, but they must be distinguished from excessive, inefficient and unnecessary subsidies. During the course of FP&D project implementation, the farm forestry program made extensive use of subsidies. The program used project funds to build tree nurseries for seedling production, to purchase tree seedlings for distribution and, on a more limited scale, to pay for ground leveling and other services and costs associated with the establishment of block plantings of trees on the lands of private farm land.

The CDIE field survey indicated that although the likelihood of tree planting did not depend solely on seedling subsidy, interest dropped considerably without it.

The original program targeted resource poor farmers and the barani region as primary beneficiaries of the subsidy. To counterbalance interregional inequality, a social equity dimension with tangible environmental? benefits was offered. In Pakistan, farm forestry subsidies appeared necessary to break down the farmers skepticism about the government motives for the social forestry program. To encourage farmers to devote time, land and labor to tree cultivation, it was perhaps reasonable to expect that the program should take an "equity" position in tree farming in the form of subsidized seedlings. Coupled with extension advice, this minimal subsidy appears justifiable in this light.

Another case for granting subsidies to participants in farm forestry programs derives from the "externalities" achieved from

growing trees on lands to protect watersheds and/or to act a "soil reservoirs" on others. The case can be made that some public subsidies are warranted to compensate farmers for a share of the costs they incur in cultivating trees that produce these external benefits to society. Although increased farm income from practicing farm forestry is the main reward from on-farm tree planting, society stands to benefit where farm forests contribute to improving micro-climates, wildlife habitats, and soil and watershed conditions.

One caution associated with farm forestry subsidies is their potential for distorting the market, which may undermine the conditions and practices they were supported to promote. As the program has shifted to a commercial and larger scale clientele (larger farmers are easily able to circumvent the 5,000 seedling per annum limit set by the program), the subsidy might be viewed in terms of an infant industry stimulus. Once subsidies have "made the market," as apparently they have with subsidized seedlings, farm forestry programs might end subsidies all-together or at least do so gradually. It may be necessary, for example, to differentiate the subsidy on a species by species basis or to divide the commercial subsidy between free seedlings to producers and industrial tax credits.

A final concern is the efficient and equitable administration of subsidies. Even during the initial phase of the farm forestry program, subsidized seedlings were given to some larger farmers on better lands capable of paying full cost for seedlings were subsidized.

- **Should there be more reliance on the management of market incentives and less on institution building and subsidies?**

Market price incentives could provide an alternative to subsidized inputs and farm forestry services. Pakistan's experience suggests that farmers generally are responsive to market incentives. Those most responsive are those with the best access to information, financial resources and management know-how to take advantage of market opportunities. As in many developing countries in Pakistan there are unequal barriers to getting information, credit and land.

- **How can land and tree tenure security best be assured?**

From the outset, the A.I.D.-supported farm forestry program targeted private lands in order to assure secure access to the benefits of investing in wood production. Once momentum is on built private lands where resistance was lowest, the more complicated issues may be easier to tackle. Such challenges as tree rights in shared access regimes, intra-household relations, and preserving investment where land consolidation undermines tree

tenure security are temporarily averted. By and large the strategy successfully avoided the problems associated with forestry on communal or state lands (Dove 1991, Cernea 1992). The strategy enlists participation indirectly by building on preexisting conditions and security of tenure.

The focus on private holdings, where perceived security for harvesting tree crops was high, was effective but incomplete. Uncertain tenancy or tree access clouded the picture.[1] This occurs in commons, or where ownership is in contention, and where the tree planter is not the landowner. Land tenure and intra-household dynamics are complicated, especially when compounded by changes in grazing and tree rights, as is the case for the farm families affected by the FP&D, especially challenging.

The program, at least for its first five years, aimed to meet the fuelwood and timber needs of small farmers, especially those residing in the barani or rainfed areas of the Northern plains and Potwar Plateau. Tenure conditions vary across a range of landowning, rental and sharecropping arrangements Absentee landlords seek ways of holding lands with minimum investment. Land consolidation creates uncertainty. According to the 1980 agricultural census, 73% of agricultural land in Pakistan is cultivated by landowners themselves.[2] Tenancy of the remaining 27 is primarily share-cropping, with some fixed rent arrangements. Early in the implementation of the FP&D project, Dove (1987) reported that a surprising 32% of landless farmers said they were interested in receiving free seedlings.

Under these more ambiguous settings, it was unclear whether these farmers had received seedlings and, if so, how they used them. How has this issue worked out with regard to program effectiveness and impact insofar as equity is concerned? It is easy to understand how larger freehold landowners benefit when trees are planted. But the landless benefit, at best indirectly, such as through increased employment. More likely, as the value of marginal communal, state, and private holdings increase, the landless lose access.

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[1]The PFI study of tree growth on Punjabi farmlands (Amjad, Shah, and Bakhsh 1992) discovered that almost half of Punjab's croplands exist in highly fragmented holding which are subject to consolidation in government programs. This creates uncertainty and thus insecurity with regard to trees found in the field of unconsolidated holdings.

[2] Pakistan Census of Agriculture, 1980

APPENDIX A

EVALUATION PROCEDURES

This evaluation is one component of a larger CDIE assessment of environmental programs in the forestry sector. CDIE's assessments of environmental programs are aimed at answering two central questions: "Has A.I.D. made a difference?" and, if so "How well did it do it?" The central operating hypothesis of the environmental assessments is that A.I.D.,through the right mix of program strategies, can impact on local conditions and practices to produce favorable long-lasting changes in the bio-physical environment and on the socio-economic welfare of cooperating countries. This Annex describes the process used to test this hypothesis in the context of the farm forestry program in Pakistan.

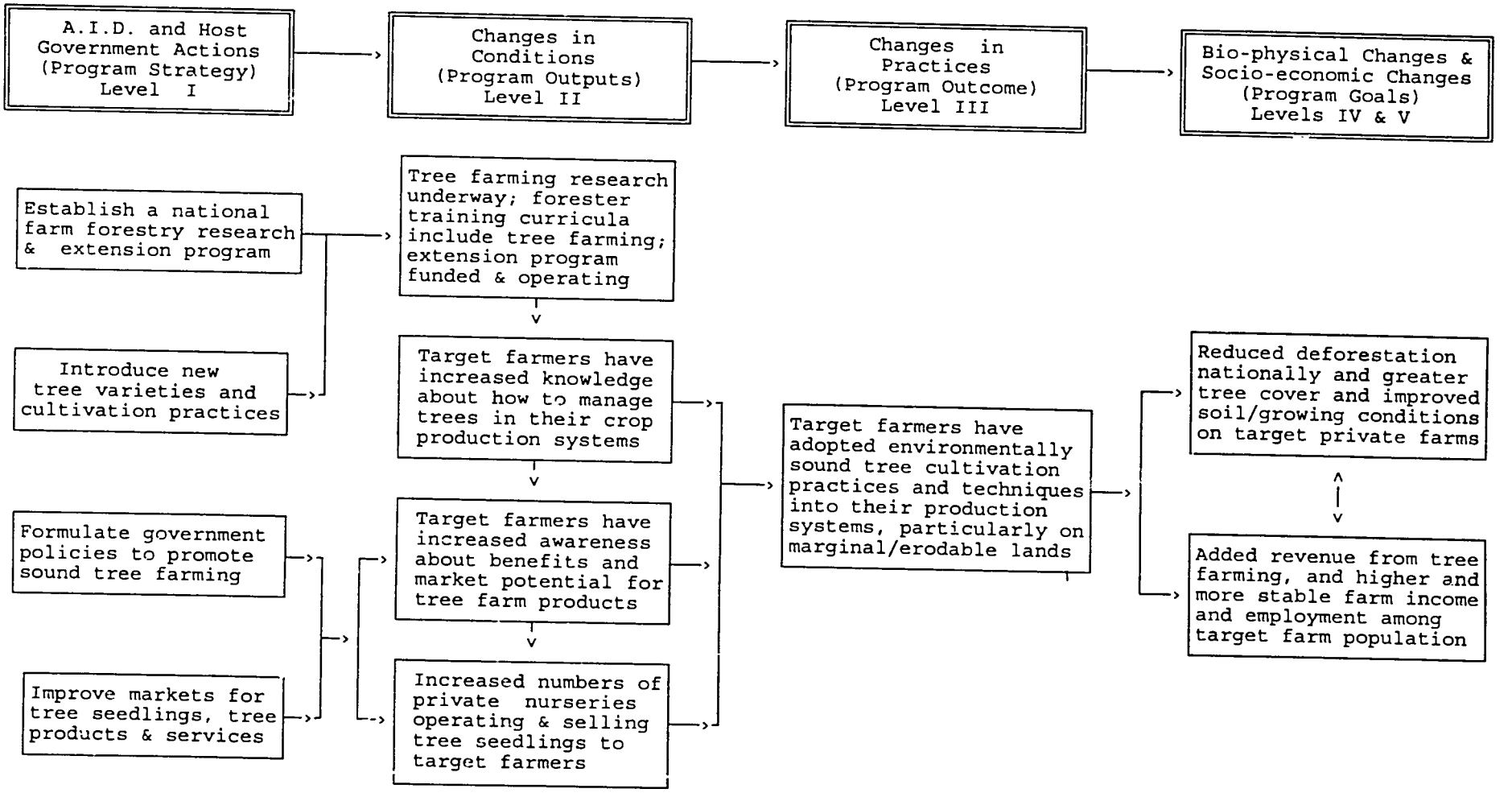
Impact - How much?

The aim the assessment is to establish plausible linkages between A.I.D. program strategies or activities and their impact manifested as benefits to the human population, resulting from improved environmental quality and from better natural resource management. In answering the first question, "Did A.I.D. make a difference?", the assessment has attempted to document: What happened or can be expected to happen? How is impact manifested? and, Where is impact is detected?

The evaluation has gathered and examined "impact" information to determine whether the strategic development objectives of A.I.D.'s FP&D project were accomplished: Has forest cover increased in Pakistan in a sustainable fashion? Unintended, as well as intended, impacts of A.I.D. environment and natural resources management projects and programs were also important as were differential impacts among subgroups -- e.g., women, small farmers or landless cultivators. This evaluation examines the relationships between environmental impact and program investment using a five-level analytical framework. (See Figure A-1.)

Working from the bottom of the framework, Level I describes the "program strategies" that A.I.D. and the Pakistan government employed in implementing an agreed environmental program. In the case of Pakistan's farm forestry program these strategies include building supportive forestry research, training and extension institutions, developing and transferring new tree cultivation technologies, improving private farmer tree nursery and tree crop cultivation skills and capacity, fostering awareness of the economic and environmental contributions of tree cultivation and introducing changes in public policies supportive to farm forestry.

Figure A-1: Analytic Framework for Farm Forestry



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At Level II, "program outputs" are the conditions that have resulted from these implementing these strategies. They include: the construction and equipping of new facilities, staffing of new institutions, new training curricula, introduction of new tree crop varieties and cultivation skills, changed policies toward farm forestry or new regulations for tree harvesting.

The Level III "program outcomes" resulting from changes in Level II conditions are the adoption of farm forestry practices and technologies by target farmers. Indicators of the adoption of farm forestry practices and technologies include numbers of farmers, share of farm land and total area of farm land under project promoted farm forestry schemes.

Level IV and V "program goals" constitute the biophysical and socio-economic changes expected to result from the adoption of Level III program outcomes or practices. Level IV and Level V goals can be viewed and mutually supportive each contributing to the sustainability of the other and in many respects each flowing from the other.

For the purposes of the evaluation, Level IV "bio-physical goals" are the specific environmental objectives of the program being assessed, e.g., increased forest vegetation cover and soil conditions in the case of Pakistan's farm forestry program. Level IV indicators measure environmental conditions and biophysical changes that contribute to producing the strategic objective: quantity and quality of forest cover increased or maintained on a sustainable basis because of practices adopted by participating farmers, changes in soil conditions on land in farm forests, reduced cutting of old growth trees as a result of demand shift to commercial farm forest supplies.

Level V "socio-economic goals" represents the development goal and is generally associated with sustainable increases in income, profits, remunerative employment, overall well-being, or production. While access to income data is difficult, the continued involvement of beneficiaries in the program can be used as a "vote with their feet" proxy indicators of improved farm incomes and profits, at least at the time of the evaluation.

Performance: How well?

In answering the second question, "How?", CDIE's primary concern is the **efficiency, effectiveness, sustainability** and **replicability** of Pakistan's farm forestry program.

Where data exist, the evaluation measures program **efficiency** by using monetary estimates of the flow of benefits to calculate an economic rate of return for those A.I.D. and host government program investments to which benefits can reasonably be attributed.

Because benefits occur in the form of a flow of benefits into the extended future, the value of benefits must be annualized and adjusted to net out all costs incurred. Rate of return estimates can then be compared to those possible from A.I.D. investments in alternative programs in Pakistan to assess their relative development impact.

To assess program **effectiveness**, the evaluation examines how well A.I.D. sponsored techniques, services, or products are reaching intended target groups and whether there is equity or bias in access and participation by target groups in program activities. Examples of effectiveness indicators include trends in the per unit costs of delivering services by newly created public agencies; the make-up of target participant groups according to resource endowments -- e.g., small or large farmers --gender or socio-political status.

The examination of **sustainability** is important at all program levels (Figure A-1). For example, will new (Level II) conditions created with A.I.D. assistance continue or will they be reversed? Will target participants continue to employ newly introduced (Level III) practices? Will new (Level IV) farm forestry production systems thrive over the long-run? Will increased (Level V) incomes, profits and jobs continue after A.I.D. and host government support is withdrawn? Evidence of sustainability includes the continuation of activities, regulations, price structures and institutions beyond the termination of A.I.D. technical and financial assistance either on their own "internal" momentum or with host government or other donor assistance. The principle measure sustainability at the conditions, practices and economic levels is the number of farmers continuing to employ project promoted practices after A.I.D. support had ended and the nature of added government and donor support provided A.I.D. initiated activities. Indicators of bio-physical sustainability include trends in plant and wildlife species in forest habitats, water and soil quality.

To determine the **replicability** the evaluation examines whether conditions and practices, promoted by the farm forestry program, have spread beyond the target areas and whether such spread is "spontaneous", occurring among participants by "word of mouth" or other means without further outside support, or "induced" by public, private or donor agencies which have picked up on an A.I.D. supported concepts and introducing them elsewhere. Replicability indicators include number of similar activities supported by local or international agencies outside the program target area and population; number of participants outside the target area that have adopted in sum or in part A.I.D. sponsored practices.

Data collection procedures

CDIE employs a variety and primary and secondary sources of

data and information to construct the chain of events linking program activities and resulting observed effects and impacts, to examine major evaluation issues, and to identify lessons learned.

In preparation for the field work CDIE collected and analyzed relevant secondary data and information that are available in Washington or in host countries from a range of sources including project documents, technical reports, and special studies that are available with the Agency's Development Information System.

In Pakistan the evaluation team reviewed studies and reports conducted by host government agencies, private voluntary organizations, and international institutions. The team was fortunate to discover a number of comprehensive surveys and reports that had just reached completion as part of the preparations for the new five-year plan in Pakistan and for the recently held UN Conference on Environment and Development. Because acquisition of primary data was also called for, the assessment team employed a small farmer-level survey and conducted key informant interviews as part of its primary data collection. Annex 3 discusses survey procedures.

APPENDIX B

FARM FORESTRY SURVEY PROCEDURES AND QUESTIONNAIRE

Background

Tens of thousands, perhaps over 100,000, farm families have participated in FP&D project-funded activities of the GOP's farm forestry programs. In an effort to identify and measure program impacts, especially those manifest at the "people-level," the CDIE evaluation determined that a farmer level survey would be well-advised. The field level monitoring activities envisioned in the original design resulted in only one effort at systematic reporting (Hull 198#), and this came too early in the project cycle to assess impact. CDIE undertook a follow-up survey of potential and actual beneficiaries residing in the project zone. Without some means of characterizing differentiating farm families according to their nature and degree of involvement with the project supported activities, it is difficult to determine the meaning of this widespread participation. "Net effects" defined here as those changes that can be attributed to the fact that the program has taken place, will be measured in terms of changed attitudes and awareness (level II) and changes in wood and energy use practices (Level III).

The socio-cultural development component of the first phase of the FP&D project carried out a series of baseline surveys. It intended to monitor a sub-sample after an interval of program implementation. This activity was not implemented. The information from a follow-up survey would allow CDIE to determine better the significance some 100 million seedlings distributed (as of 1992) under the FP&D to Pakistan's farmers. While the survey demanded additional effort, the results support CDIE's goal of greater objectivity and rigor and thus offset the additional time and resources necessary to complete the case study analysis.

Objectives

The survey tested as a hypothesis the assertion reportedly held by local and expatriate project staff (FP&D Second Mid-term Evaluation 1991), "that since small farmers have planted trees and a few nurseries are operated by small and marginal landowners, the social distributional dimension and equity issues are automatically taken care of." The surveys by Dove and Qureshi (c.f. Dove 1987), clearly underscore the interest of small farmers, even tenant farmers, in participating in the GOP program.

The 1986-1989 baseline studies do little to explore questions the discrete needs of different sub-groups of a diverse population of farmers occupying an equally varied set of environmental habitats (recommendation domains). Taken as a whole, the beneficiary population expressed diverse tree-planting objectives that would clearly benefit from access to a range of technical options based on varying combinations of crops and multi-purpose tree species. To offer a range of operational designs, the survey design assumed it would sometimes be necessary to de-emphasize the commodity nature of tree products, to activate local village groups, and to see the extension function expanded beyond foresters' customary pattern of service to a limited and elite clientele. The field team's perception was that the Pakistan farm forestry program had gravitated toward a narrow set of technologies. The survey attempted to determine to what degree this impression would be systematically confirmed when farmers themselves were doing the reporting. The survey further examined the use or intended future use of program distributed seedlings.

To summarize, the CDIE staff directed a survey to fill gaps in available data and to corroborate other data sources in attempting to answer the following questions:

- To what extent were the intended beneficiaries being reached by the farm forestry program?
- What were farmer's experiences with, awareness of, and desire to continue participating in the farm forestry program?
- What are the actual uses to date and intended future uses of the seedlings planted by participating farmers?
- To what degree have local populations perceived biophysical changes associated with the tree planting activity?

Methodology

The survey design and methodology were adopted to the constraints and possibilities available to a short term evaluation mission. The intent of the survey was to revisit a sample of villagers participating in the original FP&D baseline surveys. This was not possible during the course of the CDIE team's presence in the country. Reliance on a locally recruited survey team was therefore necessary. The CDIE team contacted with the Phase I project sociologist who agreed to oversee the proposed follow-up work. He was able to engage several of the original enumerators, thus reducing the variability inherent to such a re-survey. All members of the local research team were trained at the post-graduate level.

From a methodological standpoint, the survey needed to be simple enough to conduct within limited time constraints. Toward this end, it addressed a sub-sample of the original larger "Farmer Census" carried out by Dove and Qureshi (1987 a,b,c). In this way at least some of the more detailed household information was not lost and comparative "before and after observations" would have more validity.

CDIE defined the sample frame by reinterviewing the original respondents included in the baseline surveys for a randomly selected sub-set of Tehsils in which the program had operated in the Punjab and NWFP Provinces. A *de facto* control was possible because some of the villages originally surveyed were not subsequently involved with the provincial outreach programs. The village of Uchali, Punjab was specifically selected because, after making initial contacts, the project social foresters had not directly approached the village. One villager, however, had acquired 20 seedlings from a neighboring village indicating a potential for future contact and spread effect.

Four of the five villages reached by the program lie in Punjab Province and one is in NWFP. The local research team attempted to cover a wide range of habitats (hence there is only one village per District), but the survey design does not attempt to compare effectiveness of the FP&D effort across Provincial Boundaries. Largely for practical reasons the Balochistan Province was not included in this follow-up survey. Sindh did not participate in the social forestry program until just prior to the CDIE assessment team's visit. It was also excluded from the survey, though, for comparative purposes, one member of the CDIE assessment team carried out informal surveys in the province.

The criteria used for village selection include:

- **concentration of program activity**. The intent was to get a sense of the difference for a region where the program impact was marked and apparent. Areas of project intervention were identified by consulting with the FP&D database and with local field officials.

- **avoidance of duplication of villages with similar ecological characteristics**. The intent was to capture a broad range of farming systems.

- **expressed interest in the project during the baseline surveys**. One desire was to gauge how well the intended beneficiaries had fared in receiving services and in their satisfaction over the life of the project.

Although one purpose of the original survey was to identify future participants, there was no way of assuring that they did

indeed become subsequent beneficiaries. To insure that CDIE did in fact include sufficient recipients in the survey, a targeted sub-sample of five additional **seedling recipients** were randomly selected and interviewed. Aggregated observations, analyzed relative to the baseline data, provide a reasonably accurate basis upon which to assess the program's impact. The survey thus consists of two groups of respondents:

- a targeted sub-sample of an original random sample. Because its only distinguishing criterion is that the program reached that village (preferably in the early years), the sample should be representative generally of the affected beneficiary population. The sample for the original baseline surveys was chosen randomly from voter lists. The selection process is described in Dove and Qureshi (1987).

- a directed sample of seedling recipients, ostensibly selected through a random process. Since this sample was selected after the CDIE staff left the field, details concerning the selection process are known only through indirect reporting. One might expect it to be skewed slightly toward farmers who were better known to the local project forestry officers.

The six village sample represented an approximately 20 percent sub-sample of the original 33 village sample.

Logistical Arrangements

The supervisor of the local data collection effort met with the CDIE assessment team in Islamabad and visited a nearby village to test a preliminary questionnaire. This preliminary field test permitted us to better frame the realities of matching the survey's ambitions with its budget and time limitations. Not surprisingly, the scope was reduced to a few key variables. These preparatory steps allowed agreement on timetable and contractual arrangements thereby permitting data collection to begin immediately.

The fieldwork resulted in the following outputs:

1) **raw data forms** completed, controlled and annotated with supervisor's comments;
2) **an interim report** that describes the research preparation, the actual field experience in implementing the survey; and
3) **a final report** to include: (a) the **survey methodology** (sample selection process, description of the survey process including chronology, criteria used for selecting seedling recipients who were not included in the original baseline survey, etc); (b) **discussion** of the validity of

responses, focussing on those questions where responses may have been ambiguous; (c) **subjective observations** of the field team concerning the impact of the project on the local population and on changes in conditions since the original baseline survey was carried out in 1986-87.

The survey forms were sent upon completion of the fieldwork, and the final report including a brief subjective assessment of village level conditions (item 3 (c) was sent shortly thereafter. All outputs of the local research team were received within six weeks of the CDIE assessment team's visit to Pakistan.

The fieldwork followed a progressive schedule. Initial visits in early November consisted of the research team making contact with concerned District and Sub-District Forestry Officers funded by the project and responsible for the outreach program in their respective areas. These visits were facilitated by CDIE's having arranged a letter of introduction from the FP&D Project Officer in Islamabad.

In addition to meeting with project personnel, the local research team made contact with opinion leaders in the villages concerned. This greatly facilitated the subsequent visits. The visits also provided opportunity to select the targeted sub-sample, retrain the enumerators and further field test the questionnaire. To further enhance comparability with the baseline survey results, the original training guide for the baseline surveys was employed for the CDIE follow-on study. As an additional measure, standardized translations of key words and rules for registering local expressions were agreed upon which enhanced the validity and reliability of the data. Translation, verification, and pre-coding were done subsequently during re-checking and editing sessions.

With assistance from CDIE's Economic and Social Data Services Division, the CDIE Environmental Assessment team carried out data analysis.

Observations and Recommendations of the Field Team

In the following section, the subjective comments contributed by the Pakistan field research team are summarized. CDIE treated these field interviewers' remarks and observations equally valid to other data collected from **key informants** in focus group and informal interviews. The survey simply provided a systematic vehicle for collecting and registering such data. While important, the field team's observations represent professional judgements and their reflection of underlying realities requires confirmation through other sources. Given this caveat, the following section summarizes first the local research team's observations and recommendations. Where appropriate, their comments have been incorporated into the main body of the text.

Proximity To Roads

The ability of the Forestry Development Project personnel to provide extension services to the farmers, is directly related to the relative distance of their villages from paved roads. The average distance of these sample villages are 2.4 miles from the nearest paved road. However, it has been observed that program activities are most successfully carried out in those villages which were situated right on the road side. Good examples off this phenomenon are the villages Longay and Haroon in Sialkot and Attock Districts respectively. With respect to the development of farm forestry however, conditions in the roadside villages appear visibly more promising than in other villages.

Proximity To *Shamlats*

The proximity of the village population to *shamlats* and the free usage, whether through licit or illicit means, of their resources is an important factor influencing the dispositions of these villages towards the practice of farm forestry. In Uchali village in the District Khushab is typical example of this case. In this case, people appear to exploit the common on a regular basis-primarily for fuelwood and free grazing of their animals. This access has left the villages with little interest in planting trees on their own land to fill these needs. Another important fact may be of the status of these *shamlats*. Lands are cropped, and for this purpose they are periodically rotated among all of the land holders in the village. This rotation ensures equity in land use, but of course it would not encourage any long term invest in a particular piece of land, such as that demanded by planting trees.

Land Settlement and Consolidation

Problems with consolidation have created greater reluctance to make long-term investments in trees. The farmer fears that if he plants trees on his land, he risks losing them to a neighbor when consolidation is carried out, This is just one of the obstacles to farm forestry in the unconsolidated areas.

An other important difficulty lies with protection; farmers said that the difficulty of protection is one of the major problems of the tree cultivations. One of the major reasons why protection is so difficult is because of the fragmentation of their land holdings. They can not simultaneously look after trees growing on widely separated plots.

Extension Services

The FP&D Project can best plan its program of extension services to farm forestry. In villages people believe that a major constraint on their agricultural activities derives from inadequate

assistance from the government. Further-more, many of the respondents said that they have not met with the foresters, whereas substantial program activity had been carried out in the close vicinity off their villages. Therefore, it suggests that there is indeed a feeling that the delivery of services should be prompt and adequate. A well-designed extension module will also help in removing farmers hesitation and pessimism regarding interest in planting trees. Such modules would provide knowledge/experience in how to carry it out. Despite of the fact that tree planting is a forest service activity, it is still perceived by the farmer that principal source of assistance is the agriculture department. Compared with the agriculture and other departments, there has been little interaction or dialogue with the Forest Department.

Provision of Seedlings

The farmers who are constrained by small holdings and limited resources are not provided seedlings according to their respective requirements. The Nursery Operators are not encouraging these small farmers in providing them few or less there one hundred seedlings. This might be due to the fact they want to dispose of as many seedlings to few people and get financial benefits as early as possible. Therefore, big land-holders are utilizing the benefits while establishing block plantations. This has had the effect of depriving small farmers from provision of free seedlings.

Mechanism For Obtaining Seedlings. The procedure for getting seedlings is not simple and convenient to the farmers. First of all, they have to obtain a slip (authorization paper) from the office of the Field FP&D Project Office. After presenting this slip to Nursery Operator they will get the seedlings. The farmers do not have enough free time to visit the office of FP&D and then obtain the required seedlings from the nursery. In a few cases, foresters did visit the village and prepared lists of interested farmers. Slips were also issued right there, but this practice is no longer followed.

Big Landlords and the FP&D Project. General awareness of the FP&D project seems to be confined to the big landlords. They have more knowledge about this program. This might be due to the fact that they have been used to start the program activities. Moreover, almost all development programs rest with these big landlords. In the end, small farmers are deprived of the fruits of development.

Selection of Species. In selection of species for nurseries and onward supply to farmers, the intended or required preferred species and needs of the farmers are ignored. For example, in District Khelum and Sailkot there is a shortage of fuelwood in the sample villages, but they have been provided Eucalyptus seedlings. Eucalyptus, according to them, is a very poor fuelwood and also provides less fire while used as fire-wood. The emphasis is more

on commercial plantations rather than functional and required energy aspects. This trend has been observed in all the sample villages. Virtually, the only species is Eucalyptus: it seems that whole program is single species program i.e., "Eucalyptus."

Project Trees. By and large survival rates are very high in case of block plantations and trees within the courtyard. There have been very few follow-up visits to monitor the growth and identify the causes of mortality. Nor have farmers been provided adequate training for coping up the situation. In some cases the farmers mentioned that the seedlings provided were not healthy and up to standard. Remedying this shortcoming will require massive program of Farmer-official contact.

Recommendations

As the focus of this report is on impact assessment, the following recommendations may possibly be drawn from the discussions held with opinion leaders and observations made during the field work.

The villages with clear interest should be accorded the highest priority in this development project.

(a) Those villages which are at distance from paved roads should be given priorities.
(b) Those villages which have a high percentage of uncultivated waste lands.
(c) The traditions of informal exchange of labor should be adopted in order to encourage tree plantations and after care.
(d) The development of farm forestry should concentrate on addressing the following constraints:

(i) The lack of water for growing trees.

(ii) The difficulty of protecting trees.

(iii) The competitiveness of trees with food crops.

(iv) The lack of interest and experience on the farmers' parts and the lack of assistance on the government's part.

(vi) Farmers should develop habits geared to increasing contacts with Forest Department for assistance in mastering tree cropping.

CDIE E/NRM PROGRAMS ASSESSMENT
Pakistan FP&D Project

Interview Schedule -- Follow-up Impact Study

I. BACKGROUND

1. Village name_____ 2. Interview date:_____

Province_____District_____Tehsil_____

3. Interviewer'(s) names: i._____ ii._____

4. Name of Head: _____Original: Yes____ No____

II. PROFILE FROM ORIGINAL SURVEY

5. Are your farmlands: _____ all barani (rainfed) no. acres _____

_____ all irrigated no. acres _____

_____ mixed barani and irrigated

6. Total acreage: _____ Rented out: _____ Rented in: _____

7. Tenure status: Tenant_____ Tenant/owner_____
Owner-operator_____ Landlord _____

III. CHANGES IN AWARENESS

8. Are there more trees in your and the other neighboring villages than there were six years ago?

YES___ NO___

If yes, what species have increased the most?

and why?

9. Have you heard of the forest service tree planting activity that offers free tree seedlings to farmers for planting on their fields?

Yes_____ No_____

10. Have you been visited by a social forestry agent from this project:
individually Yes ____ No ____
group meeting Yes ____ No ____
other contact Yes ____ No ____

11. Are new foresters different than those before the project? Yes __ No __
If yes, how?

12. How has the village changed since the new foresters came to your tehsil?

13. Have you received trees from this project? Yes _____ No _____
(If no, go to next page)

If yes, list years and numbers: (Use recall methods to recreate chronology; i.e. have respondent identify something that happened about 6 yrs ago and work from there)

YEAR	NUMBER	SPECIES (list all if more than one)	TYPE(S) OF PLANTING C=courtyard, S=scattered, L=linear, or B=block)	MAIN REASON FOR PLANTING/EVENTUAL USE
1992			C S L B	
1991			C S L B	
1990			C S L B	
1989			C S L B	
1988			C S L B	
1987			C S L B	
1986			C S L B	

14. What benefits have the planted trees provided:

____ beauty ____ shade
____ fuelwood ____ construction materials
____ save dung so we have more fertilizer
____ make money ____ save labor or labor expenses
____ stop erosion
____ other: _____
_____

15. Has the forest service and project provided help since you planted the trees?
If yes, what have they done?

16. Have you received other benefits from the project? Yes_____ No_____
If yes what were they?

17. If the new forester were gone, would your village continue to plant trees?
Yes_____ No_____
Explain?

18. Would you now like to receive free (non-fruit) tree seedlings from the Forest Department? Yes_____ No_____

If 'yes,' which species and how many of each species?

i. Species_____ Number_____

ii. Species_____ Number_____
iii. Species_____ Number_____
iv. Species_____ Number_____
v. Species_____ Number_____
vi. Species_____ Number_____

19. What percent of your trees survived?

IV. CHANGES IN PRACTICES AND PERCEPTIONS

20. Do you burn dung for fuel? Yes_____ No_____

21. What percent of your available dung supply is used for fuel and what percent is used for fertilizer?

Fuel_____% Fertilizer_____%

22. Do you use dung as fertilizer? Yes_____ No _____

23. Is the supply of dung in your household sufficient for fertilizer?
Yes____ NO_____

24. Compared to six years ago is fuelwood:
_____easier to gather in the village surroundings
_____harder to gather
_____about the same

-------(GO TO OBSERVATIONS SECTION IF NO TREES PLANTED)------

25. Have you begun to use the trees you got from the project? Yes____ No____
If yes, for what purpose(s):

26. Have you sold timber wood from these trees? Yes_____ No_____

If yes how much and at what price?

Who was the purchaser?

If no, are you going to cut timber wood to sell in the future?

27. Have you sold firewood from these trees? Yes_____ No_____

If yes how much?

and at what price?

If no, are you going to cut firewood to sell in the future?

If planning to sell, who would you like to sell to?

28. What are the impacts of the trees you planted from the project on the following:

a. soil moisture:

b. soil fertility:

c. temperature:

d. crops:

29. If you cut the trees down (or have them cut), will you remove the stumps from the ground? Yes ____ No _____

If no, why not?

VI. OBSERVATIONS (changes since original interview, general ambience of interview, other comments of interest made by farmer not directly answering above questions, observation of plantings, accuracy of responses, etc. Use **back of page** if more space is needed)

APPENDIX C

FARM FORESTRY IN PAKISTAN

Farmers in Pakistan, and in the FD&P project areas, have incorporated trees into their farming patterns for a long time. Dove (1992) describes the detailed knowledge about different trees that Punjabi farmers have about the interactions between trees and agricultural crops. The FP&D project sought to to build on this farmer knowledge base by introducing new tree varieties, seedling nursery techniques and cultivation practices into farmers' production systems.

The original strategy for the FP&D project's farm forestry activities was defined as follows:

> "The first tenant of farm forestry is to integrate tree crops with the efficient operation of the entire enterprise and to achieve the highest overall return, not necessarily the maximum wood production" (FP&D PP, p 122).

The strategy of integrating trees into the entire farm operation also is implicit in the four issues defined in the Project Paper as particular concerns of Pakistani farmers and agricultural policy makers:

1. positive and negative interaction between trees and conventional row crops
2. displacement of row crops from productive arable land following the introduction of tree crops.
3. the substitution of firewood for dung permitting the use of dung as a fertilizer and soil conditioner; and
4. the reduction of available grazing areas and the production of additional quantities of fodder from managed tree crops and underplantings" (PP, p. 122).

Ecological, economic, and social characteristics of the project target population and area relevant to the selection of farm forestry technology include:

1. the high dependence on traditional fuels including cow dung and the scarcity of firewood;
2. the adequacy of rainfall (15 to 30 inches per year) for afforestation without irrigation
3. the scarcity of fodder;
4. the large quantities of marginal lands;

The project design team also "deliberately...avoided species not well-known or accepted by farmers"... (PP, p120). The

implication of this choice is that the project would build on the knowledge of on-farm trees that the farmers already possessed, as described by Dove (1992) while attempting to increase the number of trees on the farm land, especially on the marginal lands.

Species selection is the principle factor in the design of a farm forestry technology. Based upon the above considerations the design team selected Acacia nilotica. as the principle species for project emphasis. They justified this selection as follows:

> "A wide variety of native tree species exist in Pakistan and additional species are under trial, particularly various poplar clones, eucalyptus species, and ipil-ipil (Leucaena). However, Acacia arabica, or babul, has many useful characteristics that make it uniquely suitable for the production of fuelwood and energy on private farmlads. Most importantly, babul is a fast-growing, native species that is well known and accepted by farmers and foresters throughout all target areas. It is ecologically plastic and well adapted to the climatic, edaphic, and biotic characteristics of the target areas. Babul is leguminous (nitrogen fixing) and is tolerant of saline and waterlogged soils. Babul is a preferred fuelwood, yields substantial quantities of timber for on-farm and commercial use, produces fodder, and is currently the only wood for mine timbers in Pakistan. Nursery and planting methods and direct seeding techniques are well developed. The provincial Forest Departments have had substantial experience in raising babul and are in a good position to transfer that knowledge to farmers and private nursery workers. Babul produces useful quantities of firewood and fodder within the first two to three years after planting and can be efficiently grown on rotations as short as eight years although farmers may in many situations, opt to extend the growing period up to twenty years. In the absence of overriding requirements for special characteristics (special soil conditions, soil conservation treatments, or aesthetic plantings), babul is the outstanding species of choice for the target areas".

Table 14 of the Project Paper compares the species considered for alternative farm forestry models from the point of view of the products they can produce, their ecological requirements and tolerances, the ecological benefits, their growth rates, and their propagation methods. The Table indicates the comparative benefits of A. nilotica

Based upon A. nilotica "a variety of management regimes featuring babul were developed to adapt to the wide range of climatic conditions and management objectives found in the project's target areas....Harvesting patterns have been scheduled to provide...an even flow of material commencing early in the project. This feature was included in direct response to the needs

of the small, low-income farmer for a rapid and continuous return on his family's investment of time and other resources" (PP, p120).

Table 8 of the Project Paper, reproduced here, shows four illustrative planting models.

ILLUSTRATIVE PLANTING MODELS TO MEET FUELWOOD NEEDS

Zone	Plantation Type	Mean Annual Increment (cu.ft./acre)	Acre Required Per Farmer
Sub-humid	Block/Row	165	1.1
Semi-arid	Block or Row	120	1.5
Dry Semiarid	Bock or Row	60	3.0
Sub Humid	Block or Row with Grasses planted beneath	140	1.5

The Project Paper includes detailed economic analysis of the acacia on-farm planting systems (Project Paper, p.143). These show Internal Rates of Return of 8% for Dry Semi-Arid block or row equivalent plantings to 24% for block plantations with fodder production included. If the calculations include the added economic benefits of replacing the burning of dung with firewood and using the dung for fertilizer the IRRs rise to 18% and 35% respectively.

The project design, then, proposed to build on the traditional widespread use of A. nilotica on rainfed farmlands by increasing its concentration around the edge of fields and in blocks on presently low productivity land. The Project's economic, technical, and social analysis are based on the use of A. nilotica. No economic calculations, for example, are included for the use of other species. Project socio-economic surveys supported the Project Paper emphasis on A. nilotica (Jan, 19??).

The project has produced little, if any, additional information regarding the use of A. nilotica for farm forestry. There are no additional silvicultural, economic, silvical, soil, or botanical studies, for example. Especially lacking is a study of the productivity of A. nilotica for firewood and forage when

managed under the lopping system practiced throughout the project areas of Punjab, Northwest Frontier Province, and Sindh. The evaluation team did not observe any A. nilotica plantings financed by the project. The farm forestry technology based on A. nilotica that was proposed in the Project Paper evidently remains to be systematically studied in almost all its ecological, economic, and silvicultural aspects.

Field observations confirmed the Project Paper's description of A. nilotica as an important tree for farm forestry in the project area. The species is prevalent throughout the project areas the evaluation team visited. Almost without exception A. nilotica trees are lopped, whether along the edge of roads or standing alone in fields. Branches within reach have been grazed. Interviewed farmers agreed that the forage value of the leaves is high. Forest department foresters generally appear to know and appreciate the silvicultural and economic characteristics of the species.

Present Project Farm Forestry

About 60% of the trees planted under the project have been Eucalyptus camaldulensis and 40% have been other species. Exact data on the distribution of the other species are not available from the project staff.

Without a record of which species have been planted under what conditions it is difficult to describe the farm forestry system presently being promoted by the project; as mentioned above, a key choice in on-farm forestry is species selection to suit the project strategy and the target group. The arguments for choosing acacia are clearly laid out in the Project Paper. The arguments for emphasizing eucalyptus, by contrast, have not been laid out in any official project document that I could locate.

Perhaps the 40% of other species that have been planted under the project are responding to the needs and interests of the original target group of farmers as was envisioned in the Project Paper. Systematic data are not available on what size of farms and what economic level of farmer has received these trees. The non-eucalyptus species represent 38.4 million trees, however, which is more than enough to reach the Logical Framework goal of 24,000 acres of woodlots on the lands of poor farmers. The survey to be conducted during November 1992 should elucidate the use of these non-eucalyptus plantings.

Eucalyptus was not given emphasis in the Project Paper, for reasons that are stated quite clearly. Eucalyptus does not provide the same multiplicity of on-farm benefits as acacia. Its leaves do not make good forage. It does not improve the soil. Its long, superficial root system can compete with neighboring agricultural

crops. E. camaldulensis does not form a good windbreak, since it loses its lower branches. Given its long.straight growth form, eucalyptus cannot be so easily lopped as other species and probably does not produce as much firewood from branches.

The advantages of eucalyptus, stressed repeatedly by project staff and participating farmers, are its fast growth and adaptability to poor sites. These characteristics are those that have spread eucalyptus across the world (FAO, 1979) so it is no surprise that they attract attention in Pakistan as well. In fact, it is more surprising that eucalyptus had not been more widely planted before the FDPP began to promote it, since it was introduced to Pakistan in the 1867.

Discussions with project staff and field observations indicate that the change in farm forestry models occurred for the some or all of the following reasons:

1. It is not necessary to grow A.nilotica in a nursery since it can be directly seeded. E. camaldulensis, by contrast, needs to be grown in a nursery and is easy to grow. Seed is also easily available and is cheap. Both the Forest Department staff, whose performance is measured by the number of trees planted and who constantly lack funds, and the nursery operators, who are paid by the number of seedlings produced (with a profit margin of approximately .5 Rs. per seedling) have every incentive to sow the species that is easiest and cheapest to produce. E. camaldulensis is their obvious choice.

2. After several years of inaction both USAID/Pakistan and the provincial and national Pakistan governments were probably anxious to see results. The results that everybody wants to see out of a forestry project are nurseries and planted trees. (Many people have the odd idea that trees do not grow unless they are planted). The eucalyptus nursery and planting arrangement thus was the quickest way to satisfy the bureaucratic pressure for results that the project was experiencing.

3. E. camaldulensis may grow faster, at least in its first years, than A. nilotica. Fast initial growth rates tend to overly impress both foresters and the general public. The Project Paper describes A. nilotica as a fast growing species too, however, and says that it will begin to give a return of fodder within three years. In the absence of studies on the growth rates of A nilotica under the conditions of the project plantings it is not possible to determine the comparative growth rates of the two species, although it is probable that under many conditions euclyptus does grow faster. Acacia may , however, grow back more volume more quickly after lopping that eucalyptus does in coppices. The production of firewood may also be spread more evenly over the years as well.

4. The Provincial Forest Department staff may have promoted

eucalyptus to farmers simply because, for the reasons described above, it is the species being grown in the nurseries. The seedlings have to leave the nurseries in order for them to be counted as planted trees.

5. The interest or acceptance of eucalyptus possibly reflects the type of farmers with which the project seems to have principally have worked. The Provincial Forest Department staff frequently refer to "progressive farmers" as the ones who are interested in planting trees. Probably "larger and better-off" could be substituted for "progressive". The evaluation team did not meet any participant farmers who could be considered particularly poor or uneducated. A number of the farmers were absentee landlords. Several had been to the United States. At least one arrived to a meeting in a car. Several referred to the large (several hundred acres) of land that they owned. A number spoke English. These would not seem to be the characteristics of poorer, smaller farmers.

Better off, larger, and especially part-time or absentee landowners would be more inclined to grow eucalyptus and to take the advice of government forester than poorer, smaller farmers. They have more area to plant and are therefore less concerned about possible reductions in crop yields due to the competition of eucalyptus. They are more interested in the commercial cash market that eucalyptus might provide, since they depend less on their farm's production. They may be more interested in ensuring their claims to land through the planting of trees than the actual tree production itself. They do not need the constant supplies of firewood and forage that a species such as acacia supplies. All these are hypotheses, of course. A survey of the project area is planned in part to further elucidate these possibilities.

The project staff has begun to analyze the financial returns from a planting of eucayptus based on the costs of establishment and projected yields. They show returns as high as 32%. Although some of the plantations planted in the first years of the project are now being harvested, the project has not yet calculated financial returns to the farmer based on actual measurements.

Leach (1992) does make some economic calculations for eucalyptus plantations. He finds that 50 fast growing trees planted around the edge of agricultural fields give an annual net revenue of 248 Rs. when discounted at 10%. This is an additional income of about 15% in the case of wheat and 4% in the case of cotton.

Leach also quotes studies made on farm forestry in the Punjab based on detailed annual surveys made by the Punjab Economic Research Institute. These studies found that a range of tree species five higher net returns per hectare than all of the major agricultural crops, even when using a 15% annual discount rate for

costs and revenues. The annual net returns per hectare at a 15% discount rate, for example, are 6,100 and for acacia are 5,804 in comparison with rates of return for wheat and cotton of only 4,319 and sugarcane of 462. According to Leach, it is these studies "which did much to launch the Punjab Forest Department's swing from government forestry to the support of tree growing on private farmlands" (Leach, p32).

It is important to note that these financial calculations are based on the present market values of wood. Market prices could well change, and perhaps go down, as more volume of eucalyptus comes on to the market.

6. Many of the farmers interviewed said that they had planted or were interested in planting eucalyptus because of its ability to restore waterlogged and saline sites. A review of the literature on the use of eucalyptus and acacia for tree production on saline, sodic, and water logged soils (Winrock, 1990, Malik and Blake 1991) did not indicate that eucalyptus is a better species for this purpose. Field observations indicate that both species are capable of growing in difficult conditions. Eucalyptus was observed on waterlogged and saline conditions as was acacia. Two notable example of acacia's ability to restore saline soils and survive in waterlogged areas were observed, however. The huri system around Hydradabad has been used for over 100 years to restore saline soils. Acacia is a principle species of the riverain forests between the dikes of the Indus river which indicates its ability to grow in waterlogged soils.

7. A.nilotica is reported to be sensitive to frost damage when it is young, a characteristic not mentioned in the Project Paper. According to the USAID/Pakistan Project Manager, who certainly is extremely knowledgeble, this sensitivity is one reason why it has not been used more extensively by the project. Frost sensitivity may vary considerably between different parts of the project area. It may also vary with microclimates and provenances of the species.

Huri System of On-Farm Forestry

The "huri" system of on-farm forestry was promoted over a century ago by the British in order to increase wood supplies around Hydrabad in Sindh province. This system consists of broad cast seeding of A. nilotica in blocks of a few hectares. The acacia grows quickly, reaching pole size in about 6 years. The whole plantation is harvested at once, including the removal of the roots. Straighter poles have a strong market for mine props. Smaller branches are used for firewood. Animals forage on the leaves. The roots are made into charcoal. Over the rotation the acacia has regenerated the soil with the addition of nitrogen by fixation and because animals are allowed to rest and graze in the stand once it is established. The acacia also reduces the salinity

of the soil. Upon cutting, the area is returned to short-cycle crop production for two or three years before being seeded again to acacia. It is unclear why it has not spread to other districts in the Sindh province.

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APPENDIX D

FARM FORESTRY ENTERPRISE BUDGET ANALYSIS

Farm forestry in Pakistan, as well as in most countries, spans a spectrum of cultivation systems and practices. The most commonly assumed pattern of block or wood lot planting is only one of many. Farm forestry systems also include planting as windbreaks, interplanting and rotational planting with annual crops. As Annex 4 explains, the selection of farm forestry systems depends on a range of variables including tree crop varieties, local climate and soil conditions, alternative and complementary crop and livestock options, etc.

The evaluation team obtained secondary farm budget data for five different farm forestry systems in Pakistan. These data had not undergone any previous analysis by FP&D project staff. In addition, the evaluation team had farm budget data on traditional rain-fed wheat cultivation with which to compare relative profitability. These data are presented here in individual farm enterprise budgets and consolidated in Table A-5.1 to permit comparison across alternative production systems.

One distinguishing feature of farm forestry is the delay of one or more years before income flows from tree crops. Often only incidental benefits -- shade, forage, fuelwood from thinning -- are obtained until trees are harvested, rather than at the end of an annual crop season as is the case for most food crops. This deferred flow of income requires budget analysts to estimate the present values of future income stream and cultivation expenditure in order to make realistic and accurate comparisons about the economic performance of alternative farm enterprises.

In Pakistan, the types of farm forestry practices introduced to date have pay-off periods of from five to fifteen years. This results from the rapid growing eucalyptus, acacia nilotica tree varieties that predominate among the systems adopted by participating farmers.

Moreover, some farm forestry enterprise systems actually produce some income earlier from combining them with livestock grazing, annual crops and fuelwood that results from thinning and clearing. The following are budget profiles for the six production systems used in the calculation of economic benefits and program efficiency for this evaluation. In calculating costs and returns:

- All farm enterprise budgets ere calculated in current U.S. dollars per acre;

- A discount rate of 15 percent is used to calculate present values of all costs and revenues from the period in which they were registered;

- Values of fuelwood and forage for home use are imputed using local market values.

Table D-1 summarizes for each of the six enterprise budgets presented:

- The net present value (NPV) of gross income generated from the sale/use of all outputs -- fuelwood, poles, fodder, etc. -- of each farm forestry enterprise

- The imputed gross equivalent annual income (EAI) from the enterprise over its management cycle;

- The benefit/cost ratio (BCR) of the present values of total enterprise incomes and costs;

- The internal rate of return (IRR) to enterprise investments net of land values, rents and interest on borrowed capital.

Table D-1: Economic performance of selected farm enterprises

Farm enterprise activity	NPV	EAI	BCR	IRR
Eucalyptus 5-year cycle #1	3,732	996	2.17	81.9%
Eucalyptus 5-year cycle #2	18,300	4,885	4.96	109.0%
Eucalyptus-waterlogged soil	16,688	3,610	2.19	32.7%
Eucalyptus as windbreak	7,924	686	1.79	20.4%
Acacia nilotica - seeded	29,870	4,736	10.76	59.7%
Rainfed wheat (10-year cycle)	5,550	702	2.09	---

NPV and EAI are calculated in $US per acre; IRR is calculated as a percent.

Source: Unpublished FP&D farm forestry enterprise survey data. (See below for more complete list of income and expense items associated with each enterprise budget.)

1. **Eucalyptus block planting** planted in 1987 & harvested in 1991, at 15'x15' spacing in blocks under barani scheme.

Activity	Period(s)	Cost/value
Cultivation costs		
Land preparation	1	250
Seedlings	1	195
Planting	1	200
Plant protection	1-5	250
Stump removal	5	1,500
Total costs		2,395
Crop revenues		
Fuelwood	2-4	200
Stumpage	4	6,380
Fuelwood	5	500
Total revenue		7,080
Net present value (NPV)		3,732
Equivalent annual income (EAI)		996
Benefit/cost ratio (BCR)		2.17
Real internal rate of return (IRR)		81.9%

2. **Eucalyptus 5-year cycle** block plantation thinned after three years and clear-felled after five years.

Activity	Period(s)	Cost/value
Cultivation costs		
Land preparation	1	300
Seedlings	1,2	600
Planting	1,2	480
Plant protection	1-5	100
Harvest	5	3,350
Total costs		4,830
Crop revenues		
Fuelwood from thinning	3-5	1,100
Livestock forage	2-5	700
Wood sales	5	23,450
Total revenue		25,250
Net present value (NPV)		18,300
Equivalent annual income (EAI)		4,885
Benefit/cost ratio (BCR)		4.69
Real internal rate of return (IRR)		109.0%

3. **Eucalyptus on water logged soils** in high density block plantation with 6-year rotation.

Activity	Period(s)	Cost/value
Cultivation costs		
Land preparation	1	500
Seedlings	1	4,800
Planting	1	4,800
Thinning	3	500
Plant protection	4-6	500
Harvesting	4-6	250
Total costs		11,350
Crop revenues		
Firewood	3	9,000
Wood sales	4-5	10,000
Pulp & poles	6	15,000
Total revenue		34,000
Net present value (NPV)		16,688
Equivalent annual income (EAI)		3,610
Benefit/cost ratio (BCR)		2.19
Real internal rate of return (IRR)		32.7%

4. **Eucalyptus windbreaks planting** planted in 1981 on 50' wide belt along field border; first harvested in 1991.

Activity	Period(s)	Cost/value
Cultivation costs		
Land preparation	1	350
Irrigation	1	600
Planting	1	200
Plant protection	1-15	400
Harvest & transport	9 & 15	3,800
Total costs		5,350
Crop revenues		
Fuelwood	9 & 15	7,800
Erosion/flood benefit	3-15	700
Fuelwood	9 & 15	2,600
Total revenue		10,100
Net present value (NPV)		7,924
Equivalent annual income (EAI)		686
Benefit/cost ratio (BCR)		1.79
Real internal rate of return (IRR)		20.4%

5. **Acacia nilotica (kiker).** Block plantation from direct seeding in old cropland; harvested at 8 years.

Activity	Period(s)	Cost/value
Cultivation costs		
Land preparation	1	800
Seedlings	1	400
Planting	1	200
Plant protection	1-5	0
Total costs		2,395
Crop revenues		
Cattle grazing	3-8	1,500
Wood sales	8	30,000
Total revenue		31,500
Net present value (NPV)		29,870
Equivalent annual income (EAI)		4,736
Benefit/cost ratio (BCR)		10.76
Real internal rate of return (IRR)		59.7%

6. **Rainfed wheat cultivation** in 10 year cycle with two crop failures in years 3 and 6; yield of 5 maunds/acre/year.

Activity	Period(s)	Cost/value
Cultivation costs		
Land preparation	1-10	500
Seed/fertilizer	1-10	250
Harvest	1,2,4,5,7,8,9,10	100
Threshing	1,2,4,5,7,8,9,10	50
Total (annual) costs		900
Crop revenues		
Grain	1,2,4,5,7,8,9,10	900
Straw	1,2,4,5,7,8,9,10	600
Total (annual) income		1,500
Net present value - all years (NPV)		5,550
Equivalent annual income (EAI)		702
Benefit/cost ratio (BCR)		2.09
Real internal rate of return (IRR)		---

APPENDIX E

THE A.I.D. ENVIRONMENTAL PROGRAM IN PAKISTAN

Background

Environment and natural resources management initiatives in Pakistan began over a century ago with early forest and wildlife protection measures introduced during the British colonial period. These early measures were reinforced since partition of Pakistan and India in 1947 with a series of laws and regulations governing the management and use of the nation's water, soils, rangelands, forests and fisheries resources.

The Pakistan government did not, until the mid-1980's launch more systematic efforts to address the increasingly serious threats of soil degradation, loss of forest cover, growing industrial pollution and energy waste. Current Pakistani environmental efforts have not yet been sufficiently sustained nor strong enough to reverse these deteriorating environmental conditions.

However, Pakistan today is also experiencing growing popular awareness about its environmental degradation and natural resource depletion problems. A newly prepared official government framework for action, the 1991 National Conservation Strategy (NCS) offers a course of action for dealing with Pakistan's environmental ills. Limited public sector financial resources and technical capability will constrain Pakistani Government agencies in their efforts to carry out the NCS. However, this evaluation suggests that Pakistan has considerable private sector capacity and initiative that can complement public efforts.

Pakistan faces the challenge of discovering how to unleash incentives to encourage more sound environmental and natural resources management practices with only a limited need for government support or regulation. A.I.D. assistance has helped, particularly in the energy and forestry sectors, in identifying, developing and testing promising approaches.

The A.I.D. Environmental Program in Pakistan

In one sense, the A.I.D. assistance program in Pakistan has had a range of intangible and unmeasured environmental benefits. USAID/Pakistan agricultural programs in the 1970's and 1980's not only improved food crop yields but, in doing so, reduced pressures to clear and cultivate more fragile and marginal lands. A.I.D.

support for improved irrigation water management has helped reduce the demand for power to fuel irrigation pumps and has retarded deterioration of soils from canal seepage and waterlogging.

In the early 1980's, however, A.I.D. began to introduce explicit environmental goals into its assistance activities in Pakistan. In two sectors -- energy and forestry -- the country's resource base was showing particularly visible and worrisome signs of strain that threatened long-run national economic development. In 1983, A.I.D. launched two initiatives in energy and forestry planning and development which have explicit environmental objectives.

- **Farm Forestry.** The Forestry Planning and Development (FP&D) Project was launched in 1983 as a 10 year $ 27.5 million undertaking aimed, in the first instance, at helping Pakistan increase its energy supplies and move more towards energy self-reliance. As a secondary goal, the FP&D project also aimed to reverse deforestation and expand Pakistan's forest resource base by generating interest among farmers to plant trees. The FP&D project also shows potential as an environmental model. Under the FP&D project, farmer's, foresters' and officials' attitudes towards farm forestry have changed, trees have been planted and in target areas perceivable changes in environmental and socio-economic conditions are visible.

- **Energy Conservation.** The Energy Planning and Development (EP&D) Project began in 1983 as a $ 105 million 10-year effort to strengthen both the public and private energy sectors in the country and to better manage and monitor development and use of Pakistan's energy resources. One important component of the EP&D project helped launch an energy conservation program. The EP&D project, however, does not address the environmental dimensions of energy production and use in Pakistan. It ignores, for example, the indirect benefits of reduced emissions of CO_2 and other harmful gases from better energy management or of reduced need for potentially environmentally harmful hydro-electric facilities or coal extraction. These benefits are real and worthy of closer examination in the future.

During the implementation of the EP&D and FP&D projects, the A.I.D. Pakistan mission also began a series of small direct activities, often using project development and support funding, aimed at building the foundations for a systematic and sustainable strategy for dealing with national environmental problems. Among these activities have been the following:

- **The Role of the Media in Environmental Awareness.** In December 1988 USAID and the United Nations sponsored a National Seminar on the Role of the Media in Public Awareness of the Environment for the GOP's Ministry of

Planning, Environment and Urban Affairs Division. The Seminar was convened to highlight the role of the media in environmental public awareness, to identify and discuss techniques of environmental journalism, and to conduct a dialogue between the media and the various actors on the environmental scene. Numerous governmental, inter-governmental and non-governmental organizations have since engaged in discussions of the role they might play in spreading environmental values and arousing public consciousness. "Green files" kept by Pakistani NGO's that monitor environmental articles in the English and Urdu language press demonstrate that environmental consciousness is growing in Pakistan.

- **Legal Aspects of Environmental Management in Pakistan.** In July 1991, USAID/Pakistan assisted the Pakistan Government to summarize and analyze current legislative approaches to environmental protection at provincial and national levels. The study examined legislative, regulatory and institutional changes necessary to improve implementation of environmental laws and assessed the adequacy of existing civil enforcement capacity, methods and penalties and standards in Pakistan to protect the environment. The report on "Legal Aspects of Environmental Management in Pakistan" has been reviewed by the GOP which is exploring a continuing activity for framing environmental standards, rules, regulations and procedures for the new Pakistan Environmental Protection Agency (PEPA).

- **Environmental "Docudrama" Production.** USAID/Pakistan has collaborated with the Pakistani Government in the pilot production of a docudrama video film on environmentally sensitive areas of sustainable development in Pakistan. Members of the environmental docudrama production team are all Pakistani nationals, recognized as top quality professionals in their respective fields. The docudrama's environmental messages are delivered in a grassroots entertainment format popular in Pakistan. The docudrama effort demonstrates that an environmental message delivered through a human interest approach could increase awareness of: a) the extent and nature of environmental problems in Pakistan; b) the need to preserve environmental quality and biological diversity; and c) how to correct environmental problems and acchieve sustainable development. An important product of the docudrama effort was the creation of an environmental media NGO with experience in producing such messages in the future.

- **Agricultural Sustainability and Natural Resource Management** To mobilize domestic attention to

environmental problems that threaten Pakistan's potential to sustain future agricultural growth, USAID/Pakistan collaborated with the Pakistan Government Ministry of Food, Agriculture and Cooperatives, and Ministry of Environment and Urban Affairs, to sponsor four provincial workshops in May 1990. The workshops sought to obtain provincial perspectives on the critical human, environmental and natural resource management issues affecting agricultural sustainability. The seminars were a first step in a process which led to a national level conference held in April 1992 to obtain consensus on the critical issues affecting agricultural sustainability and natural resources management and to develop an agenda and action plan for sustainable agricultural development and natural resource conservation during the next decade. One additional product was the establishment of a National Task Force on Agricultural Sustainability composed of public and private sector leaders.

These USAID/Pakistan environmental initiatives were undertaken with a view toward building the foundations for a comprehensive long-run environmental program. The strategic objective of the USAID Pakistan environmental program at the time of this evaluation in 1992 was to "increase sustainable productivity of the country's natural resource base. The two program outcomes aimed at achieving this objective were: a) the conservation of agricultural lands and waters; and b) promotion of environmental conservation and resource management. The Pakistan A.I.D. mission had organized its staff within this framework and begun work to integrate its cross-cutting environmental strategy across all sectors of its development assistance portfolio.

When Pressler Amendment regulations suspended A.I.D. assistance programs in Pakistan in 1990, that process was disrupted. However, Pakistani public and private interest in environmental problems has continued. A.I.D. financial support has declined and with it the pace of converting awareness into action has slowed. But Pakistani official and private concern kindled by earlier A.I.D. supports appears inextinguishable. Translating awareness into action still requires considerable commitment to crafting cost-effective environmental strategies.

APPENDIX F

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