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Forestry and the Environment

Mali Case Study

April 1994

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FORESTRY AND THE ENVIRONMENT
MALI CASE STUDY

by

Abbe Fessenden, Team Leader
Office of Evaluation
Center for Development Information and Evaluation
Policy Directorate

LeRoy Duval
Forester
Consultant, Development Alternatives, Inc.

with the assistance of

Alassane Kanoute
Sociologist

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PREFACE

USAID 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. USAID 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

Mali is one of the countries where USAID has provided support for two important areas of environment and natural resources management: sustainable forestry and agriculture development. This report summarizes findings from an examination of Mali's forestry program. A separate companion report covers the environmental impact of Mali's programs aimed at sustainable agriculture.

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

Over the thirty-year span of its assistance programs in Mali, USAID has supported a range of development initiatives with environmental benefits. USAID programs with direct environmental and natural resources management objectives are only of relatively recent vintage in Mali, however. This study focuses on the period from 1980 to 1992.

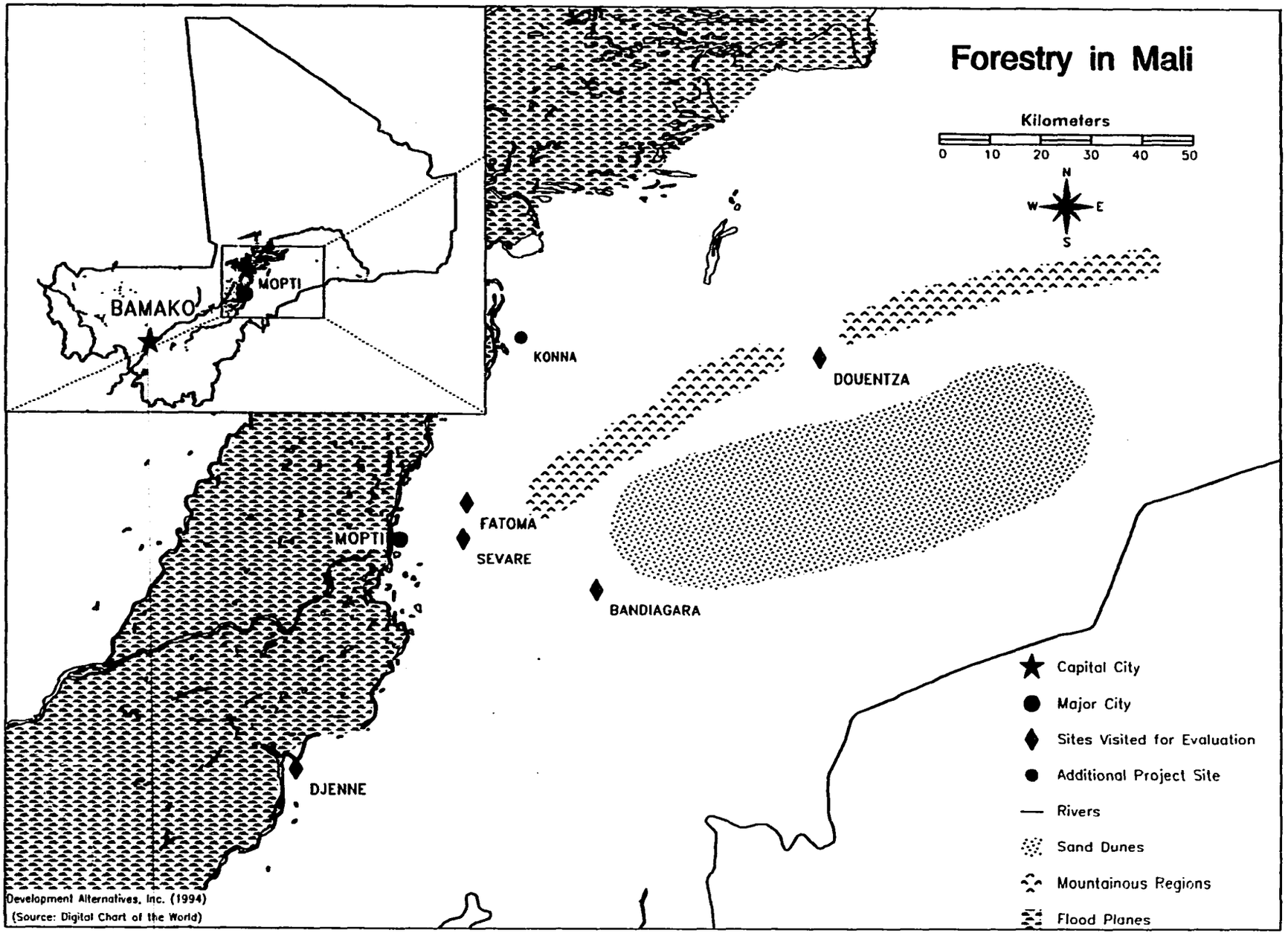
The fieldwork was conducted in July 1993 by a three-member team of environment and economic development specialists. During their one-month stay in Mali, the team members worked in Bamako and traveled to the Mopti area to visit project sites, to meet with public and private sector organizations and individuals. The team also interviewed farmer groups in collecting information to formulate and verify its findings.

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

GLOSSARY

AIP	Accelerated Impact Program
AMRAD	Malian Association for Rural Development
APAP	Agricultural Policy Analysis Project (USAID/W)
arrondissement	local administrative division below a cercle
BNDA	Banque Nationale du Développement Agricole
CCA/ONG	Coordination des Actions des Organiations non-Gouvernementales au Mali (national NGO association)
cercle	regional or provincial administrative division
CGIAR	Consortium for International Agricultural Research
CIDA	Canadian International Development Agency
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo
CLUSA	see NCBA
CMDT	Malian Textile Development Company
CRZ	Centre de Recherches Zootechniques
DED	German Development Group
DNAFLA	Functional Literacy Directgorate
DNEF	Forestry and Fisheries Service
DRSPR	Rural Production Systems Research Division
FCFA	French West African currency - At time of study approximately US$1.00 = 285 CFA
FLUP	Niger Forestry and Land Use Project
FSR	Farming Systems Research Project (USAID)
GDP	Gross Domestic Product
GRM	Government of the Republic of Mali
IARC	International Agricultural Research Center
ICRAF	International Center for Research in Agroforestry
ICRISAT	International Crop Research Center for the Semi-arid Tropics
IER	Institut d'Economie Rurale
INRZFH	Institut National de la Recherche Zootechnique, Forestiere et Hydrobiologique
IRAT	Tropical Agriculture Research Institute
ISNAR	International Service for National Agricultural Research
KfW	Kreditanstalt fur Weideraufbau (Germany)
Kilka	local association for renewable natural resources (Douentza cercle)
Loi Cadre	skeleton or framework enabling law
NCBA/CLUSA	National Cooperative Business Association/Cooperative League of the USA

NEF	Near East Foundation
NGO	Non-Governmental Organization - local
NRM	Natural Resource Management
OHV	Opération Haute Vallée Project (USAID)
OHVN	Opération de la Haute Vallée du Niger
PIRL	Inventory Program for Woody Resources
PIRT	Land Use Inventory Project (USAID)
PLAE	Projet Lutte Anti-Erosive
PVO	Private Volunatary Organization - international
RNR	Renewable Natural Resources
SAFGRAD	Semi-Arid Food Grain Research and Development Project
SALAWA	Semi-Arid Lowlands of West Africa Agroforestry Research Network
SPARC	Strenthening Research Planning and Research on Commodities Project (USAID)
UNESCO	United Nations Education and Science Organization
USAID	United States Agency for International Development
VRP	Village Reforestation Project (USAID)
ZAF	Zone de Alphabétisation
Zai	micro-cachement technology


Forestry in Mali
Kilometers
0 10 20 30 40 50
N
W
E
S
BAMAKO
MOPTI
KONNA
DOUENTZA
FATOMA
SEVARE
MOPTI
BANDIAGARA
DJENNE
Capital City
Major City
Sites Visited for Evaluation
Additional Project Site
Rivers
Sand Dunes
Mountainous Regions
Flood Planes
Development Alternatives, Inc. (1994)
(Source: Digital Chart of the World)

1. INTRODUCTION

Although a relatively minor donor in the forestry subsector, USAID is a major contributor to induced technological and institutional change in forestry and natural resource management in Mali. Most USAID-funded forestry activities are in Region V, centered on Mopti, 600 kilometers north-east of Bamako. USAID interventions have had results which demonstrate that induced technical and institutional change is begining in forestry, when supplemented with sustainable agriculture actions.

This study reviews the developmental impact of USAID's interventions in forestry and natural resource management in Mali. Aside from policy reform efforts, this evaluation covers interventions carried out in Region V south of the Niger River. A few rather new small activities elsewhere are either inaccessable due to civil unrest or in very different ecological zones.

Community or "social" forestry is defined as social forestry arrangements or contracts with local communities and Non-Governmental Organizations (NGOs)[1] for the reforestation of degraded lands and sustainable management of forested areas. USAID-funded forestry activities moved away from community woodlots for fuelwood after this technology failed to achieve meaningful results in the early 1980's under the Village Reforestation Project (VRP I). USAID used the pilot project's flexibility, and by 1989, a redesigned second phase (VRP II) was carrying out "group" and individual farm forestry activities integrated into soil and moisture conservation and other sustainable agriculture practices. Groups and individuals often adopted several technologies and practices simultaneously, including both sustainable agriculture and forestry actions. This approach has been more successful than village woodlots.

Grants to Private and Voluntary Organizations (PVOs) and NGOs under the natural resources component of the PVO Co-Financing Project (1989-1999) also used the combined approach, while the research-oriented Land Use Inventory Project (1977-1985) did some institutional development. Critical work was also done in forestry sector policy reform. VRP II financed a grant to the University of Wisconsin's Land Tenure Center, which, when combined with other studies, provided critical inputs into the forestry policy reform process. Mali is on the brink of implementing major reforms, which are closely linked with decentralization and democracy/ governance processes.

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[1] For purposes of this study, PVO is defined as "International Private Voluntary Organization." They should be distinguished from local Malien non-governmental organizations or NGOs. They have increased rapidly since the mid-1980's and undertake many relief, development and public interest activities.

2. BACKGROUND

The Problem

In Mali, the dominant problem for managing trees is that of being on the desert's edge. It came to the fore during the Great Drought of the late 1960's and early 1970's, one of the key events of Mali's history. Perceptions of underlying constraints and remedies to stem the degradation of agricultural and forest resources varied considerably over time.

Mali covers 1,240,000 square km. The northern two thirds are desert, and most of the 8.9 million people live in the south. Mali's natural resource base consists of 140,000 to 200,000 square km of arable land (depending on rainfall), major river systems, and largely untapped mineral resources. Because of droughts, population pressure, poor land use management practices and deforestation, Mali is experiencing severe degradation of the environmental resource base. (USAID 1989)

The forestry sector accounted for about 1.9% of GDP in 1976 and provided 93% of the country's energy. In 1980, annual firewood requirements were estimated at about 1.7 million tons, of which about 17% was consumed in urban areas. Mopti's firewood came from more than 50 km away and prices were 40% higher than in Bamako. (USAID, 1980). By the 1990's, forest products accounted for about 5% of GDP, and at least 15% of the value added in the agriculture sector. In 1988 forestry products were valued at about $160 million. Wood met 95% of energy requirements by 1987. Fuelwood consumption rose to 3.9 million tons and the share of urban consumption had doubled in a decade. Other tree products, such as poles and building materials accounted for $10 million. Forests also provided wood and fiber for making tools, craft materials, food, medicines, dyes and tannin. Browse provided about a fifth of the fodder consumed by livestock in the Sahelian zone during the dry season. (USAID, 1993)

Under most definitions of agro-ecological zones, Region V is classified as Sahelian, coming close to Sahelo-Sudanian in the wetter areas to the south. From the late 1960's through 1985 annual rainfall dropped substantially, so that much of the area studied could be classified as dry Sahelian, with 400 mm or less. The decrease was sufficient to change vegetative cover and composition. Rainfall averages have increased since 1986, but the CDIE team was informed that the rains are shorter and more irregular than they were before the Great Drought.

The area studied covers four *cercles*, or administrative districts, all south of the Niger River in Region V. The area is the size of Rhode Island, Massachusetts and Connecticut combined. It has three distinct agro-ecological areas. One includes portions of the Niger River's inland delta. Djenne and parts of Fatoma (Mopti) *cercles* are in this area, which floods annually and has good sub-surface water. The southern part has abundant bushes but few shrubby trees. Agricultural activities include flooded rice, rainfed millet/sorghum, livestock and fishing. The Bandiagara plateau covers much of Bandiagara and Douentza *cercles*. It is drier, with steep rocky slopes and fewer bushes and trees. Peaks rise to about 800 meters and little land is suitable for cultivation. Major crops are millet, cowpeas, and peanuts. Water from the Yaame river is used for intensive gardening, and small ruminants predominate. The bare Seno and South Gourma plains lie between the Plateau and the Delta . Trees and bushes are sparse, except in microclimates. Rainfed crops and transhumant and local livestock dominate this area.

Table 1: Land Area, Population and Rainfall Characteristics

Cercle	Douentza	Fatoma/ Mopti	Bandiagara	Djenne
1926-76 av. rain in mm.	487.1	529.4	565.5	589.2
1979/1987 average rainfall	335.9	388.4	404.6	468.7
area in Km^2	18,903	7,262	8,209	4,561
Population 1987	151,000	243,000	183,000	126,000
population per Km^2	8	33	22	28

Adapted from Henry de Frahan, 1990

Food production in Region V is highly variable, with lows of about 82,000 metric tons (MT) of coarse grain in 1975 and 1979, while 1988 had a record harvest of about 341,000 MT. The major factor affecting production is rainfall. The region is normally deficit in food grain production and must import cereals from the south. Even in good years, localized drought pockets occur.

USAID Assistance Approach

Both USAID and the Government of the Republic of Mali (GRM) recognized that they were dealing with very fragile environments, but perception of key constraints varied. USAID recognized, during the late 1970's, that first Mali must develop institutions to analyze its natural resources for rational planning and allocation. USAID's tool was the Land Use Inventory Project, which concentrated on building capacity for technical analysis and then carrying it out.

By 1980, the key problem was thought to be severe droughts, which caused the growing population to increase exploitation of the natural resource base, particularly trees, to compensate for lost agricultural production and forage. The result was crisis, including threats of massive starvation, mass migration, and family breakup. Drought and population pressures caused forests to be exploited faster than they could regenerate or be replaced. Villagers were aware of deforestation because they had to go further to collect firewood or paid more for fuelwood. The second energy crisis created anxiety, since Mali's petroleum import bill was soaring. (USAID, 1987). USAID tried to get the Forestry service to focus on social forestry, not policing. USAID promoted decentralized environmental management, through improved institutional capacity and village activities, to increase wood production and reduce consumption. (USAID, 1980). In reality, it pursued a quick technical fix.

By the late 1980's, donors, and increasingly the GRM, recognized that block plantation woodlots in villages did not work. Much debate took place on how to increase participation of the population in forestry and natural resource management. Public sector programs tried to mobilize the population and were identified with directives from top political leadership. Competition between rainfed crop production and transhumant livestock production became very acute on marginal lands. Some development professionals thought that the solutions lay with strengthening local formal and informal institutions that work with forestry and natural resource management. Social forestry was felt to be extremely important, and the value of improved traditional practices were recognized. USAID believed that since PVOs had a demonstrated ability to involve populations of local communities, the PVO Support project's natural resources grants should build institutional capacity and conduct extension programs. It was also felt that passing forestry reform laws was insufficient unless accopanied by village level programs to change practices. (USAID, 1989).

Another defining event in Mali's history was establishment of multiparty democracy in March 1991. This forced another perception change in the forestry problem and strategies to resolve it. Forest policy placed control over land resources and tree manage-

ment in the hands of the State, and the rural population wanted to get back control over its own patrimony. Since the rural population could not benefit from forests and field trees, incentives to plant and protect trees were removed. Mali's Forestry Service did not have the means to manage forest resources properly. GRM officials and donors recognized that weak state control with a protectionist approach was not solving environmental problems. The atmosphere of fear and antagonism between foresters and the rural population was incompatible with sustainable management. The benefit stream from natural resources, however, was flowing towards urban-based merchants, rather than to the rural population. (USAID, 1993)

The proposed Mali Forestry Reform Program presents the USAID's current view, which fully recognizes the stifling effect of inappropriate policies, and overly centralized State control. Decentralization and legal reform are essential, without them no progress could be made in forestry and land use management. Legal codes, which emphasized resource protection, conflicted with traditionally based local institutions for managing forest and land resources. The strategic focus shifted towards more integrated approaches to technology transfer, institutional development and extension. These included expansion of agro-forestry techniques and emphasis on the design and implementation of land use or forestry management plans. (USAID, 1993).

The following USAID/Mali bilateral projects contribute to the Forestry/Natural Resource Management program.

The **Village Reforestation Project** (VRP I) was approved as a $495,000 Accelerated Impact Project (625-0937) in 1980. Its purpose was to identify successful and cost effective methods for reforestation and efficient uses of wood resources at the village level in Mali's Fifth Region. The project got $160,000 more when it was reauthorized as a bilateral project (688-0937) in 1983. The goal was to contribute toward the rehabilitation of Mali's renewable resource base and thereby improve and protect the well being of the rural population. This was to be done through a pilot program in Bandiagara and Fatoma *cercles*, which would reorient the forestry service's approach so that it stressed social forestry and decentralized environmental management.

USAID redesigned the project in FY 1987 and added a phase II (VRP II). The purpose remained unchanged, but the project activities and approach were different. Phase II funding amounted to $2,606,000 through completion in July 1993. (Kone, 1993b). The Forestry Service component, reactivated in 1989, focussed on research, training, extension and management. CARE received an operational grant in 1988 for Djenne *cercle* (referred to as CARE/Djenne), to identify, demonstrate and diffuse agro and sylvo - pastoral technologies to rehabilitate degraded lands and stabilize agricultural technologies. The Land Tenure Center of the Universi-

ty of Wisconsin received a grant during 1990 for the study of the restrictive policy and institutional environment. (USAID, 1980, USAID 1987, USAID 1993, Kone 1993b.)

The **Private Voluntary Organization (PVO) Co-Financing Project** (688-0247) was approved in 1989; in 1993 it was amended to extend the project's life until 1999 and increase funding levels to $50 million. The goal is to contribute to Mali's economic growth though more efficient resource allocation and increase production, productivity and incomes at village and community levels. The purpose is to use NGO's to promote and support Mission Strategic Objectives through improved outreach in child survival, natural resource management and micro to small private enterprise development. (USAID, 1989). The major natural resource management grants examined in this evaluation are:

- CARE/Djenne "bridge grants" for FY 1992 and 1993;
- Near East Foundation (NEF) Village Forestry Grant; and
- CARE/Mali - CCA/ONG Pivot Grant

Box 2: PVO Natural Resource Management Interventions

CARE/Mali is the lead, or pivot PVO for natural resource management, and has the Malian NGO umbrella organization, *Coordination des Actions des Organisations non-Gouvernementales au Mali* (CCA/ONG) as its partner. Originally support to CARE/Mali and CCA/ONG was provided under a regional project, but in March 1992 a $666,866 operational grant was made to CARE/Mali - CCA/ONG to support NGO integration in *Amensgement des Terroirs* (Local level land and resource management) activities.

Near East Foundation (NEF), working in Douentza *cercle* with Gua Mina, a Malian NGO, received a $430,080 PVO co-financing grant in 1992 to establish a village forestry management program, involving a federation of thirteen villages. NEF also received earlier study grants from the same source.

CARE/Mali works with AMRAD (Malian Association for Development) to set up a credit component for future CARE activities in Djenne *cercle*. CARE received two bridging grants totalling $270,000 from the PVO Co-Financing project for activities in Djenne after its VRP funding ended in 1992.

The CDIE team did not examine two other PVO Co-Financing Project grants. Access to AFRICARE's Niafunke *cercle* Natural Resources Management project was limited due to security problems north of the Niger river. The Save the Children Integrated Rural Development Grant for Kolondieba District is in a very different ecological zone in Southern Mali.

The **Land Use Inventory Project** (688-0205), known as PIRT, received $5,492,000 over the project's life between 1977 and 1985. Its goal was to obtain rational allocation of Malien natural resources by the GRM. Its purpose was to: (1) provide a technological basis for the allocation of resources to agriculture and range

development activities; (2) develop Malien capacity in natural resources inventory and planning; and (3) compile information about Malien natural resources so that planners could make rational judgments on optimal allocation.

The **Farming Systems Research (FSR) Project** (beginning in 1986), and its successor, **Strengthening Research Planning and Research on Commodities (SPARC)** Project (starting in 1991), were to conduct research on agro-forestry as part of their programs, but implementation delays have meant that the projects have contributed relatively little to Region V community forestry and natural resource management activities to date.

USAID used several sources to support the analyses used to develop policy reform initiatives or to fill gaps.

Box 3: Other Activities Supporting Policy Reform

In addition to land and tree tenure research done under VRP I, regional and other projects supported policy reform.

Project Development Support and other sources financed a grant of $200,000 to the GRM for the Forestry Code Revision. The grant supported the consultative process, the preparation of guidance and background papers by a National Technical commission, a public media campaign, and the conference.

A buy-in to the **Decentralization: Finance and Management Project** covered Mali as one of three case studies in its examination of the conditions necessary to achieving sustainable natural resource management. The report examined the effectiveness of Malien communities in managing their natural resource base in the absence of support from the national government. (Dennison and Thomson, 1992; and USAID, 1993)

Africa Bureau's Policy Analysis Research and Technical Support Project funded Mali's Forest Code reform program as a case study under the **Implementing Policy Change Project** (936-5451). The study analyzed the management dimensions of forestry policy reform in Mali, with the goal of identifying key implementation issues constraining the effective application of policy, and the potential field impacts of policy reform.

The Africa Bureau's **Natural Resources Management Support Project** (698-0467) assisted Missions and the Africa Bureau in research and analysis in sustainable agriculture and natural resources. In Mali, it financed a biological diversity assessment and an action program. It funded a PVO grant, the Mali portion being used to launch the CARE/Mali - CCA/ONG effort to strengthen capacity and carry out pilot activities.

Several projects were used to finance **study visits and training** (inside Mali and elsewhere) of GRM officials, NGO representatives, project staff, farmers and women's group repre-

sentatives. This has been particularly important for renewable natural resources management area.

Through CGIAR, A.I.D. provides funds to the **International Center for Research in Agroforestry (ICRAF)** in Nairobi. ICRAF's Semi-Arid Lowlands of West Africa Agro Forestry Research Network is active in Mali. (see chapter 3 on Research Organizations).

Evaluation Procedures

This evaluation is one of several country case studies (the others are Nepal, Philippines, Pakistan and the Gambia) in an assessment of USAID's efforts in community and invidual forestry Programs. This case study uses a conceptual framework, established in the evaluation design to trace actions and their effects over a five-level continuum (See Appendix A).

The evaluation seeks to establish linkages between USAID program efforts and chnages in environmental conditions and related socio-economic welfare. The analytical framework for these causal USAID program linkings starts with a set of strategy initiatives and provision of inputs(Level I) to program outputs or necessary conditions (Level II) to changes in behavior and adoption of technologies and practices(Level III). Changes in behavior, in turn, should result in biophysical and socio-economic impacts Level IV and V).

This field assessment concentrates on level II conditions and level III changed behavior. While some sustainable agriculture practices seem to be starting level IV's biophysical change and level V socio-economic change, quantitative data is not available and insufficient time has passed for measuring broader impact of forest and tree related activities.

The CDIE team gathered and reviewed available documentation on the programs before going to Mali in July 1993 for four weeks. Almost no data on adoption rates or biophysical and socio-economic impact was found in Bamako. Much anecdotal and other data were only available through project headquarters in Region V. Time, logistics and lack of baseline data inhibited team members from using formal survey instruments to gather meaningful quantitative data. The team interviewed USAID staff, GRM officials, PVO representatives and other informants in Bamako. The VRP team was very generous in giving the CDIE team access to raw data, information and reports.

The CDIE team spent six days in Region V visiting project sites, interviewing GRM officials, project personnel, PVO staff, project sites and villagers in Mopti town, and all four *cercles* where USAID financed programs were implemented. Both group and individual interviews were conducted, using a French language

variation based on the design's interview guide to give shape to key informant discussions, which stressed local institutional development and changes in practices. The CDIE team worked closely with a local sociologist who was particularly helpful in discerning changes over the past two years.

3. EVALUATION FINDINGS: PROGRAM IMPLEMENTATION

This evaluation examines A.I.D.-funded forestry and natural resource management programs in Mali's Region V in light of the following implementation strategies:

- **Institution Building** - Strengthen organizations and institutions in the public, private and community levels which support forestry and resource management;
- **Education and Awareness** -- increase knowledge of rural individuals, groups and public sector agencies about forestry and natural resource management within rural production systems as well as policies and laws;
- **Policy Reform** -- change legislation regarding forestry protection, tree and land tenure to facilitate private and public sector activity to enhance sustainable forestry and renewable natural resource management interventions by groups and individuals, including decentralization; and
- **Changes in Technologies and Practices** -- introduce practices and technologies which result in changed individual and group behavior in the sector.

Institution Building

Given its lack of financial and human resources, Mali's Forestry Service does not have the capacity to manage the country's forestry resources using a protectionist, State-oriented approach, which still applies in practice. Efforts to move to greater individual and community control of forestry activities, while making progress, are not yet the general rule.

On the whole, USAID put relatively little effort into building formal organizations working in the forestry sector. Before 1988, the Village Reforestation Project was implemented as an attempt to find technical solutions, without building capacity in public sector institutions or at the village level. A partial exception was the participant and on the job training under the Land Use Inventory Project (1977-85) which contributed to informal networks of individuals working in social forestry and renewable natural resource management.

Institutional weaknesses of public sector agencies strongly influenced the outcome of USAID's forestry efforts. USAID is a minor donor in Forestry. In 1989, donors provided $36.35 million in total life of project funding to forestry related programs, but USAID funded about one ninth of the total. USAID has begun to pay more attention to increasing capacity in the formal sector institutions. Collaboration still remains weak between public sector agencies. Some PVOs and NGOs do not consider the Forestry Service to be a viable partner in development programs.

The Forestry Service. Mali has often reshuffled its public sector agencies which work in forestry and natural resource management. The Forestry Service, which is the term used in this evaluation to refer to the forestry side of the *Direction Nationale des Eaux et Forets* or Forestry and Fisheries Service, has reported to various Ministries since 1980. In May 1993, the Ministry of Rural Development and Environment was broken up, and the Forestry Service was put into a Ministry of Environment. It manages classified forests, a national park, wildlife reserves, and protects of forest resources outside the classified zones. Its authority extends to cultivated and fallow lands where it is charged with protecting certain tree species. It consists of a national directorate and seven regional offices. Forestry and Fisheries are represented by a regional directorate in the regional capitals, with divisions at the *cercle* level and forest posts at the *arrondissement* level.[2] (USAID, 1993). The Forestry Service is authoritarian and is still run on paramilitary lines.

Serious budget constraints hamper the ability of the forestry service to carry out social forestry and extension programs, except when supported by donors.

Limited budgets are clearly inadequate to slow down deforestation. In 1983, GRM resources provided $2.0 million for all forestry and water resources programs. Average funds for non-personnel operating expenses were only $160 a year per *cercle*. (USAID, 1983). By 1990, GRM funds for forestry amounted to $3.6 million (0.37% of the national budget). The Forestry Fund (mostly fines for violations of the forest code) met 88% of non-personnel operating costs. After the Ministry of Finance took over the Forestry Fund in 1991, receipts dropped sharply. The Forestry Service remains heavily dependent on donors for its programs. Other donors assisting the Forestry Service have been the Swiss, and the World Bank. The French and UNESCO have supported training. (USAID, 1993).

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[2] In Mali, a *cercle* is an administrative division just below the Region or province, while an *arrondissement* is the next smaller division.

USAID initially ignored Forestry Service institution building until Phase II of VRP. These recent efforts paid off in terms of increased capacity to carry out group and individual forestry and NRM/soil conservation in Region V.

Overall, the Forestry and Fisheries Services have made good progress in staffing field officers with the best available people. By 1990, staff had increased to 1,161 people, about 70 percent of whom were foresters. The national headquarters employs about one-fifth of all Forestry Service Engineers (B. Sc. level). There were about 16 engineers per region. Lower level Technicians and Technical Agents dominate the regional staff. (USAID, 1993). The Forestry Service has about 80 staff members in the Region V. Under VRP II, the project professional staff consisted of eleven Forestry Service staff, six contract professionals and eleven support staff. (Kone, 1993a).

USAID provided assistance to the Forestry Service, primarily through VRP, but it does not appear to have provided direct aid to Mali's Forestry Schools. Although VRP I contained objectives to improve technical capabilities, the Project Paper budgeted only $10,250 for training (USAID, 1980). Its Forestry agents had minimal training in extension techniques and were exposed to only a limited number of technologies and practices. Both VRP I and VRP II's 1991 evaluations criticized VRP sharply for the lack of attention given to training.

A massive training program was launched late in VRP II and 314 people were trained, nearly all in-country. Sessions covered technical, socio-economic and management aspects for forestry and land management programs. The project ran 27 courses for farmers and extension agents. Six study tours were organized, one of which visited other countries (Kone 1993a). During its field trip, the CDIE team was impressed by the knowledge and capacity of most Forestry Service and contractual staff in VRP II.

Mali's Forestry Service will not meet full preconditions necessary for implementing forestry/natural resource management programs. It has not yet completed the process of becoming a more flexible and open public sector organization.

VRP I staff were criticized for lack of "leadership." (USAID, 1983). This may have reflected institutional problems in the Forestry Service which have not yet been completely resolved. VRP I could not carry out its own mid-course correction when faced with the failure of the community woodlots. Communications were poor within the project and between VRP I and the Forestry Service. Tension between contract and career employees on VRP, and between

VRP and other Forestry Service staff made the situation worse. (USAID, 1987; USAID, 1991; Kone 1993 a).

The evaluations recognized problems caused by the lack of a functioning Information System (except for Phase II's financial management system). Although mechanisms existed within the Forestry Service to communicate with other forestry projects, VRP I did not appear to receive technical information from other reforestation projects (USAID, 1983). Even now, coordinating programs is difficult, because the bureaucratic structure and practices in Mali generally inhibit communication except through formal channels. Community forestry and renewable natural resource management programs have to work closely with other technical ministries, the Ministry of Interior, Regional Governors and the rural development projects. Implementing extension and training programs with Adult Literacy programs and the Radio and Television Services requires close coordination. Until local government reforms are in place, each local renewable natural resources activity requires a separate major effort to work out intra-government coordination. (USAID, 1993).

Communication between the Forestry Service and villagers was difficult. The 1983 evaluation stated that many VRP I staff needed interpreters to talk with villagers. After March 1991, the balance in the Forestry Service's public philosophy shifted towards participation, two-way communication, and making the local population responsible, while retaining the protectionist mission. The CDIE team felt that the situation remains unsettled, because bureaucratic stakeholders stand to lose power.

Mali does not possess a formal detailed plan for natural resource management which is operational. The *Schema Directeur du Secteur Developpement Rural* is not a formal sector development plan, but it is appropriate for Mali's resources at present.

With the partial exception of the $5.2 million Land Use Inventory Project (**PIRT**), during 1977-85, USAID provided limited assistance to developing institutions for planning use of natural resources. By 1985, the project's remote sensing imagery and maps had been sold to donors or given to various Malian technical ministries, institutes and agencies for planning purposes. The PIRT evaluation team found that planners and sector-specific offices felt that the product was useful. It was less so for technicians working on site-specific activities, but this was the consequence of the reconnaissance-scale mapping thought necessary to establish baseline information on Mali's natural resources. PIRT financed three graduate and several short term participants. Training results were judged as marginally adequate but variable. On-the-job training ranged from very good to poor. Concerns remained about PIRT's future due to limited institutional develop-

ment. Of particular concern was the strength of demand for PIRT's services to meet the GRM's planning needs and those of donor projects. (USAID, 1985, Goodson and Kanoute, 1987).

The CDIE team found that PIRT was restructured as an Inventory Program for Woody Resources (PIRL). It still conducts studies for donor projects. People who worked in PIRT felt that it provided a solid foundation of skills, enabling them to work effectively in environment and natural resource management. It laid the groundwork for an informal network for restructuring forestry and resource management institutions and policies.

The ***Schema Directeur*** for Rural Development is the result of a collective effort between April 1990 and March 1992. USAID, France and the World Bank helped in the process. The CDIE team was informed that it was drawn up by a committee with members from several ministries. Its key principles are:

- decentralization - with natural resources to be managed by local communities; with the level depending on the final decentralization legislation;
- collaboration - measures, actions, or projects affecting natural resources and their management should be prepared and implemented in collaboration with the beneficiaries;
- participation - users should contribute labor or financing to manage their lands, with the objective of eventually assuming management of the resources; and
- use of a global approach - natural resources are exploited by traditional or improved systems of production that affect numerous aspects of the ecosystem (Ministere de l'Agriculture, de l'Elevage, et de l'Environnement, 1992).

Mali's institutions engaging in forestry research are weak (despite the presence of some very competent staff) and remain dependent on donor financing of any research activities. Direct A.I.D. contributions through USAID/Mali Forestry programs have been very limited. Indirect support was more important, but it has not yet resulted in recommendations for extension.

The VRP's design anticipated that as a pilot project, significant information/data collection and analysis would occur. This did not happen. The USAID financed farming systems projects work with the Agricultural Production Directorate in Mali's research system, not with Forestry and Water Research. To date USAID farming systems projects have not focussed on forestry

problems and most research has been done in regions with more rain than Region V. (USAID, 1991b).

The **Institute of Rural Economy** (IER) is Mali's national agricultural research agency. Prior to 1990, forestry research was undertaken by a separate livestock, forestry and water resources research institute. (USAID, 1992b). The Forestry and Water Research Directorate investigates ecosystem dynamics and structure, soil and water conservation, agroforestry, wildlife, forestry production; and fisheries production.

During 1991-92, the GRM prepared a twelve year Strategic Plan for Agronomic Research to identify priorities. Production systems and rural economy, and natural resources management were considered to be indispensable basic programs. From the start, Priority would be given to: forest management in the Sudanian ecological zone, gum arabic regeneration, rural land management, soil and water conservation in the Sahelian and Sudanian zones, soil restoration techniques, and management options for the Boucle du Baoule National Park. During the forth year work would start on technical packages for different agro-ecological zones.

The *Comite de Coordination des Actions des ONG au Mali* (CCA/ONG) has identified at least 17 NGOs that have indicated research on natural resources management issues as being among their on-going or planned activities (CCA/ONG, 1993). USAID's PVO Co-financing Project also supports natural resources related research activities. The Near East Foundation (NEF) conducts natural regeneration field studies and is studying palm trees in Douentza. CARE/Mali and NEF are studying impact of soil and water conservation measures on agricultural production.

Box 4: International Support to Forestry Research

A.I.D. provides funds through the Consultative Group for the International Agricultural Research to the **International Center for Research in Agroforestry (ICRAF)**. ICRAF has been active in West Africa, through the Semi Arid Lowlands of West Africa Agroforestry Research Network (SALAWA). ICRAF is providing technical support and funding to the network activities. (Dagamaissa, 1993). From its start-up in 1989, SALAWA has undertaken research activities in Mali. Since 1991 assistance was provided through an IER/ICRAF Agroforestry Research Project. Some work is done in Region V. The project evaluated agroforestry potential of land use systems, and conducted fodder bank, live fencing and ally cropping trials, a study with CARE/Koro on agroforestry pastures and live hedges/*Faidherbia albida*. Using ICRAF assistance, IER set up a documentation center, an agroforestry bibliography for Mali, and a 4,000 species Multipurpose Tree and Shrub database.

The World Bank launched several activities supporting basic and applied research in 1989. The program focused on technical and socio-economic problems in managing plantations and natural forests. The Dutch have been the dominant bilateral donor in forestry research, working at Sikasso.

Although many lack the institutional, management and financial resources capacity expected to meet pre-conditions for changes in practices, USAID-supported PVOs and NGOs played major roles in implementing group and individual forestry/natural resource management programs in Mali.

The Mission views PVO's and NGOs as an integral part of the USAID program in Mali, and as an option in service delivery to local communities. One use of the PVO Co-financing Project is to support non-governmental organizations in village level interventions for natural resource management in Mali. (USAID 1989). Criteria for awarding grants include involving Malian NGOs in the projects. (Poulton, 1990). A major barrier for local NGOs seeking direct USAID funding is the stringent financial accountability requirement, which may exceed NGOs' administrative capacity. A CDIE team member was informed that CCA/ONG is the first local NGO to seek certification for meeting USAID accounting procedures, with completion expected in July 1993.

Box 5: Building Management Capacity through NGO's

The CDIE team was told that originally, support to CARE/Mali and CCA/ONG as "pivot" organizations was provided under the regional Natural Resources Management Support Project (698-0467) through a pilot program for development, technical coordination and networking, information exchange, workshops and small grants to increase their capacities to implement NRM projects. The PVO Co-Financing March 1992 grant to CARE/Mali - CCA/ONG probably financed many local observation tours and exchanges that Region V villagers mentioned to the CDIE team.

The PVO Co-Financing Project's grant all involve Malian NGOs working with the international PVO's. NEF is on the cutting edge of NRM activities, using participative approaches. Working in Douentza with Gua Mina, NEF got a grant which emphasized participation in local management of natural resources. NEF and Gua Mina provide support to thirteen village groups in the Bore Forest that are establishing a single organization to represent them during negotiations with the GRM on managing the Bore forest lands. NEF has financed study tours and helped organize village assemblies to discuss approaches to renewable natural resources management. NEF/Gua Mina financed McLain's investigation of local land tenure problems in 1992. NEF hired a lawyer to investigate possible mechanisms to empower the local people for negotiating contracts between the villages and the Forest Service for the management of renewable natural resources. (USAID, 1993, and Dennison and Thomson 1992).

NEF staff also told CDIE team that it works with another local NGO, GRAD, on a village capacity building project involving literacy, natural resource management, trees, fisheries and Grameen Bank type credit operations. Its objective is to develop the capacity in local institutions to plan, obtain financing, and carry out small scale development activities.

Where institutions based on Malian traditional structures have been empowered to play major roles in forestry and area land management through participatory processes, a

major pre-condition is being met. A.I.D. funded forestry programs, however, only started doing this recently. Application of this approach is uneven, because it tackles hard tasks of transferring skills to negotiate, plan, and allocate resources.

Traditionally, villages had institutional arrangements to oversee and protect the lands and natural resources belonging to the village and its surrounding land or "space." Dogon villages are known for their cohesiveness. They have self-help groups and enlist age grade groups into these activities. Most self-help organizations are now recognized *associations villageoises* (pre-cooperatives). Villages often institutionalize the role of "Tree Master" who provides technical knowledge, supervises the woodlot and guides younger people's work in planting watering, pruning and tree care. (See McLain, Ba and Koloma).

With the transfer of authority from the traditional institutions to the central government at independence, the role of local institutions diminished sharply. The Forestry Service took over management and protection responsibility for all public lands and the forest resources, so that traditional arrangements were not used. Its directive approach to development exacerbated the situation, because it sought to mobilize the populace to carry out government objectives, without transferring "ownership" of the objective to the community. (See Geller, et al). The Forest Service did not have the resources to take on the land management role. Other factors which fed the perception of the Forestry Service as an oppressor were the anti-desertification and anti-bushfire campaigns, which were highly politicized and had some coercive elements. Following the coup of March 1991, pressures were strong to decentralize and to re-empower local populations, the private sector and local institutions. (USAID, 1993; Gage and Brinkerhoff, 1993; Dennison and Thomson, 1992)

A very strong local institutional promotion effort that the CDIE team found was that of NEF, in conjunction with Gua Mina, in developing a local association known as Kelka. Development of local capacities and institutional behavior in local management of renewable resources is at the core of NEF's programs. It has been hard to determine mechanisms for local land management. Constraints have included difficulty in determining the mechanism for collaboration, that will fit within the existing legal system, as well as respond to current decentralization efforts. NEF's other projects also emphasize developing local institutional capacities to plan, seek resources and implement rural economic and area natural resource management activities.

Although not as strong in promoting local institutions as NEF, VRP II has become more flexible in applying technologies for group and individual undertakings, as well as actively encouraging building local institutional capacities. In Bandiagara *cercle*, the

strong institutions in Tougoume village (visited by the CDIE team) permitted undertaking several joint activities in natural resource management. Their institutional strength is demonstrated by the complex irrigated tree nursery/ vegetable garden/orchard, which requires that five lineage groups and 44 households organize water-turns. (USAID 1992a).

In Fatoma *cercle*, strong self-help institutions had a major role in planning and implementing forestry activities. Of note are those observed by CDIE team members in Moussawel village and the history of Poutjiwel village (Kone, 1992b, USAID 1991). McLain's village woodlot data demonstrate the correlation between strong self-help organizations and local skills with relative "success" or failure in VRP I. Village disputes contributed to failure in two villages. The most successful village, which expanded its woodlot and sold trees, had exceptionally strong institutions. Woodlot work was shared out and the association's president supervised pruning. The association assessed members to pay a watchmanwaterer during the dry season. Woodlot products are shared, with proceeds of the polewood sales going to the village treasury. (McLain, Ba and Koloma, 1991).

The CDIE team noted that CARE/Djenne appeared wary of group undertakings and focused on individual initiatives, particularly in gardens and fruit trees and in soil conservation. Starting in 1992, CARE/Djenne worked with two village groups to develop a credit program that would allow the groups to establish a loan fund capitalized by repayments. They have encouraged village experts to form technical committees. CARE/Djenne has worked with about 200 women gardeners organized in groups for access to land. They have been so successful that CARE is seeking to withdraw from gardening activities in Djenne. The major problem identified by participants was timely delivery of quality seed.

Extension/Awareness

Despite donor efforts, and reformers within the GRM, Mali has not yet met full level II capacity in Extension/Awareness. From the beginning, Region V's population possessed a high degree of general awareness of the role of forests and soil and water conservation. Awareness has increased since then. USAID-funded extension/awareness activities since 1989 targeted audiences to alleviate specific constraints.

Since the early 1970's, the Region's inhabitants were very aware of the environmental consequences of recurrent drought and southward shift of rainfall through the middle 1980's. People's first objective was short term survival, even if this meant doing things which had negative environmental consequences in the long run. The degree of sophistication in understanding relationships

between plant, animal and human populations and rainfall patterns increased. One example is given in Moimart's 1989 paper on women and anti-desertification efforts.

Using VRP II funds, McLain surveyed attitudes and practices of male and female groups and individuals in four zones of Region V in 1990. She found that while 91% of farmers planted trees, 86% did so in their compounds, but a much lower percentage (57%) planted trees in their fields. Trees were planted on 85% of fields cultivated by respondents in Bandiagara, but only 12% in Fatoma. Field trees were planted for fruit or leaves (92%), raw materials for artisanal work (50%), soil fertility (42%); and live fencing (17%). Regarding tree protection, all farmers avoided plowing up or destroying seedlings, 56% weeded, and 28% dug water cachements. Four fifths of the informants who used all three practices were Dogon. While 87% of farmers who inherited land planted trees on at least one field, only 43% of farmers planted trees on borrowed fields. (McLain 1991).

Box 6: Attitudes Toward the Environment

The design team was impressed by the high level of awareness of deforestation on the part of the villagers in the Fifth Region.... Villagers were able to readily cite the names of vanished tree species and give figures for the steadily increasing distances covered in the search for firewood ....Distances are now so great that village men are more willing to gather wood themselves or pay to have it gathered. (USAID, 1980)

On the Dogon plateau, the villagers interviewed expressed great interest in anti-soil erosion activities. Confronted with the problem of land scarcity, the Dogon villagers are very much aware of how erosion reduces their meager growing areas. (USAID, 1987)

Regarding soil and moisture conservation, McLain reported that all of her informants practiced passive manuring, 62% engaged in intensive manuring, 52% allowed field to lie fallow, 43% used dikes, rock lines or grass strips, one-third had trees and only 10% used *zai* on their fields. The integration of trees and crops was evident on the plateau, where Dogon farmers actively plant and protect trees. McLain thought that most villagers were likely to enforce their customary rights to cut and trim useful field trees as much as they could.

Notwithstanding USAID and other donor efforts to promote group and individual forestry and natural resource management in Mali, the mere existence of the Forestry Service's protection and enforcement role limits the effectiveness of any awareness message or transmission of extension information.

The Forestry Service is charged with managing Mali's forest resources. Traditionally forestry agents served as enforcement officials. Their training left most agents ill-equipped to undertake extension activities. The forestry code did not define clearly the status of trees that people plant themselves, or the status of trees that regenerate naturally in fields that people protect, either actively or passively. (McLain 1992). Part of the fines were distributed to the forest officer who caught the offender. Abuses were bound to develop, especially as the GRM's ability to pay public sector salaries deteriorated sharply. (McLain 1992, USAID 1993, Dennison and Thomson 1992) McLain found that about a quarter of her informants had been fined.

Early efforts under VRP I to retrain Forestry Service agents as extension officers met with marginal success. The villagers regarded the forestry officers as suspect, even if they made sincere efforts to work as extension agents. In 1990, McLain asked villagers whether their relations with forestry agents had changed over the past ten years. Relations were worse, according to 63%. Three-quarters of the informants cited larger fines, while more than half said that agents came more often and they were less likely to overlook small offenses. Individual informants mentioned that the Forest Agents were there to protect the forest (46%), make money/fine people (36%), to sensitize or teach (37%) and don't see what use they serve (27%). Groups were even more apt to cite the forester's role protection and fining roles. (McLain 1990). Years of fear and distrust for the Forest Service on the part of villagers, and the Forestry Service's disrespect and authoritarian attitudes towards villagers will not change quickly. Some NGO informants told CDIE team members that problems remain in using the agents as extension staff because of their former enforcement role.

The 1991 (post coup) Evaluation stated that a positive evolution of the forester towards becoming an agent of development was occurring. Information gathered from villagers indicated that the project contributed to a change in thinking among forestry agents who were no longer seen as agents of repression but as extension agents. The change was incremental and based on technical training better adapted for project objectives and socio-economic conditions. (USAID, 1991). The CDIE team was told that many agents remain hesitant to engage in field and enforcement actions (See Dennison and Thomson 1992, Brinkerhoff and Gage 1993). CDIE team members were repeatedly told, that all USAID supported forestry activities in Region V (and the Forestry Service itself) conducted extensive training programs and publicity campaigns in **local languages**, for both Forestry Service staff and villagers, on the Forestry Code, so that everybody was operating on the same wavelength.

Contrary to previous experience, some public sector and NGO forestry and natural resource management activities

in Mali are now much more participatory, resulting in an increased sense of local "ownership" of the project.

The historical practice on "participation" has been top down and uni-directional. It meant mobilizing the local populace to carry out an action. This was clearly a problem in VRP I, despite the collaborative approach outlined in the design, maybe because the project staff may not have known how to be collaborative. Even in the 1987 evaluation and redesign, the extent of ownership and participation was not clear.

The NEF programs in natural resource management have used, with success so far, an approach grounded in a careful analysis of local institutions and a truly collaborative attempt to develop strong local institutional capacity, including literacy and numeracy, while carrying out activities. Skills are not limited to technologies or practices, but include training villagers in management and planning skills necessary for resource mobilization and bills of quantity for contractors.

VRP II, which used Forestry agents and contract extension agents and forestry service personnel, tried to build village level ownership. CDIE team members observed real enthusiasm and pride in activities during village visits. Villagers explained their activities and reasons for their actions, possessing command over technical aspects and future plans. Obviously they "owned" their activities. VRP has received more requests than they can handle from non-project villages.

Box 7: VRP II's Approach to Extension

The project staff provide the necessary minimum technical and material support. Individual partners and groups have a priority concern in selecting and implementing appropriate technologies. The group of agents make a visit to raise awareness at the village level at the start of the campaign. During the course of open debates, topics such as the project's objectives and the problems of managing local natural resource are discussed with the people. A statement of needs is developed, and analyzed in terms of the ability of the project and the level of motivation of the proposer desiring to become a project partner. The village prepares a list of persons and technologies. Each extension agent is then made responsible for several villages and the activities in them, which he/she follows up with through regular visits to the partners for implementing the established workplan. The partners carry out a program of visits within the project and with others in the region.

Bather Kone, VRP II Co-Director

CARE/Djenne relies heavily on master farmers as extension agents, using a technology based approach to extension. CARE has trained individuals well in individual technologies/practices These people, supervised by CARE extension staff, were successful in

teaching the technologies, both within and outside of the target villages. Although people can chose to whether to become partners and from a menu of technologies, the CARE/Djenne project did not seem to the CDIE team to be truly participatory in the decision-making processes of design and implementation. It slights the capacity building aspects of developing local institutions for the technology transfer process. (CARE 1992). Knowledge is limited to a particular technology (thus reducing flexibility when circumstances change) and the availability of the master farmer or forester for initial extension. The technologies promoted stressed individual horticulture, nurseries and soil/moisture conservation actions.

During the 1980's in Region V, people responsible for forestry extension had relatively little knowledge of alternative technologies or methodologies for non-directive technology transfer. Only later did USAID funded activities strengthen these capacities; by 1993 the extension function was clearly better, but still needed financial support from donors.

Another aspect of extension is awareness of technologies and initial introduction of them to a few implementers who transfer the knowledge to neighbors. VRP I's agents apparently lacked training in extension methods and had limited technical skills, resulting in rigid application of instructions for establishing woodlots. (USAID, 1987). Some could not speak local languages. (USAID 1983). These factors contributed to VRP I's failure. VRP II used both Forestry Service and contractual extension agents, who seemed well trained and competent during CDIE team visits. At present, the GRM does not have adequate funds to undertake the initial extension function without external assistance. The World Bank is becoming the dominant donor in both agricultural and forestry extension, using a modified Training and Visit approach. While a U.S. style extension service is too expensive for Mali, a knowledge transfer mechanism is essential.

Local institutions can take on the knowledge transfer function, but they must be able to connect the local client with the source of knowledge about the technology, or transmit the problem to the researchers for their solution. This connection is not complete in Mali. The agents extending a practice must (1) be able to communicate with the local population, (2) understand the biophysical and farming systems context in which they are working; (3) understand and apply extension methods (especially listening); and (4) understand the technology or practice that they are extending.

Another worry is the weak extension-research linkage. Research is done in one organization but others carry out the extension function (Different department, Ministry, PVO or

independent development project). All act independently, and the recipient may receive contradictory messages. The CDIE team did not find solid institutions which bridge the gap. Rules of bureaucratic conduct in Mali make research/extension linkage difficult. When the knowledge transfer process is integrated (same agency and preferably the same agent works on forestry, crops and livestock in a village) it may be more effective in reaching the recipient and probably is less costly.[3]

Policy Reform

Since 1991 Mali has made rapid progress toward meeting Level II conditions of Forestry/NRM policy reform using highly participatory processes.

USAID financed both the analysis, which provided the basis for the reform proposals, and the participatory processes leading to the National Conference which made recommendations on the new forestry legislation. Other donors and NGOs played important roles in forestry policy reform efforts. The World Bank and Norway recently agreed to a major natural resource management project, and the Swiss provide a senior policy advisor. The World Bank, French and Dutch have been deeply involved in parallel work on reforming Mali's Land Law (USAID 1993).

Mali's ongoing revolution, with decentralization of State authority at its core, is critical to forest policy reform. Political changes have increased stakeholders' ability to air views publicly and the process for revision of the forestry code is open and participatory. Changed perceptions have resulted in increased acceptance of local management of common lands, revenue sharing, and rights to use trees planted in individual fields.

Before 1989, Mali's highly centralized, but weak government, with its limited human and financial resources, could not resolve most of its economic and developmental problems. Doing so required local rule-making and enforcement. Since communities could not legally exercise certain collective powers, no one could make decisions on matters that must be managed locally. Devolution of authority to local governments must be accompanied by a shift from administrative to juridical controls (Thomson 1991). Before 1991 popular participation often meant mobilizing the populace for national goals, not local people determining objectives. Decentralization occurred because donors insisted on it, but only on

[3] Given interview results and what CDIE team saw in the field, some base level extension agents must be very talented in integrating the agriculture and forestry/NRM messages in both the VRP and NEF projects (see practices below).

technical matters. (Ministere du Developpement Rural et de l'Environnement 1993c; Geller, et al., 1990).

Mali's 1991 Constitution provides for empowering local populations. The meeting of the *Etats-Generaux du Monde Rural*[4] recommended that communities be given the responsibility and right to manage their own resources. The State should limit its role to conflict arbitration, planning and technical assistance. In interviews with CDIE team members, most GRM officials stated that local organizations and communities must become responsible. In January 1993 the GRM passed a law which established guidelines for local ordinances establishing independent administration of local communities. In interviews, several people mentioned that the devolution of powers for detailed local rulemaking on NRM should probably extend to groups of villages, but others felt that the State would be unwilling to devolve any powers below the *arrondissement*. Other rulemaking should be done by users of ecologically defined areas, such as watersheds. (USAID, 1993).

An encouraging factor is the common usage of a highly participatory process which ensures that all groups concerned with major issues, receive public hearing before major legislation is presented. (Brinkerhoff and Gage, 1993).

Current statutory law is not consistent with natural resource objectives. Conflicts exist between statute law and customary rules of governance. Proposed revisions of the Forestry Code and the Landed Property Code are efforts to close the gap between law and locally sustainable rules.

Forest policy in Mali concentrates power over forest resources in the hands of the State. Rights to land are also governed by customary law at the village or pastoral fraction level. The Government recognizes customary tenure at the village level, although it also claims ownership over all unregistered land in the country, or virtually all land outside urban areas. Rural residents normally use customary practices regarding ownership and usage rights. Tenure is collective. Cultivated fields, pasture lands and used bush area are included within the village domain, but statute law does not give official status to village and pasture areas. The headman, in concert with the village council, allocates land, settles disputes and decides on the management of communal areas. Cleared land is managed on an extended family or

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[4] The *Etats-Generaux* were meetings in which representatives of the Three Estates (clergy, nobles and commons) presented their grievances against the government to the King for adjudication and recompense. For the term's psychological significance to French speakers, see key events of 1789.

individual basis. Individuals and families claim access to land through inheritance, gifts and borrowing arrangements. Extremely few people have formalized their claims through registration according to the *Code Domanial et Foncier* or Landed Property Law, a very arduous process. (McLain, 1992).

Tree ownership is associated with land ownership. Tree title is transferred to the new land owner. Borrowers need the owner's permission to plant new field trees or cut down existing trees. Customary tree tenure laws normally permit field tree owners to harvest and dispose of trees and tree products on land that they own without obtaining permission. Since women normally borrow land, they are not considered as being tree owners even when they plant trees. They may be allowed to harvest fruits and wood from the trees on the land that they use. (McLain, 1992).

The Malian State's claim to trees rests primarily upon the Forest Code of 1935, as revised. The non-forest domain consists of land in fallow for less than five years , non-wooded land to which a non-state entity has obtained title, and urban areas. The forest domain includes forests, areas reforested by groups and individuals, sacred forests, land excluded from clearing actions, wooded animal passages, and cropped land in fallow for more than five years. The forestry code restricts use of classified forests and protected forest domain. The Code also applies to registered reforested land. (McLain, 1992)

Mali's forest laws restrict the customary rights of landlords to prune and fell trees. Both the Forestry and Landed Property Codes are ambiguous about applying user rights principles to trees on unregistered land outside the forest domain. Statute law fails to define individual and community rights to forest resources in the non-forest domains. Institutional weaknesses permitted application of the law in capricious and arbitrary manner. (McLain, 1992).

Zealous Forestry Service Agents interpreted the Forest and Land Codes as obligating them to enforce regulations for the protected forest domain on all unregistered land, including land clearly under cultivation. (McLain, 1992). A NEF/Gua Mina survey (1991) reported that farmers felt that they did not have full ownership of the trees in their fields and eliminated young shoots of trees which had a beneficial effect on soil and water conservation. McLain found that the most fines were levied on farmers who pruned volunteer seedlings in their fields.

Both men and women must obtain free permits to cut trees that they have planted. They must pay for the permits for wood intended for sale. This conflicts with customary rules. Agents had total discretion in issuing permits, and most preferred to give them to reward participants in forestry programs. Less than 1% of the households in Mopti, Bandiagara and Koro received free permits

during 1990. (McLain 1991, 1992). Enforcement of the Code negated the efforts of any activity that required planting trees, even in farmers fields. VRP's original design recognized that policing caused problems, and that community forestry programs would require that the Forest Service became an extension service. The VRP I Agreement had conditions precedent to disbursement which restricted enforcement actions when staff were engaged in VRP activities. (USAID, 1987).

Phase I's optimism was not borne out in practice. Due to the problems caused by the Forestry Code, VRP II financed the Land Tenure Center studies carried out by Rebecca McLain and her researchers in 1990-91. She found valuable information on how statute law and institutional weaknesses inhibited forestry and natural resource management activities. She suggested a process for modifying the Forestry Code and proposed substantive reforms, which were developed further during a later consultancy. The grant financed Malian participation in the consultative process. (McLain, 1992; USAID, 1993; and Brinkerhoff and Gage 1993).

McLain proposed reducing the conflict between statutory and customary law by enacting a national enabling law (*Loi Cadre*) to provide basic principles and definitions. Local governments would enact and implement specific regulations governing resource use, which take in agro-ecological zones and local governance rules into account. Land categories would be defined clearly and the State's role would vary according to the ability of other institutions or individuals to manage resources effectively. In the non-forest domain, the landholder would exercise a maximum amount of control over trees. The State's role in the individual, community and supra-community forest domains would be primarily that of an advisor on managing woodlands. Local management units would to settle disputes. (McLain, 1992).

The National Technical Commission on the Revision of the Forestry Code published guidelines which stressed that the State should establish the broad principles for managing renewable natural resources and assures their coherence, but the law should be implemented by decentralized bodies. It must not conflict with decentralization and the new Land code, as well as guarantee private, group, community and state property according to resources and circumstances. (Ministere du Developpement Rural et de l'Environnement, 1993c). The National Conference on the Revision of the Forestry Code was held in late July 1993. It recommended that the new law set forth the general principles for each sector of activity, administrative regulations and local and regional conventions. The domains should be split into state, decentralized collectivities and private sectors. The local inhabitants should be involved in oversight and protection of natural resources on their lands. Powers of taxation would be devolved to local bodies and funds would be used for forestry development. The management concepts for natural resource management should be clarified and

the role of the Forestry Service would focus on providing technical skills and advice. The Conference recommended devolution of legal responsibility for village forests to local government organizations. After review at the ministry, recommendations will be presented for legislation. (USAID, 1993; Ministere de l'Environnement, 1993).

The National Land Code Conference approved "General Guidelines for a Rural Land Tenure Policy" in January 1993. It recognized the conflict between customary and statutory law on land tenure. The guiding principle should be "Land should be considered as the patrimony of all Malians who would have equal rights of access to resources, but on the condition of respecting legitimate rights acquired by local populations, rights derived from long occupation or regular title." Communities must be given the right to manage their patrimony. (Ministere du Developpement Rural et de l'Environnement, 1993a and b).

Technologies/Practices

Forestry technologies/practices met only part of conditions necessary for changes in practices to occur. Development and testing for Malian conditions still require external support.

USAID/Mali and other donors have promoted use of technologies and practices which support improved natural resource management and forestry. USAID/Mali has done little to develop and test additional forestry technologies/practices, despite activities built into VRP and FSRE project designs. Conduct of research depends upon donor financing. (See above).

In the early 1980s, forestry projects addressed perceived fuelwood shortages. The dominant technology was industrial and community plantations for firewood. Implementation involved large-scale commercial plantations on State forest lands,or smaller scale woodlots. These projects, including VRP, used collective actions for community benefit. Technologies used were: planting woodlots to produce fuelwood and poles; operating tree nurseries; and planting shade trees. The problems encountered, in Mali and elsewhere, are well documented.

Gradually Sahelian forestry activities shifted to small group and individual actions which contributed more directly to food production, income generation and area management of natural resources. This happened first in other countries. VRP II was among the first projects in Mali, began to incorporate sustainable agriculture interventions into strict forestry activities. These included fruit tree and gardening activities, renewable natural resource management of village lands and soil and water conserva-

tion programs. These were added to individual and group forestry interventions for income generation.

USAID-funded activities used mostly technologies and practices developed by others, although some adaptive work was done. VRP I did not produce data on technologies. Little raw data from VRP II has been analyzed and results disseminated.

Many technologies and practices used in the program were borrowed or upgraded from traditional practices. Often they were incremental improvements of known technologies or practices, or new applications of old technologies. (See appendices).

VRP I focused on the village woodlot for fuel technology, which was borrowed from higher rainfall zones of the Sahel and on disseminating woodstoves. The project began with demonstration woodlots and trees planted in school yards, fields, boundaries, and windbreaks, before moving fully into establishing village woodlots. The 1983 evaluation doubted the economic viability of fuelwood production using eucalyptus in Region V, because of slow growth rates on rainfed land and low value of fuelwood.

The project was expanded in August 1988. Since the GRM delayed approval of workplans and conditions precedent, the Forestry Service component remained in limbo for a year. It appears to the CDIE team that USAID modified its approach to take advantage of work done elsewhere in natural resource management and add sustainable agriculture practices into forestry technology extension activities.

VRP II's 1988 grant to CARE was to develop alternative approaches to community forestry in Djenne *cercle*. The grant stressed technologies for individuals, particularly gardening (with tree nurseries), field trees and sustainable agriculture practices, such as micro-cachements or *zai*. CARE/Djenne focussed on teaching technologies. Staff told the CDIE team that agents worked with individual farmers who picked a technology in which they were then trained. Master farmers the taught others. CARE/ Djenne withdrew support once a technology was firmly established.

VRP II stressed improving management capabilities and extension activities using known improved technologies and practices for individuals and small groups in Fatoma (Mopti) and Bandiagara *cercles*. VRP II uses a more collaborative approach to assemble a "basket" of technologies/practices that agents made available for individual and group use in a project village. (See Kanoute's annex). Both constraints analysis and solution development are joint agent-villager processes. While this is labor intensive, the forestry/natural resource management and sustainable agriculture practices are scientifically feasible and socio-economically appropriate. This approach to technology transfer is

costly and should be used only to build up a critical mass or "oil spot" adequate for less formal person to person transfers.(Dagamaissa, Kanoute and Dia; Kone 1992 a and b, 1993).

The natural resources management component of the PVO Co-financing Project emphasized technologies suitable for individual or household activities, often sustainable agriculture measures rather than forest management or production. The criteria for grant approval include support of one or more of the following:

- Water conservation and management
- Soil conservation and erosion management
- Soil fertility (compost, *Faidherbia albida*, rotation)
- Natural vegetation conservation/regeneration
- Natural resource education/extension/training/ sustainability (Poulton, 1990)

Forestry activities concentrated on local management of common woodlands. The NEF programs in Douentza *cercle* made the most progress. NEF stressed developing local capacity to plan and implement both forestry and sustainable agriculture practices, and small group gardens, as well as direct seeding of field trees and tree nursery technologies.

Several technologies and practices used in Mali came from USAID programs in neighboring countries. USAID/Niger's Forestry and Land Use Project (FLUP), developed and implemented techniques for local community management of natural resources. These efforts are well known and have been adapted for use elsewhere. The techniques used in NEF and VRP activities for cooperative local management of natural forests come from FLUP.

The Regional Natural Resources Management Support Project (NRMS) helped facilitate technology spread through exchange visits of technicians, NGO staff, and local experts. Mali received a NRMS grant to strengthen NGO capacity in natural resource management. CCA/ONG managed the grant's networking, small pilot activities, and training, farmer exchanges between VRP II, CARE/Djenne and CARE/Koro "partners," and trips to Burkina and Niger to observe technologies and practices.

Programs in Region V used a wide range of improved and borrowed practices for group and individual forestry, renewable natural resource management, and sustainable agriculture.

Based on document review and discussions with project personnel, it does not appear that any "totally new" technologies were developed or extended by the USAID-funded activities. Several are based upon older practices that had fallen into disuse. While the technology must be scientifically sound, other factors govern

adoption and spread. Indicators of potential success appear to be that: (1) a technology improve upon a traditional activity wherever possible, and (2) the user gets a quick return from undertaking the activity. The most frequently adopted technologies and practices are those providing a clear impact on agriculture production in a season, which are then combined into "baskets" with slower maturing practices. Table 2 lists some practices and their potential objectives.[5]

Table 2. Interventions and Objectives

Natural Resources Management and Sustainable Agriculture POSSIBLE INTERVENTIONS	SWC	FWP	SAG	INC	HHU	DEL	ACC
Woodlots (limited success)		X		X	X		
Nurseries	X	X		X	X		
Management of natural woodlands		X		X	X		X
Boundary/line plantings						X	
Live hedges	X		X	X		X	X
Windbreaks	X	X	X				
Individual fruit trees and orchards			X	X	X		
Field trees	X		X	X	X		
Grass strips	X						
Zai cultivation	X		X				
Contour ridges/rock lines in fields	X		X				
Check dams	X		X				

SWC - Soil and water conservation
FWP - Fuelwood, poles, construction wood, fodder, etc.
SAG - Sustainable agriculture
INC - Income generation
HHU - Household use
DEL - Delimit an area
ACC - Control or limit access to an area or a resource

[5] See Weber and Stoney 1986, and Young 1989.

Woodlots (or *bosquets*) - plantations of forest trees, using regular spacing. They produce fuelwood, poles, construction wood, or other wood/tree products, including fruit. Fuelwood is probably the lowest value products from a woodlot. Woodlots need many years before they can harvest under local conditions. (Used in VRP I, less frequently in VRP II).

Management of Renewable Natural Resources - local management of resources, including woodlands and bush on village lands, with long term planning and local policing and enforcement by the community concerned. This includes fuelwood offtake, browse, other tree products, and soil and water conservation practices. (VRP II and NEF).

Boundary Plantings - Planting of shrubs and trees along field edges often facilitate soil and moisture conservation and reduce erosion. (VRP II, CARE/Djenne).

Live hedges - (*haies vives*) closely spaced plantings of suitable trees or shrubs replacing dead branches and sticks as fences and barriers around garden plots, or other areas needing protection. Some species used as live hedges provide secondary products. Fruits of **Jatropa**, grown as live fencing, can be used to manufacture soap, an income source for women. (All projects).

Wind breaks - planting of multiple parallel rows of trees, perpendicular to the prevailing winds, protecting field crops. Wind breaks can slow surface wind velocity, thus reducing evapo-transpiration and wind damage to crops. Wind breaks can be managed to provide poles, fuelwood and other materials, without seriously reducing their effectiveness. (Infrequent VRP II).

Field Tree Planting and Care - Deliberate planting and care of field trees, as well as protecting and pruning volunteer seedlings, break up surface air flow and promotes turbulence, thus reducing wind erosion in vulnerable areas. Some leguminous field trees contribute to soil fertility. *Acacia raddiana* is well known for this. Enforcement of the Forestry Service protection mandate has, in the past, dampened interest in keeping field trees and in pruning for maximum effectiveness. NEF has tried "marking" volunteer seedlings so that desirable species are not destroyed. NEF project nursery operators have also worked on techniques for direct seeding of field trees, such as baobab. They discovered that soaking of seeds in hot water makes seeds germinate nearly as well as the recommended labor-intensive

scarification and soaking procedure. Workshops on this technique have been held for NGOs in Region V. (VRP II, CARE/Djenne, NEF).

Vegetation or grass strips - strips placed along the contours to reduce surface water flow and soil erosion. They are one or more meters wide, and consist of dense vegetative cover, which slow any water flow over land and traps suspended soil particles. Spacing and density depend on slope, soils, and precipitation. Farmers may not want to establish an adequate density of vegetation strips because this reduces the area available for crop production. Grass strips provide thatch and forage for livestock. (CARE/Djenne, VRP II)

Micro-catchments and *Zai* - micro-catchments usually consist of small basins in which tree seedlings or field crops are planted. They may be shallow v-shaped trenches, half moon ridges, tied ridges or other shapes, oriented along the slope to intercept and retain rainfall. They provide an improved site for the tree or crops sown in each micro-catchment. The CDIE team saw more *zai* than any other micro-catchments. *Zai* are a traditional

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      upslope
v v v v v v
 v v v v v
v v v v v v
 downslope
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practice more common in Burkina Faso than in Mali, and consist of a shallow basin scraped into the soil, with the seed sown, or trees planted, in the basin. CARE/Mali, NEF and VRP II promote "improved zai" which are dug with a slight berm on the down slope side, often with a bit of compost or organic fertilizer added, seeds planted on the inner edges of the hollow, and arranged in off-set rows along the slope to trap surface flow. *Zai* have permitted farmers to grow crops on fields which have not been cultivated for 15 or 20 years due to erosion and lateritic crusts. (All projects except VRP I.)

Contour ridges (or *diguettes*) - this intervention, with its modifications, involves ridging the soil along the contour to slow water flow over the surface, improve infiltration, and reduce soil erosion. Ridges are susceptible to rain damage, and must be inspected and repaired after storms. **Rock lines** (*cordons pierreés, pierres en lignes, diguettes filtrantes*) - arranged rock lines in fields, aligned along the contour, to slow the flow of water across the surface, improving infiltration, and reducing soil erosion. They last longer than contour

ridges made of soil. Rock lines are common in Mali. Traditionally, rocks are arranged in straight lines, regardless of contours, so they breach easily. The projects promoted placing the rocks along the contour line, thus reducing failure rates. Rock line construction is very labor intensive; requirements are reduced substantially if the source is adjacent to the rock line site. (All project except VRP I)

Check dams - Structures to slow runoff flow, normally built in gullies or ditches. They may be rock dams, or a line of stakes driven into the ground across the gully, with interwoven branches between them to form an impermeable barrier. Stake and branch barriers last for a year or two, unless sprouting species are used for the stakes, in which case a permanent live barrier can result. A check dam can divert water flow, or slow it enough to reduce erosion damage and water-borne sediments settle out above the check dam. Once gullies get established, they usually require extensive upstream interventions. (VRP II and NEF).

Research to develop the next generation of technologies is just starting in Mali and is dependent on donor support. Failure to develop adequate baseline surveys, information systems and institutional linkages for information exchange in most USAID-funded forestry activities have partially limited their usefulness in identifying extendable technologies.

Most indicators of technology and practice adoption are qualitative at best. They are anecdotal, and often incomplete or non-existent. Sometimes data may be in a form that is not usable. Consistent time series are very rare. Information on VRP II activities is kept in a series of handwritten notebooks. Any attempt to analyze this data would necessitate hand-tallying or initial computer data entry. Project evaluations consistently criticized the project for its failure to produce usable data for proper evaluation of the effectiveness of pilot activities. While the VRP may have installed management information systems for administrative and financial matters, this didn't carry over into technical aspects. The VRP received computers in 1991. In July 1993, the CDIE evaluators found that the computer and printer were still being used very lightly.

CARE/Djenne focused on agricultural related interventions. Its ability to measure changes in practices was weakened when the baseline survey strayed. The study had flaws due to interviewer confusion about key moisture conservation practices (Vitelli, 1989). They have some documented cases of adoption rates. They have only recently started trying to quantify the impacts of

interventions on agricultural productivity. The NEF/Gua Mina community forestry management activity has conducted baseline surveys, including one by McLain as well as biophysical and environmental data on the Bore Forest.

4. EVALUATION FINDINGS: PROGRAM IMPACT

Impact on Practices

Despite limited availability of information, individuals and groups in Region V are modifying their practices and technologies for forestry and natural resource management. Many USAID-promoted practices have spread beyond project participants.

The technology of village woodlots was, along with industrial plantations, the dominant forestry technology in Mali and the Sahel when VRP I started. VRP I concentrated primarily on village woodlots, using a few species because of limited seed availability and unfamiliarity with other technologies. By 1983, about 20 hectares of woodlots were established in 30 villages, and about 130,000 seedlings produced. Five individuals also had woodlots. Only 30% of seedlings survived, with most blame placed on poor rainfall. Since fuelwood's value is very low compared with other tree products, a woodlot growing primarily fuelwood will have a very low return compared to other uses. The evaluation noted that, the village woodlots were not an efficient way to increase fuelwood production. (Taylor et al, 1983). The Mission decided to de-emphasize community woodlots (USAID 1984).

The 1987 evaluation found that woodlots did not appear to be socially or economically viable and were technically difficult in the region's environment. Survival rates were low (40%), and growth rates were poor for neem. Four-fifths of production consisted of exotics. The woodlots were not well integrated into the physical environment. However, there were exceptions, such as inter-cropping between trees when water was available, and using micro-climates for pole production. While VRP I produced the outputs set forth in the logframe it did not meet the intent of the project purpose. (USAID 1987).

In 1991, Rebecca McLain's team studied the impact of six VRP I community woodlots (McLain, Ba, and Koloma 1991). Two of the selected villages had harvested poles, two had sufficient trees to harvest, but had not done so, and two had woodlots where very few trees survived.

Village woodlots failed because villagers thought they did not "own" the woodlot and could not see a use for the trees.

Almost unanimously, villagers believed that the woodlot belonged to the forestry service and not to the village. In all cases the woodlot idea came from the Forestry Service. Its directive approach to development contributed to this perception. To avoid being fined, villagers dared not prune or harvest unless told to do so by the forestry agents. The two villages that harvested wood did so only with the chief's approval after being instructed by the Forestry agents. The other four villages did not have harvesting systems. (McLain, Ba, and Koloma 1991).

Box 8: Views on Community Woodlots

"We aren't interested in expanding the woodlot, at least with those species! It's been seven years since we planted those trees, and we have not gotten any benefit yet. Now the trees are pretty, but other than looking nice, they are of no use to us. When you do work, you expect to get some kind of reward. The trees we have in the forest are more resistant to termites than neems. These trees haven't convinced us that they are with the effort."

"We told them we wanted mango, guava and papaya trees but they brought us neems. They forced us to plant these trees. They fooled us, they said we could use the trees. But if we ever cut the trees in the woodlot, then they would make us pay a huge fine. We would like to make a village store, but we don't dare cut those trees."

(McLain, Ba, and Koloma 1991)

In addition, villagers did not perceive uses for the woodlot trees which furthered their own well being (McLain, Ba, and Koloma 1991). Even in 1980, they were very clear that they wanted fruit trees, trees with medicinal products, or poles for construction. (USAID 1980). In 1991, the respondents couldn't see any use for the trees, or that they were useful only when cut. The only groups that citing positive future uses for woodlot trees were in a "successful" village which had sold construction poles. A women's group mentioned using dead branches for firewood and leaves for medicine while elders and young men desired construction poles. Almost two-thirds of the groups wanted fruit trees alone or combined with food for work or wells. Villagers wanted food for work (they confounded other non-U.S. food for work activities with VRP) and wells (which some VRP I villages obtained) (McLain, Ba, and Koloma 1991).

Village woodlots failed because fuelwood production plantations using species employed under VRP I were not economic in the prevailing biophysical conditions.

According to Weber and Stoney (Second edition, 1986) the common fuelwood species of *Eucalyptus camaldulensis* and *Azadirachta indicia* (neem) need more rainfall than prevails in Region V in order to achieve suitable growth rates for fuelwood production.

Eucalyptus needs at least 800 mm of precipitation or access to plentiful groundwater (which happens in microclimates and on the delta itself). Neem needs 500-700 mm of precipitation annually, although it does well if groundwater is within nine to twelve meters.[1] The average rainfall for the 1978-87 period in the four *cercles* was between 336 and 469 mm. It is not very surprising that slow growth rates and outright failures occurred in VRP I fuelwood activities, with only 30 to 40 % of seedlings surviving. In micro-climates, and bottomlands eucalyptus can be grown for higher value products, such as poles. Neem does not grow very fast in region V, where it is prized for medicines and pest control. The 1983 evaluation concluded that from an economic and social standpoint, the village woodlots were probably not the most efficient means to increase fuelwood and complement food production (Taylor et al. 1983 and USAID, 1984). In the 1987 evaluation, village woodlots did not appear economically or socially viable. They were technically difficult because tree growth of fuelwood species was too slow. The team's sociologist found that the villagers considered the communal woodlots to be the least beneficial activity of the project.

Woodlots impose large labor requirements when first installed. This task coincides with planting rainfed crops. Among the constraints cited was the conflict of tree planting with the cropping calendar and lack of easy access to water (CARE 1992b). While the trees will grow better under irrigation, the returns to investment and labor are too low for a low value crop such as firewood. Alternatives, even dry season migration, provided better food security and returns to labor. Therefore, the priority placed on fuelwood production was not high.

The 1983 evaluation recommended, and the Mission accepted that the emphasis on woodlots be dropped (USAID, 1984). The CDIE team was told that the VRP project and the extension service no longer recommended planting Eucalyptus in Fatoma and Bandiagara *cercles*, unless adequate water is available in micro-climates, and only then for growing higher value products, because of the slow growth rates. The CDIE team observed failure of Eucalyptus planted for poles in Moussawel village (1979-87 average rainfall, about 380 mm) against the advice of the local extension agent.

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[1] The species distributed by VRP I for live fencing were much better suited to the biophysical conditions. *Prosopis juliflora* and *Parkinsonia acculeata*, prefer less than 600 mm of precipitation, but they are used primarily for live fencing. Two other species used in VRP I are prized for food products that are often sold, *Parkia biglobosa* (locust bean or nere) and *Butyrospermum parkii* (Shea nut or Karite) require 500-700mm and 800 mm or more, respectively, although Karite produces well when grown in bottomlands.

Village woodlots failed because weak government institutions contributed to the failure of village woodlots in Region 5.

The 1987 Evaluation criticized Phase I for weak leadership, since the project was unable to make a mid-course correction when faced with the failure of community woodlots. The evaluation recognized the problems caused by the lack of a Management Information System (USAID 1987). The CDIE team views the problem as being primarily institutional. It stems from the paradox of Mali's centralized but weak state, where only senior headquarters officials had authority to make decisions. Information is tightly held. Often administrators and the local population did not speak a common language (USAID 1983). All these factors restricted communication on problems.

The CDIE team could not find concrete evidence regarding Forestry Service coordination with agricultural extension organizations for crops during VRP I or with the livestock service. This probably reflects the institutional constraints discussed above, but may also be because extension activities occur only when donors finance it.

Phase I VRP Forest Service Staff apparently had minimal training in extension methodology. They knew only a few technical practices (especially village woodlots). VRP I used Peace Corps Volunteers at first and contracted for some extension agents. All Phase I evaluations were highly critical of the lack of training, apparently VRP II had to start training people from the beginning. (Dagamaissa, Abdoulaye, and Kanoute 1991).

Sometimes village expertise compensated partially for institutional weaknesses in the public sector agencies. Study of McLain, Ba and Koloma's findings leads to the conclusion that the villages which had local "tree masters" or villagers with technical competence than villages which did not have an expert.

Village woodlots failed because shortfalls in recurrent cost funding hampered effective implementation.

The GRM budget constraints hampered the ability of the Forestry Service to cover operating costs. Although VRP I and II financed essential supplies and equipment, there was little room to pay for small supporting activities.

Although forbidden to exercise their enforcement role when carrying out VRP business, existence of the Forestry Service's enforcement mission weakened effectiveness of extension efforts. Since part of the fines collected supplemented the reporting agent's salary, a strong temptation for abuse existed. This undermined the credibility of the extension message in the eyes of

the rural population. Forest Service extension activities were viewed with suspicion (McLain, Ba, and Koloma 1991).

Village woodlots failed because the only "successes" in VRP I village woodlots occurred when village level institutions were particularly strong.

Strong village institutions correlate with successful woodlots. Variations exist among the ethnic groups in Region V. Dogon villages are noted for cohesiveness, and often have elaborate self-help organizations. Many of these have become recognized *associations villageoises* (or pre-cooperatives). Villages often institutionalize the role of "Tree Master". CDIE interviews confirmed the existence of a "land usage and disputes committee". The most successful Dogon village studied had the strongest self-help group, with well defined tasks shared out and rotated among groups and a harvest sharing procedure. Institutions were not as strong in the other two, and were rent with dissention in the poorest performer (McLain, Ba, and Koloma 1991).

On the plains, the most successful village expanded its woodlot to 2.5 hectares and sold trees. Its institutions were strong. The registered self-help association has access to funds, and a long history of programs. Woodlot products are shared out, including sale of polewood, proceeds going to the village treasury. The village that failed completely did not have its own self-help group or treasury. The village in between had an unofficial self-help association, a "tree master" but no harvesting plan(McLain, Ba, and Koloma 1991).

Under USAID-funded programs, individuals have used woodlot technologies successfully in individual mini-plantations where micro-climates permit profitable wood and wood product production. Individuals and groups used field tree protection, management and plantation practices where accommodations were made with the authorities regarding Forestry code enforcement.

VRP Phase II encouraged individual tree planting and management, especially where physical conditions permit wood and wood product production, or increases in agricultural production. VRP II's 37 villages had 4.75 hectares of woodlots planted with trees only compared to 30.25 hectares in combined garden/orchard/ tree lots through the 1992 growing season. Over 2,000 field trees were planted and participating farmers have kept many more valuable tree species in their fields (Kone 1993b).

Individual plantations increased where micro-climates and other conditions favored them. The CDIE team visited Engolou

Togo's enterprise at Pelessegou. In 1982, he received Eucalyptus seedlings from VRP I, when he asked for help in establishing windbreaks to protect his rice field in the Yaame river bed. He has done well by growing and selling eucalyptus timber and poles, *Parkinsonia, Faidherbia albida*, tamarind and baobab seedlings. He supplied Eucalyptus seed to VRP and other forestry projects. Many neighbors have started their own plantations). (Kone 1992a).

The garden/nursery/orchard/woodlot is more popular than woodlots alone, because, with interplanted crops, it earns income and meets a variety of needs, including tree products. These are primarily individual, except when individual access to land is limited. Again, appropriate microclimates and access to water are crucial. A CDIE team visit to Kori-Kori village found four individual woodlots which failed because sub-surface hardpan prevented tree roots from reaching adequate water. (Kone 1993a).

Practices regarding field trees are changing. McLain's research indicated that after the 1990 growing season while 85% of fields surveyed in Bandiagara *circle* had trees planted on them, only 12% had them in Fatoma *circle* (McLain, Ba, and Koloma 1991). Probably the change is due to weakening the strong disincentive of substantial fines on pruning field trees, through a major extension education initiative held sessions in 140 villages in Bandiagara and Fatoma *cercles*. In the year after the coup, 44 project "partners" protected or planted 462 trees. About 1,600 trees were planted/protected in the next year. (Kone 1992b, 1993b). The CDIE team was told that the Forestry Service head in Djenne worked with CARE staff in the same process. As a result, villagers have started begun to take responsibility for managing and protecting field trees. In Douentza, NEF's program promoting the protection of natural regeneration in crop fields became viable after public meetings were held in Mopti, during which people were officially given management rights over trees in their fields. CDIE observations confirmed that an attitudinal shift on field trees has occurred throughout the region and protection is now spreading quite rapidly. Repeated interviews with farmers confirm their understanding of the law regarding field trees following this extension effort, and their willingness to take action to plant, protect and manage field trees, hedges, boundary trees and even windbreaks.

Group technologies and practices were adopted less readily than technologies and practices which are implemented by individual households. Group practices were used when: (1) Other options were blocked or not feasible; (2) they have clear short term income/food benefits; and (3) benefit or profit sharing mechanisms are clearly envisioned or in place.

VRP II became much more flexible in its approach to technologies/practices for **group woodlots** and individual undertakings. The

Forest Service side of the project carried out some group activities. Kone's woodlots study cites three group woodlots in Fatoma *cercle* with commercial objectives, such as Eucalyptus poles, timber and firewood; and *Acacia nilotica* for tanning. He also looked at three Bandiagara cases.

In Moussawel village (Fatoma), 23 households organized a collective plantation of 1.5 ha. in an abandoned village field in 1990. They told the CDIE team that they planted eucalyptus with a live fence, because they wanted poles, firewood and medicinal leaves. It failed because the site was too dry. In 1991 the group planted *Acacia nilotica* (used in tanning), with a *Jatropha* hedge. (Kone 1992a). The group established a rotating watch against livestock incursion and interplanted cowpeas. By July 1993, the *nilotica* was doing well while few eucalyptus survived .

It seems that group technologies and practices are adopted only when a constraint makes an individual activity impossible. Individual small scale forestry/orchard production is common on the plains around Mopti and in Djenne *cercle*, where good land is relatively plentiful, but on the Dogon plateau, cooperative undertakings are frequent. Most individual undertakings are run by men, while usually group activities are carried out by women, who do not have easy access to land. Group undertakings visited by the CDIE team on the plain appeared to be women's income-earning or product substitution activities.

Local management of natural resources has attracted attention, although Mali started later than its neighbors in using this practice. USAID financed activities promoting this practice only began full implementation after the 1991 coup. Since current laws inhibit villages and nomadic groups from *de jure* management responsibilities for their own lands, reform implementation is necessary before these practices can be adopted widely. Experiments have occurred, in projects which have the village or "fraction" manage their own natural resources.

USAID has supported initiatives for local management of forest resources. Some concentrate on a series of local forests, the "Bore Forest", which straddles the Douentza-Bandiagara border and is skirted by the Mali's main east-west highway. The Bore is a common pool resource for the local population and provides water, pasture and browse for herders. It supplies about 70% of Mopti-Sevare's wood. People living in the Bore villages cut dead wood and pile it at the roadside for sale to transporters. Harvesting deadwood requires a forestry service permit stating the number of steres to be cut. Permits are granted to non-resident professionals, who appear, cut wood, and vanish. The system appears riddled with abuses. Although the chief of the Bore forest service post encouraged villagers to monitor the forests between 1987 and 1991, support fluctuated with individual district heads. Villagers have

tried patrolling the forest to control abuse, with varying results (Dennison and Thomson 1992).

Box 9: Governance and Management of Village Forest Resources

Amba village contains part of the Bore forest within its *terroir*. Between a quarter and a half of the village's annual income comes from trade in dead forest wood. As of 1992, the villagers wanted to purchase woodcutting permits for the cost of paper and printing and then sell them to woodcutters. The village council created a revolving fund for a woodcutters' cooperative, which would collect wood, hold it until the selling season, and then sell to commercial dealers. The Forestry Service would provide technical advice on improving productivity. The villagers would define use rules, ensure monitoring, issue permits, set penalties for infractions and apply them. The head of the district would provide backup to the village system as needed. The forestry agent promised a single permit for the cooperative to use for a month. (Dennison and Thomson 1992).

Tougoume village in Bandiagara has organized a group to manage its forest reserves. With VRP backing, it obtained cutting permits which the village sells, taking a commission off the top. The profits go into the village treasury. The system was in operation during the CDIE team visit.

NEF/Gua Mina promotes local management of forest lands on the Douentza side of the Bore, under a USAID grant. CARE/Koro works on the other. Staff explained to CDIE team members that NEF is seeking a way for the group of thirteen villages known as Kelka to become a legal entity with authority to enter into contracts with the Forestry Service to manage the resource and to obtain rule enforcement. Kelka wants to issue permits directly to Mopti merchants (USAID 1993; Dennison and Thomson 1992).
The CDIE team was told that Kelka members visited Burkina Faso and Niger to study local management activities. They reported back to the general assemblies of the thirteen villages, which then discussed management options. The technical aspects of local management have required much thought since formerly management concerned protection and use rights, not production and offtake. Although baseline studies were done and institution building is well under way, it is still too early to observe major impact.

When more practices were extended simultaneously in Region V, most participants adopted from an array of practices in forestry, resource management and agriculture. This is done to meet food security requirements and minimize risk.

All USAID-supported forestry and resource management projects provide examples of adoption of multiple technologies and practices. Examination of VRP II reports and field interviews show that most people are "multiple adopters" of forestry and sustainable agricultural practices. The same applies to group practices except

for CARE/Djenne, which had few group activities. The NEF project has many joint activities in soil/moisture conservation, filtration dams, and local renewable natural resources management as well as individual activities.

Under the VRP II component and NEF, individuals and groups pick from an array of forestry and sustainable agriculture technologies and practices according to their needs and agro-ecological situation. Their implicit intent is to reduce risk to household food security and increase control over individual and village resources. It is important to offer technologies and practices simultaneously. Technologies and practices that best relieve constraints will vary substantially within small areas and annual rainfall variations frequently result in physical changes equivalent to an agro-ecological zone. Since most extension activities are done before the rains begin, groups and individuals may have to decide which practice to use at the last moment, without time to consult an extension agent. The combined array approach appears more sustainable as a means of technology transfer than separate crop and forestry packages.

In Region V, a chronic food deficit area, those forestry and NRM practices which bring about prompt increases in food production and/or income are adopted more quickly with those with delayed impact. This is very important at the household level.

No matter how certain the practice, interventions which grow trees normally require several years between investment and start of the benefit stream. Renewable natural resource management and soil/water conservation may sometimes produce an income stream more quickly than trees. Sahelian populations, particularly at the limits of rainfed crops are living on the margin. Nearly all households in Region V are net consumers, not net producers of coarse grains. The Great Drought and its aftermath have made people even more risk adverse. To survive, Sahelians use strategies such as having several income streams. Studies elsewhere in the Sahel zone show that 30 to 40 percent of household income and production come from rainfed agriculture, and the rest from livestock, migrant labor, crafts and trade, and other ventures. Investment in a new forestry practice takes place only if it will provide more food or income, without incurring undue risk.

VRP II and other recent USAID-funded forestry and natural resource management" activities, at least implicitly, took this into account and offered sustainable agriculture technologies at the same time. One example is *zai*. *Zai* and water harvesting systems bring uncultivatible land into production and result in increased productivity, and they may need less labor requirements than other land preparation methods. *Zai* provide increased food security, especially in drought years. McLain found, in 1990, that

only 10% of fields had *zai*, and that it was an infrequently used conservation practice. The CDIE team observed a rate of adoption which appeared to be significantly higher, sometimes a third to a half of visible fields.

During 1991 the VRP Forestry Service activity extended improved soil and moisture conservation techniques to 43 farmers. Seven had increased their yield by 55% in treated fields compared to 1990. (USAID 1992). In one village near Fatoma, two VRP partner farmers introduced *zai* in 1992. In July 1993, the CDIE team observed fields planted by six farmers; other villagers were sufficiently impressed by the fields planted ten days earlier to want to do it next season. Kone (1993a) holds that soil and moisture conservation measures probably increase crop production, for several reasons: (a) they demonstrate concrete results after one rainy season; (b) farmers think that they are the best intervention promoted by Forest Service VRP agents; (c) they permitted farmers to use fields that had been abandoned because of low production due to badly degraded soils; (d) farmers state their willingness to continue them, even after project completion; and (e) farmers from non-project villages have started using the practices.

The CDIE team was told that CARE/Djenne's control plots using practices yielding 300 to 400 kg/ha of sorghum while yields of 1,200 kg/ha were obtained using improved practices. A farmer at Soumatogo in Djenne said that a field with improved *zai* gave a yield about 25% greater than traditional practices. *Zai* could be used where no other cultivation technique worked. *Zai* are reported as being somewhat less labor intensive than standard plowing. CARE/Djenne personnel said that nine people in project villages used *zai* on 1.3 hectares in 1989 and 110 farmers used them on 63.3 hectares in 1991. Given the extent of *zai* visible to CDIE team eyes, the practice had spread rapidly by July 1993. (CARE 1992).

During the past five years, USAID-supported natural resource management activities have switched from centralized and public sector nurseries to contract seedling production.

Individual mini-nurseries are popular and have spread through the Region V, because seedlings can be sold to the Forestry Service, donor projects and private individuals. Seedling production combines neatly with truck gardening as a food and income producer. Early in VRP I, all nurseries were run by the State. The 1987 evaluation mentioned about 25 community/ school nurseries, and two individual nurseries. Under VRP II, Bandiagara *cercle* had nurseries in eight villages, which produced 3,392 seedlings of 16 different species, and Fatoma had a total of three nurseries during the 1990 season. Dagamaissa, Kanoute and Dia (1991) did not mention school nurseries. In 1991, ten mini-

nurseries grew 11,106 plants of 14 species in Bandiagara. Fatoma *cercle* produced 7,292 seedlings of sixteen species in nine mini-nurseries (Kone 1993a). The CDIE team was told that when VRP closed in July 1993, nursery production will be in private hands.

PVO experience with nurseries parallels that of the VRP. During interviews the CDIE team found that CARE/Djenne used village nurseries to decentralize seedling production, train people in techniques, and as an income earning activity. There were 117 private producers in 1991, 105 in 1992, and about 140 in 1993. Thirty of them contracted to produce at least 1,000 seedlings each to distribute to participants, as well as selling seedlings privately. The remaining family nurseries produce for their own and neighbors' needs. NEF staff told CDIE team members that they use a mini-nursery system. Their system starts with volunteers, who must undergo training. The project (and other donors) purchases seedlings. Commercial producers may sell for their own account. Some species, such as baobab, are so desirable that Dogon women will pay CFAF 100/seedling. "Mixed" producers sell some seedlings and produce some for themselves.

Biophysical Impact

Few quantified biophysical indicators of change can be found, which can trace change due to USAID-funded activities.

It was not possible to determine quantitatively the biophysical impact of AID financed forestry and resource management efforts in Region V, because no reliable data were available which permitted comparisons. In addition, cycles of drought and adequate rainfall have greater impact on vegetative mass than anything else. Paving the *Route Nationale* probably affected fuelwood offtake from the Bore forest more than any other factor. Forestry interventions often take several years to reach full productivity. Only the village woodlots technology started soon enough to show biophysical impact by July 1993.

The individual forestry activities in the Yaame valley started a decade ago. Enougou Togo was joined by 16 neighbors growing trees on 24 hectares by 1991. During a site visit, Togo and others informed the CDIE team that two years later, they were working with about 50 woodlot specialists in the valley near Fatoma town and had trained 75 people. Among the constraints facing Togo and his colleagues are problems in regularizing land ownership status (to exclude migrant livestock) and legal establishment of a cooperative group. Under current law, Togo must obtain permission of village chief and council for formal registration, this has not yet been obtained. (Kone 1992a).

Natural forest management practices are too new to observe biophysical impact.[2] Intensive work began only after the 1991 coup. Such programs have demanding requirements for developing local institutional capacities and rules changes, which must be done before actual management of the natural forest can take place. A CDIE team member was told that CARE/Mali started work in 1992 with traditional land management societies (Ogokondu), in Koro to develop management contracts so that they could take over some Forestry Service management functions. McLain's work under VRP II and for NEF/Gua Mina has facilitated the work in Koro. While the process of rewriting the Forestry and Landed Property Codes is underway, as is that of decentralization of powers to local governments powers, natural forest management will not spread widely until these laws and governance rules change.

Institutionalization of private mini-nurseries provides a key capacity for rapid expansion of acreage under individual and group forestry as legal and policy constraints are lifted.

Biophysical change is evident in program villages where USAID funded projects worked and spread has occurred to villages which have not received direct assistance from the programs.

Since most households in Region V have substantial food deficits and avoid risk, they are only willing to undertake forestry activities in conjunction with practices to improve food security, and/or income. While each separate practice or technology may have a modest effect, the combined impact on household or village land are starting to show some potential for biophysical change. Since USAID-financed projects only began to use this approach about four years ago, impact remains limited.

Field tree practices are changing. The CDIE team observed that even today, the vicinity of Fatoma and Sevare towns are bare and virtually treeless, with few field trees visible to the passerby. An information campaign in both the Forestry Service and CARE/Djenne components resulted in a rapid acceleration of field tree planting and protection on project village land (See above). Small seedlings, often protected, were evident in most fields during CDIE team site visits in Fatoma *cercle*, despite the barren appearance of neighboring villages and fields. Field trees were very evident in visits to Bandiagara. CARE/Djenne told the CDIE team that villagers have begun to take responsibility for managing and protecting trees in their fields. In Douentza, a CDIE team member was told of NEF's initiatives in promoting protection of

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[2] The CDIE team is concerned about tracing causality to AID, since some villages have improved their own traditional practices with little outside help, and the "improved practices" are deliberately attuned to traditional institutions.

volunteer seedlings in fields only became viable after public meetings in Mopti where people were officially given management rights over field trees. The September 1991 NEF/Gua-Mina study of natural regeneration will provide a baseline for future analysis. CDIE observations confirmed that an attitudinal shift has occurred, and the practice of protecting field trees, is now spreading.

The CDIE team observed clear impact as a result of soil and moisture conservation practices, which increase yields, reduce risk, and show results, especially within one season. Improved *zai* are spreading rapidly, especially for sorghum and millet. This practice has spread rapidly since McLain's study. A critical mass has been reached in project villages and *zai* are now spreading from farmer to farmer well beyond project villages. This was clear, from windshield observations and CDIE interviews. In Djenne, use of *zai* began on little more than a hectare in 1989 and reached 61 hectares two years later. One master farmer interviewed by the CDIE team trained people from his village and six others in the project. He trained two instructors from the neighboring non-project village of Ganya where 57 fields are now planted using improved *zai*. People from the non-project village of Perta have also observed the techniques as well. The technology is well enough established in some villages that CARE staff have been withdrawn from this activity (CARE 1992a).

Conservation measures which require group action are spreading as well. Windbreaks, which pose ownership questions, are rare. Filter dams, grass strips and rock lines are installed if physical conditions make the technology appropriate, and the institutions and materials are available.

Although the area covered in Region V by a single forestry/ sustainable agriculture technology or practice may be limited (with the exception of *zai*), adoption of multiple practices in participating and some nearby villages indicates a potential for substantial cumulative biophysical impact on village lands.

CDIE interviews and project reports indicate that several group and individual practices were introduced in participating villages in all four *cercles*. The CDIE team did not have the luxury of conducting surveys. In addition, the line between "traditional good practice" and "improved practice" is thin. Nevertheless, the CDIE team visited villages in all three *cercles* where VRP and CARE/Djenne operated, where the coverage of the combined technologies appeared to have some impact.

Box 10: Multiple Practices

Under CARE/Djenne, Soumatogo village had about five mini-nursery proprietors (one woman) who supplied the project, other nursery/gardeners, grass strips to reduce erosion, improved maintenance of *Faidherbia albida* and widespread use of improved zai. These technologies had spread to neighboring villages. CARE had cut back severely support to zai and nurseries.

Moussawel village (VRP Phase II), located on the barren plains near Fatoma town, had a group woodlot of Eucalyptus (failed), a group plantation of *Acacia nilotica* for tanning (more successful), group live hedges including *Jatropha* for soap making, cowpeas and vegetables interplanted in woodlot, (group), rock lines, amenity trees, protection and planting of field trees, and hedges, trebled users of zai in first year since small trial plots.

Tougome village in Bandiagara *cercle*, participates in VRP II. It manages a woodcutting permit system for the forest on village lands, runs a five hectare irrigated garden/nursery/woodlot, established a series of filtration dams for gully control, rock lines, live fencing, field and amenity trees, and *zai*.

The spread of private sector mini nurseries provides flexibility for rapid increases once demand accelerates.

During the last four years, nursery production of seedlings has changed considerably. U.S.-supported activities have created an extensive mini nurseries network in the four *cercles*. This activity became decentralized and largely privatized before VRP II ended. The private nurseries produce larger quantities of more species in demand by villagers, than the old system did. Some mini-nursery operators became quite professional, while other produces for family and friends. Production rates probably will not skyrocket before forestry law changes are implemented. If demand suddenly takes off, production can expand rapidly.

Socio-economic Impact

Technologies and practices are already bringing about economic changes some economic changes at the household and village level, since the major reason for adopting the changes are increases in food and/or income.

Very little hard data are available on the economic impact of the technologies, because the USAID financed projects did not gather it in usable forms. Anecdotal evidence and CDIE team observations lead to the conclusion that several technologies and practices generate substantial incomes at the village and individual levels, and some don't. Technologies may be limited by agro-ecological conditions; trees grow too slowly to make returns to labor from fuelwood plantations worthwhile. While consistent data series are not available, several technologies for individuals and groups appear to have positive economic returns which make them

interesting economic activities for the rural population. Soil and moisture conservation activities, allied with area renewable natural resource undertakings, can provide substantial income streams for rural households. Local management of renewable natural resources should allow villagers to capture more rent from natural resource capital stock.

In the Bore, although Amba village woodstock has been reduced severely, the remaining wood dealer sells three to four truckloads a year. A 10 ton truck-load of dead wood contains about 30 steres or 1,000 fagots, which sell from 25 to 50 CFAF each, depending on the season. This amounts to 75,000 -200,000 CFAF per annum. In Tibouki village during 1992, local wood-cutters negotiated a deal to sell wood for 40 FCFA a fagot to Batouma wood-cutters, who turned it over to transporters. In three months, the three Tibouki woodcutting teams can cut, stack and load 70 thirty-stere truck-loads of (dead) wood from the Bore. At 33 fagots/stere, they would have made 2,772,000 FCFA for their work or about $ 9,900. Two teams of "strangers" cut about 33 truckloads which would sell for 1,306,800 FCFA or about $4,667. Total 1992 woodcutting income is estimated at about $14,667.

Commercial permits used to cost 6,000 FCFA for a 30 stere truckload, valid for one month, or 200/stere. Tougoume village sells permits at 250 FCFA per stere, and gets a cut off the top. After March 1991, villagers stopped paying for permits, but earlier they were frequently fined. (Dennison and Thomson 1992).

Engolou Togo and his neighbors have obviously done well by selling eucalyptus poles. CDIE team observed evidence of several sales of poles from 12,000 to 20,000 CFAF during the past year or two as well as selling eucalyptus seeds to USAID and other donor projects. He owns a motorbike, which is very uncommon. However, periurban nursery men have not found it easy to sell in urban areas, although disposable income is higher. Most people want fruit trees and ornamental, and the depressed state of the local economy has reduced demand.

Non-fuelwood group woodlots appear profitable. Moussawel village grows *A. nilotica* for tanning chemicals and interplants vegetables for sale. *Jatropha* hedges provide live fencing, erosion control and soap making materials.

The 1983 evaluation team pointed out serious flaws in the economic analysis done for VRP I's fuelwood- oriented design. The design gave a low level of internal rate of return (10%, which was lower than the discount rate), overestimates of benefits and underestimates of costs. (Taylor, et al, 1983).

Research in Senegal may give clues on relative financial return of Sahelian agro-forestry and forestry interventions. The work is flawed by assuming an opportunity-cost of labor of zero (which

certainly is not true in Region V of Mali) and it gives no rainfall data. G. Edward Karch's work on agroforestry practices in Senegal (see USAID 1993) gave block plantations a benefit-cost ratio of 1.63 and an internal rate of return of 32%. Planting field trees had a benefit cost ratio of 4.32 and an IRR over 50%. He calculated a benefit cost ratio of 7.39 and an IRR of more than 50% for fruit orchards and 3.52 and over 50% respectively for nut orchards. Protecting fruit and nut field trees has a much higher return because inputs and skills are less demanding. Windbreaks have an IRR of 32.65%. *Prosopis juliflora* live fences had a benefit cost ratio of 2.54 and an IRR of over 50%.

Most of the increase in income comes from improved resource management, including soil and water conservation.

The CDIE team confirmed Kone's report that the majority of individuals and groups who adopt improved technologies and practices utilize more than one NRM or agro/forestry practices, which creates a synergy (Kone 1991b). Improved agronomic practices, such as contour plowing, water harvesting, and *zai*, often have sufficient effect to stabilize soil. Their importance is that they reduce risk in drought years. Crop yields from a water harvesting scheme in Burkina were similar to traditional practices when rainfall was adequate, but in a drought year, yields were 48% greater than on control fields (USAID 1993).

Kone's data for Fatoma *cercle* indicate that between 1990 and 1992 nine farmers increased reported cereal yields between 25 percent and 12 and 1/2 times (Kone 1992b). During 1991 the Forest Service worked with 43 farmers who used improved soil conservation techniques which led to better utilization of water for growing crops. A sampling of seven farmers indicates an average increased yield of 55% in fields with soil conservation measures in 1991 as compared to yields from the same fields in 1990 without conservation measures (USAID 1992). Soil and moisture conservation measures are apt to increase crop production and reduce risk, thus improving household welfare.

CARE/Djenne's work in soil and moisture conservation included *zai*, and testing modifications of traditional practices. CARE's experiments showed increases of 300 to 400% in using modified traditional techniques such as *zai*. While such increases may not occur in farm-field conditions, a Master farmer obtained a yield increase of roughly 25% with improved *zai* over standard traditional practices. The farmer apparently conducted the experiment in a year with good rainfall. This may have narrowed the difference between the treated and untreated plots. The farmer also tended his *F. albida* field trees, which fix nitrogen, and used grass strips, which may have increased production levels above the local

norm. *Zai* also have good economic return because they can be used to reclaim land where crops cannot otherwise be grown.

In Djenne, a CDIE visit to Mme Tiento's nursery and garden operation found that it helped her earn a substantial income. Other CARE Djenne contract nursery owners will sell up to 1,000 seedlings back to the project. The plants are sold back at 50 FCFA, which means a gross receipts of 50,000 FCFA, less costs of perhaps 5,000 FCFA (pots are subsidized). In Douentza cercle, mini-nursery/truck gardens provide an income for many.

Work done in Burkina Faso on contour ridge systems showed an average grain yield increase of 30% (170 kg/ha) for sorghum and 43% (90 kg/ha) on millet fields (USAID 1993). Rock line systems show an even higher short term results. An evaluation of such systems in Burkina Faso obtained increased yields of nearly 55 percent. Economic analysis of the ICRISAT package showed that the break even annual sorghum yield increment of only 155 kg would assure a return of 15% on the labor and cash investment in the Sahelo-Sudanian zone (approximately those of Djenne *cercle*), two-thirds of the farmers exceeded the increment. (USAID 1993).

5. EVALUATION FINDINGS: PROGRAM PERFORMANCE

Effectiveness

USAID forestry programs in Mali are successful as pilot efforts which combine forestry, natural resource management and sustainable agriculture approaches.

Forestry and NRM have been sub-components of other strategic objectives. If VRP II had kept to its design, it would not have had as many forestry practices adopted. In implementation, VRP II shifted from forestry to forestry and sustainable agriculture. CARE/Djenne also shifted away from Forestry. NEF had parallel sustainable agriculture activities.

In basic terms, VRP I, as designed, met its modest formal output targets. They did not maintain the same intent of the project purpose. (USAID 1987). Regarding VRP II, the project made major contributions to natural resources management, but what was implemented was quite different than the design. If VRP II had kept to its design, it would not have succeeded. It used the VRP I purpose "to identify successful and cost effective processes for achieving reforestation and more efficient use of wood resources at the village level in Mali's Fifth Region." VRP II assumed that "with adequate extension and education, individual farmers would become aware of the benefits of purposeful tree planting on their own land and will be willing to bear the costs." People ought to adapt technologies which bring about economic benefits and increased food technology, without using food for work or direct payments to farmers.

VRP II demonstrated that the array of technologies must produce quick returns to the household for adoption and spread of forestry practices. Almost all rural households in Region V are net consumers of basic cereals. The combination of practices must generate food or income quickly to meet food security requirements. To do so, forestry programs should be accompanied by major efforts to promote sustainable agriculture and soil conservation, well beyond what the VRP II design had proposed. The design assumed that the purpose could be met if: trees were planted for soil stability and fertility; fuel conserving woodstoves were disseminated; and woodlands were locally managed.

VRP II had uneven results in achieving the formal objectives (or outputs) of: (1) improving the effectiveness and efficiency of forestry sector institutions in extension and education; (2) creating and strengthening data basis and information flows; (3) improving sectoral planning and priority setting capabilities; (4)

developing competence in management and financial systems; and (5) demonstrating and disseminating agro-forestry and water harvesting technologies. Substantial progress occurred in technology diffusion and the land tenure component accomplished far more than anyone anticipated. Other outputs were less successful, and little was done on some. CARE/Djenne paid little attention to forestry and public sector agencies. It did not seem to do much in village level institutional development.

The Near East Foundation's activities appeared to be more innovative and successful in reaching towards its objectives than CARE/Djenne, particularly in institutional development, area resource management and even in modifying technologies. NEF concentrated on collaborative problem solving, developing local management skills and making considerable use of local talent and solutions. NEF activities appeared to be closer to the concept of renewable natural resource management than VRP II.

For experimental and pilot activities, the coverage and distribution of the USAID programs was adequate.

The programs studied were all pilot activities carried out in part of one Region of Mali. VRP I had roughly thirty villages and VRP II another 37, while CARE/Djenne had about 20. NEF's activity with the Kelka covers 13 villages, but NEF reaches a number of other villages through other projects. The projects were located in three distinct agro-ecological areas and included villages inhabited by former ruling groups and by former slaves.

VRP and other NRM projects were generally aware of and took action (when possible) on gender related inequities concerning fuelwood and access to and participation in forestry activities.

The VRP I designers were aware of the gender-related inequities regarding fuelwood and participation in other forestry and agro-forestry activities. The energy based design of VRP I took into account women's disproportionate workload in gathering wood. It was felt that the woodlots, along with improved stoves, would lighten this workload, but it ignored that fact that the women bore a disproportionate load in watering seedlings and that there was no plan to distribute the plantation's production.

VRP II hired women as extension agents under contract, to work on stoves. They were let go when A.I.D. funding ended. All projects except VRP I extended live fencing of *Jatropha*, which was used for making soap. Many women have mini-nurseries and group orchard/forestry undertakings. About 25% of commercial mini-nursery proprietors in Djenne are women. Since 1991, the pace of exchange visits, including women's groups, has grown.

The major barriers for women's participation concern customary rules on land and tree tenure. Although statute law and regulations permit women to register and own land, almost no one (male or female) does this in rural areas. Under customary rules, the degree to which women control land and manage its use varies among ethnic groups. Among the Dogon and the Rimaibe, many women farm parcels separately from their male relatives and may hire laborers. Among the Fulani, Malinke and Bozo, women rarely farm parcels alone, unless widowed, divorced or their husbands are absent. Tree ownership is associated with land ownership. Tree title is transferred to the new owner with the land. Borrowers need the owner's permission to plant or fell field trees. Since women normally borrow land, they are not considered as being tree owners even if they plant trees. They may harvest fruits and wood from the trees on the land they use (McLain 1992). Women gather dead wood and sell it, although most commercial dealers are men (Dennison and Thomson 1992).

The use of community managed woodlands, particularly having the village or local association control access and issuance of permits for commercial cutting, should eventually lead to capture of rents by the local population.

Experiments as described in the impact section should lead to local communities capturing the profits rather than townsfolk.

Sustainability

The more sustainable of USAID's recent forestry subsector interventions, when combined with resource management and sustainable agriculture activities, are those which provide reasonable return to labor, measured in terms of food security. Village woodlots for fuelwood are not sustainable.

As discussed above, those technologies and practices which are adopted make economic sense to the household and community. Some have a clear short-term payoff in increasing food security. *Zai* and water harvesting systems bring uncultivatable land into production and increase productivity. They may have lower labor requirements. Individual woodlots, especially when interplanted with crops, and orchard activities which produce a good return to the household and have lower opportunity costs for labor will be sustainable. If the technology does not provide a prompt return translatable into food security, it is dropped.

The ability to increase food security through realizing benefits is essential for group activities. People will not invest in a joint activity if they cannot see a payoff in the short term.

Payoff includes food or money to buy food this year; and/or food or income within a couple of years, if labor is needed when options with a higher return are not available. Group activities are secondary to individual or family efforts and require local institutions capable of distributing the resulting benefits. Investment occurs if: (1) the problem that needs solving covers more than a single family's lands; (2) the investment is beyond a family's capacity to carry out; (3) the problem requires managing village common lands and exclusion of outsiders, or, (4) the person cannot be a "proprietor" and must band together with others to obtain access to land.

Extending multiple practices in forestry, natural resource management and sustainable agriculture at the same time make the forestry technologies sustainable for Malians to implement, even if they are not sustainable when implemented in isolation.

Examination of VRP II, CARE/Djenne, and NEF documents and field interviews make it clear that most individuals, and nearly all target villages, are multiple adopters of technologies. Almost everyone interviewed had used more than one technology. It appears important to offer simultaneously technologies and practices for soil conservation, renewable natural resource management, agro-forestry and field crops, because the technology that best relieves individual and community constraints will vary greatly. Such flexibility probably reduces risk and increases a sense of control. This appears to be more sustainable as a way to transfer technology in the Sahel than presenting in isolation packages for each separate forestry and crop technology.

Although the projects all use adapted and improved traditional technologies, there are few new technologies for Region V on the horizon. This may decrease sustainability.

Most individual and group technologies are variants on traditional practices or those used in neighboring countries under similar conditions. Technologies should not remain static, because conditions change. Long term sustainability requires a flow of technologies and practices. Dutch and Swiss Natural Resource Management research efforts are under way in the south of Mali, while USAID and ICRAF have just started work on related research in Region V. The research should generate new practices and refine borrowed or older ones. The CDIE team did not see evidence of new research results for region V which integrates forestry and crops into prevailing farming systems. No ongoing research came to the team's attention which tries to solve the space/time conundrum by integrating crops, renewable natural resource management of areas, forestry and livestock (both trans-humant and sedentary). A

sustainable technology research system should also feed local improvements into the research loop.

Mali's lack of effective linkages between research and organizations that transfer the technologies to producers gives rise to concerns about long term sustainability of forestry/ natural resource management programs.

Once research is done, the results must be turned into extension recommendations and a nucleus of people trained in using the technologies/practices. We did not find much evidence of this process happening yet to soil conservation/NRM research projects in region V (outside of some PVOs). Because research has a long lead time, concerns arise about the long term sustainability of the innovations flow. The Farming Systems Research and SPARC projects are supposed to deal with this.

Unless appropriate laws and policies are in place and enforced, forestry and NRM programs are not sustainable.

At least three aspects of policy and law affect sustainability of forestry sector programs. These are:

- Strict enforcement of protectionist forestry laws;
- Ambiguities in the land laws, and conflict between statutory law and tenure/access systems based on traditional practices.
- Arbitrary, top-down efforts to manage natural resources with insufficient public sector means, without participation of the local population, and without devolution of rule making and judicial authority to representative local bodies.

McLain and others found evidence that the protectionist approach to forest resources helped accelerate natural resource loss. Repeated fines did not always deter woodcutting in parts of the Bore forest (Dennison and Thomson, 1993). Fear of fines from pruning woodlot trees in woodlots may have reduced productivity while destroying a sense of local ownership. In some places, farmers pulled up field tree seedlings because they feared fines for pruning them. (McLain 1990, 1991).

USAID is in the forefront of actions to make forestry policy reform more sustainable in Mali.

Policy reform sustainability can be examined using the criteria of Brinkerhoff and Gage. The recommendations of the 1993

Forestry Conference stressed setting up local systems to resolve disputes. If enacted, the new policies should contain clear objectives, or criteria to resolve goal conflicts. The reformed code should be consistent with managing natural resource uses in a sustainable way.

The reformed policy should identify more accurately the principal factors and linkages which affect impact. Awareness of linkages has spread. The key debate concerns the potential of local resource management via self governance compared with state-guided management. This depends upon the GRM's philosophy on granting rule making authority to local bodies. The GRM previously emphasized the technical aspects of authority in top-down execution, rather than giving due consideration for the institutional, social and economic factors that are inseparable from forestry issues (Brinkerhoff and Gage 1993).

Strong public pressure exists for structuring reforms to maximize the probability of compliance from implementing agencies and target groups. Past history reveals a pattern of progressive bureaucratic paralysis, corruption and declining capacity to carry out the Forestry Service's protection mandate. The gap between rhetoric and reality was huge. The GRM's commitment to decentralize and make the rural sector responsible offers an opportunity for restructuring. The forestry service is under pressure from within and without. (Brinkerhoff and Gage 1993).

It remains to be seen whether leaders and top managers have sufficient strategic management and political skills, and are committed to the reforms. CDIE team interviews and documents point out the shallowness of existing analytic and management capacity in the Forestry Service and dependence on donors. Donors have hired trained Malians at all levels. A nucleus of highly trained Malians exists, working in research institutions, as private sector consultants, as experts with other donors and NGOs. The most acute shortage in the Forestry Service may be among mid level staff with skills in proactive bargaining, networking and negotiation with groups to influence resource allocation, actions and attitudes. (Brinkerhoff and Gage 1993).

Policy reform receives ongoing support from constituency groups and key stakeholders but the legal system is not yet restructured to be neutral or supportive. Recent political changes have increased stakeholder's ability to air views in public. The process for revising the forestry code is open and participatory, with consultative procedures to ensure that all groups concerned with major issues received public hearing before preparation of major legislation (Brinkerhoff and Gage 1993).
There is no guarantee that socio-economic and political conditions will remain supportive and thus not undermine the reforms because of changes in priorities, conflicts and/or radical shifts in resource availability.

USAID's assistance has been very useful in diagnosing the problems, especially in the forestry code and in working with both public sector bodies and private groups (and individuals) to make statutory law more appropriate, flexible, and consistent with local tenure practices. Despite progress made to date, the policy reforms themselves are not implemented yet.

Most Malian public sector agencies engaged in forestry/ natural resource management activities are not yet sustainable. Local level institutions are absolutely essential in making the programs sustainable.

Although some technologies now spread on their own and do not require much support, the situation is not sustainable. A constant stream of technologies is needed to cope with rapidly evolving economic, physical and social conditions.

As mentioned above, research, extension and development of public sector institutions takes place only if financed by donors or PVOs. This has distorted development of institutions and organizations, the prime examples being the domination of cotton and rice in research and extension. Forestry and natural resource management suffered. The GRM cannot fully use its trained researchers because of budget constraints. The private sector is not placed to take up the burden of supporting quasi public goods such as research and technology introduction.

Upgrading the capacity of local Malian organizations is a critical component of sustainable forestry interventions, in particular actions which require group implementation, such as filtration dams, and renewable natural resources management. The group needs the skills to plan, to broker out responsibilities, as well as obtain access to technical knowledge. Equally important is the knowledge of how to plan the project and where to obtain the resources needed. Without this capacity, group undertakings will collapse apart after donor departure. Even individuals need some local backstopping.

VRP I ignored development and institutionalization of community capacities in design and implementation.[3] Under Phase II, VRP's record appeared better in local skill development, and was clearly so among individuals and women's groups. CARE/Djenne focused on technical practices and individuals, although it used village level technical committees. Although CARE/Djenne's master farmers and nursery operators probably can continue work on their technology, little capacity seems to exist to bring in new practices when needed. No work seems to have been done in no

[3] While strong organization were a criterium for village selection, neither McLain nor evaluations indicate that VRP I undertook institutional development.

developing capacity to organize resource acquisition, once the donor departs. The NEF project devoted much of its resources to develop and insitutionalize local capacity to plan and manage future forestry and natural resource management efforts.

USAID's involvement in extension/awareness has been limited but important in some areas. It has not focused on the sustainability of the extension process.

Region V's inhabitants are very aware of the need to manage natural resources and soil and moisture wisely. Sometimes people may not be able to take major action due to the overwhelming need to obtain food, or to other limiting factors, such as overly zealous enforcement of the forestry code, which inhibits carrying out sound natural resource management practices. The major role of organizations that engage in awareness currently concerns empowering local institutions.

Education on legal provisions of the forestry and land codes is not sustainable without donor support.

Another extension function concerns informing the Region's inhabitants and all levels of the relevant public sector agencies about Forestry and Land law and administrative rules. In Region V, the VRP and PVO projects undertook this task so that all Forestry Agency staff and relevant authorities understood the laws and regulations clearly as well as the rights of individuals in Forestry and natural resource management. Also, the publicity campaign informed the local population of the legal provisions and their rights. The same process must be repeated when the laws and policies are reformed. This will require extensive media campaigns and programs in the local languages to train those administering the laws and rules, and to inform people about their rights and responsibilities. The GRM does not have the financial resources to do this task and will need help.

Spreading the initial knowledge of technologies and practices to a nucleus of potential adopters is not sustainable at present, due to financial and other constraints.

Any new practice or technology must reach a nucleus of potential adopters who form a critical mass for broader based transfer to neighbors. The GRM does not have the funds or staff to undertake this function, nor is it likely to in the future without substantial donor and PVO assistance. While a U.S. style extension service is too expensive for Mali, a knowledge transfer mechanism is essential. Failure in this area was one reason why VRP I did so poorly. Little evidence was found of a permanent capacity in the

public sector. Local institutions can carry out part of this function, but they must be able to connect the client with the knowledge source on the technology, or transmit problems to researchers. This loop is not complete. The agents extending a practice must: (1) be able to communicate with the local population; (2) know the biophysical and farming systems context in which they are working; (3) understand and apply extension methods (listening!); and (4) understand the technology that they are extending. In addition to adequate funding, non-financial constraints must be overcome. These include:

- **Research is conducted in one organization but the extension function is done in different parts of the same Ministry or in different Ministries.** There is a lack of institutional arrangements to bridge this gap. The rules of proper bureaucratic conduct in Mali make the research/extension linkage task very difficult.

- **The extension functions in Forestry, Crops and Livestock are carried out by different agencies in Mali. In addition, a number of PVO's and rural development projects act independently in carrying out these functions.** The recipient is bombarded by messages which may conflict or not suit his or her situation. When the knowledge transfer process is well integrated and the same agency working in all areas in a village, the process of reaching the initial recipients may be less costly.

- **There is still a problem of human skills, capacity and attitude, despite improvements in VRP and PVO projects.** Agents with inadequate knowledge are apt to transfer the knowledge as if it were a recipe to make bread, turning off rational and knowledgeable rural people.

Although the World Bank is launching large extension programs, this aspect of forestry programs is not sustainable.

Forestry programs are not sustainable as long as the same organization has to carry out both the extension function and the policing function at the local level.

These tasks require different skills, but the police role negates the extension message in the recipient's mind. Just as using an extension agent to collect debt on loans reduces his effectiveness in transferring crop technologies, the same thing holds in the forestry sector. Ideally, local law enforcement personnel would hand violators over to the judicial system, rather than subjecting them to arbitrary administrative action. At minimum, the extension function and the police function should at least be carried out by separate Forestry Service units.

Replicability

A multiple technologies and local institutional development approach may be replicable in the Sahel, but more ambitious efforts may be possible in countries where food security is not overwhelming.

A multi-technology strategy combined with development of local institutions may be replicable in the Sahel, if conditions are appropriate. Some countries may be able to go beyond the VRP II approach. The most useful tack might be a concerted attack on policy constraints, combining non-project and projectized assistance for local institutional development, and an array of appropriate agriculture and forestry technical practices. The projects could be public or private sector. Design is site and culture specific; cloning does not work. VRP I demonstrated the pitfalls of doing forestry on the cheap.

Policy reform, built on a foundation of sound legal and economic anthropology, combined with highly participatory processes for framing reforms may be replicable, if the political climate permits. Some Sahelian countries may be ahead of Mali in reforming laws, but others may be behind in devolving powers to the local level. The Malian approach probably will not work unless *de facto* delegation of power occurs, or experiments tolerated, as well as giving agencies permission to combine extension of agriculture and forestry technologies and practices.

Variants of the consultative process used in Mali may be relevant for building ownership through broad-based participation in policy reforms. The process should work in countries with low literacy rates. It works when formal participatory organizations are weak to non-existent. The pay-off from an investment of a few hundred thousand dollars in preparing analyses and providing logistic support for a national conference representing all interested groups. The process goads public administrators and holds the state accountable. The reforms work even better if donors finance extension campaigns about the new legislation.

Relevance

VRP I was not relevant. It was based on technological misperceptions and symptoms were mistaken for causal constraints. The approach of VRP II and NEF, which treated forestry as an integral component of sustainable agriculture is more relevant in the Sahel.

VRP I concentrated on rural village woodlots to produce fuel. It was a prime example of development on the cheap based on a myth. A symptom, fuelwood shortage, was treated as if it were a cause in

order to solve an urban fuel supply problem. Technologies were only one out of many necessary elements for success in group and individual forestry. The few villages which had relatively successful all met the following conditions:

- Strong and cohesive village level institutions and self help associations;
- Resident expertise in managerial and technical requirements of tree growing;
- Access to an adequate water source (better performance if it was close to the plantation); and eventually,
- A harvest plan and system for allocating the proceeds.

Villages with unsuccessful woodlots with few or no surviving trees did not have strong institutions (or leadership conflict existed). They do not seem to have had a resident "expert" and a good water source nearby. The villages where some trees were ready for harvest met more criteria than the poorly performing villages but not as many as the successes. The original technology, designed for an environment with better rainfall, was also unworkable on social and economic grounds. It ignored public agencies' problems, local institutional strengths and weaknesses, the perceived needs of the populations, perverse effects of policies and statute law, and economic horse sense. Only when VRP II began to pay more attention to these factors did individual and small group forestry begin to make headway, in adoption of practices, especially when combined with programs incorporating soil and moisture conservation practices.

In contrast, the approach developed by the end of VRP II was very relevant to the constraints and problems facing forestry and natural resource management in Mali. It was also relevant in terms of agency and bureau policy regarding environment/natural resources projects.

6. LESSONS LEARNED

Forestry interventions are more likely to succeed if they are taken simultaneously with sustainable agriculture and natural resource management interventions. Adoption of forestry technologies depends upon maintaining household food security.

In areas where almost all households are net consumers of subsistence cereals and annual production varies greatly, substantial increases in food production and/or income generating activities are essential before individuals or groups will invest in forestry. The forestry intervention must generate a sizeable income stream promptly, or it must be accompanied by practices which improve the certainty of food production during drought. Once food security is improved, household and groups will invest in forestry and resource management actions which produce non-food security benefits in the longer term. Indicators of potential success for adoption appear to be: (1) it improves upon a traditional activity whenever possible; and (2) users get a quick return from undertaking the activity.

Households and groups adopt multiple technologies to resolve their perceived constraints. Simultaneous extension of several improved technologies which fit within existing household systems provides a way for less risky adoption of forestry and natural resource management technologies and practices. It allows for last-minute adjustments, such as substituting a less water-demanding practice for a higher yield, but more water intensive technology. The range of technologies extended should cover the whole range of forestry and sustainable agriculture activities.

Community fuelwood lots using common species in Region V are not feasible in Sahelian agro-ecological zones with under 500mm of annual rainfall (except when groundwater is available).

As discussed in impact section when bio-physical conditions are such that less than 500mm of rain (and no supplementary groundwater in microclimates) seedling survival rates are inadequate to make the return to labor satisfactory, in light of alternative uses. Other wood products of Eucalyptus, such as pole production, may succeed in micro-climates, and other species used for non-firewood products may also succeed. Firewood prices are too low at present to make investment in irrigation pay off.

Technologies and practices which individuals can implement are more likely to be adopted than group interventions. The exception is when the activity is beyond an individual's capacity, or if key resources cannot be obtained. Strong local institutions are critical for the success of group activities and important for supporting individual and household interventions.

Village and other local institutions: facilitate work organization; bring together resources beyond an individual's reach to solve group problems such as soil and moisture conser-vation; mobilize skills for the community; and facilitate growth of benefit sharing arrangements. Local institutions are critical for managing the village "space" especially for setting and enforcing the rules for renewable natural resource management.

A sense of ownership of an undertaking, particularly a group undertaking, is critical. The activity must be "owned" by the people working on it. They must share in planning, rule making, implementation and distribution of benefits.

The lack of woodlot "ownership" in the community is a major reason for the failure of village woodlots to produce fuel. The idea and technology came from the Forestry Service. People "saw" that the woodlots belong to the Forestry Service, which would gain all the profits. The Kelka association in the Bore forest starts with empowering villages to manage the resources in the area and simultaneously enhancing traditional sense of ownership and responsibility for these lands. Other NEF soil management activities stress empowerment and establishing control over group resources. VRP II's activities gave less emphasis on ownership, but the sense of group and individual empowerment remained. Community solidarity appears to carry over into individual activities and provide a framework for solving problems with technologies and how to obtain the resources necessary.

The process of broadening political participation by decentralization and delegation of local rule-making authority is central to natural resource management. Statutory law and traditional land tenure and forestry practice conflicted in Mali. Proposed reforms should bring the two closer together, with local flexibility under a decentralized, participatory system.

Before March 1991, the Region's inhabitants V felt that they had lost authority to manage their own village "space" and the resources in it, as well as being dispossessed of political voice and participation. Since then, Mali's ongoing revolution has stood the philosophy of a highly centralized and directive government on

its head. The rural inhabitants are now trying to establish some control over their resources. Natural resource management is a key area in the process of making communities responsible. A major change is the willingness to give villages, on an experimental basis, the power to issue woodcutting permits, to limit access to strangers, and, with the authorities' help, to catch and punish rule-breakers. The process includes changing from administrative rule-making and penalizing to local rule-making within a central framework and use of judicial procedures.

Inappropriate land and forestry codes limited or prevented adoption of Forestry and natural resource management practices. Inappropriate application of severe protectionist measures may accelerate the loss of forest resources, partially due to weakening of local institutions and sense of resource ownership.

The technologies most acutely affected by this are those which concern renewable natural resource management plans and actions to inhibit erosion and improve soil fertility. It also affected proper pruning and other woodlot practices. Planting and preservation of field trees are other key practices where arbitrary state actions have infringed on a space that the individual "owns" or borrowed under traditional law.

The same enforcement agency cannot effectively carry out the extension of technologies and practices. In order to be effective, these functions must be separated into different organizations, at least at the local and provincial level.

Just as in agriculture, the message gets lost if the person carrying out the extension function is the same person who comes around to collect payments on loans to farmers and cooperatives. The situation is particularly bad if there have been abuses of power. The Forestry agent enforces the law, and then is expected to extend technologies and increase awareness of forestry and environmental concerns. The Forest Service's ability to do extension is severely hampered by local suspicion.

Sometimes local groups take action before the laws and administrative rules are changed. With PVO and NGO help, the dynamics of decentralization and an ongoing political revolution can provide valuable pilot activities on the interaction between policies, institutions and the adoption of practices.

Attempting to do forestry "on the cheap" using a strict technological fix approach does not work, and is not sustainable.

Both organizations and institutions must have enough capacity to meet pre-conditions ("sufficient and necessary" criteria) for adopting the technology. It is essential for enough of the capacity to be there to carry out the actions.

In the Sahel, limited financial resources restrict forestry research, extension and implementation programs to those which donors finance. The result may be distorted resource allocation. The apparent lack of new technologies being developed for Malian forestry raises concerns in light of shifts in biophysical and other conditions. It is made more worrisome by the lack of research extension linkage and long lead times for research.

7. OUTSTANDING ISSUES

The basic conflict between forestry protection and forestry extension roles still remains a major constraint to adoption of forestry and natural resource management technologies and practices.

Because of its political and legal inheritances, Mali presents the dilemma in stark terms. In present day Mali, the protection mission of the Forestry Service collides with the rural movement to "regain our patrimony" through increased local political control over land and its uses, tax revenues and expenditures, and political destiny.

Developing a workable solution to the protection and extension dilemma will take a long time, despite the achievements of the revolution following the March 1991 coup. The Government and the constitution are based on the principle of devolving power and responsibility to local levels and the use of participatory processes. Development of decentralized institutions and rules will be slow. Enforcement of the protectionist mission of the Forestry Service, which has been in force for nearly 60 years, remains a flash point among rural grievances. It will take many years to eliminate distrust, even after revision of the forestry and the landed property codes. Consequently, the effectiveness of the forestry service agent as an extension/technology transfer is inhibited.

USAID's forestry projects have conditions and covenants that the forestry service agents must not engage in their policing role when working on USAID projects. In Mali's circumstances, this pledge may not be sufficient to allay suspicions of the forestry service agent wearing an extension agent hat.

The ideal situation, in the long term, would be to establish a forestry protection service (to guard national parks and large classified forests. Such a service would provide support to local detachments of police which carry out police functions and be responsible to decentralized, representative local governments. Community management and policing of local wooded areas with substantial citizen participation would be an integral part of the process. Such a program would require switching from administrative to judicial processes for dealing with infringements. The skills required for this are very different than those for technology transfer.

The extension function would be carried out by forestry extension agents (and cross trained agriculture extension agents)

in a restructured extension service. The forestry extension agents would be able to do general soil and moisture cultivation, agro-forestry and sustainable agriculture extension as well. General livestock extension ought to be integrated into the system as a whole. To carry out the extension function well, the general agent must have the background to understand the implications of the recommendations for the household enterprises. While extension agents should focus on the initial transfer of technology, "master farmers" or "tree experts" should take the process from there. The extension agent provides linkage into the formal organizations and agencies. The exchange of information must be a two-way street, and agents will need training in both extension methodology and technical forestry and agriculture.

Countries such as Mali cannot afford to have separate agriculture, forestry and livestock services, each with their own logistic support and topics to extend, each with their won logistic support and topics to extend. On top of this, Mali has inherited huge "rural development operations" which carry on their won work independently. These logistic support and technical topics overlap, or conflict at the local, village and household levels, resulting in inefficiencies.

On the other hand, the problem with splitting the forestry service into an extension agency and a protection service is cost. Mali does not have the resources to do this. Non-project assistance, however, might offer a possible source of funds in such as situation, since funds to support restructuring could be released as policy reforms are carried out.

Given the institutional forces involved, and the loss of power among bureaucratic stakeholders, such reforms are unlikely. The best that can be hoped for would be the local integration of forestry, sustainable agriculture and livestock extension functions below the *cercle* or *arrondissement* level.

APPENDIX A

EVALUATION PROCEDURES

CDIE assessments of environmental programs are aimed at answering two central questions: "Has USAID made a difference?" and, if so "How well did it do it?" The central hypothesis of the environmental assessments is that USAID, 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 Appendix describes the process used to test this hypothesis in USAID social forestry programs.

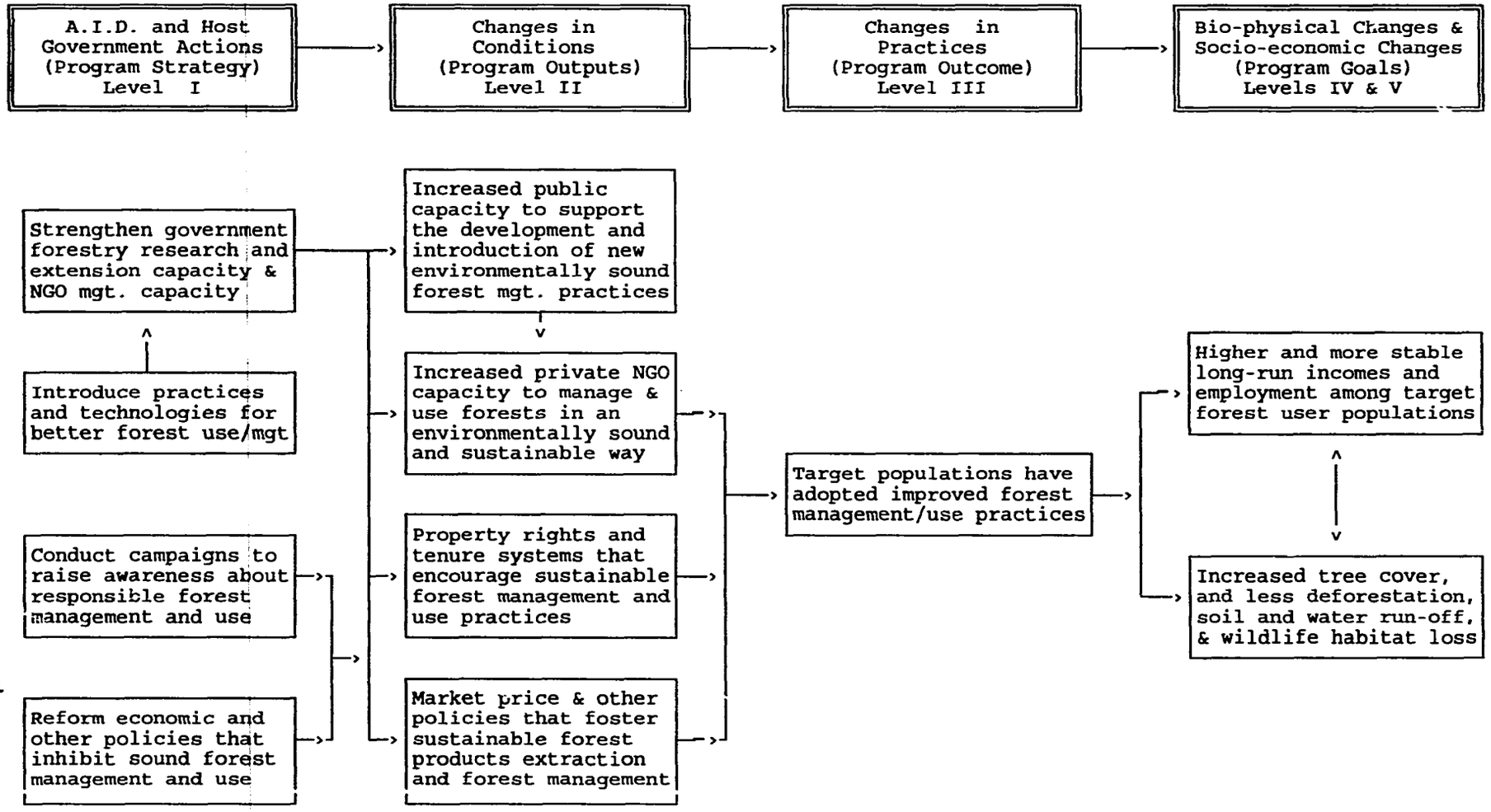
Impact - How much?

The assessment seeks to establish plausible association between USAID program strategies or activities and changes in environmental quality, natural resource management and socio-economic well-being. In answering the first question, "Did USAID make a difference?", the assessment has attempted to document what happened or can be expected to happen. In Mali the evaluation has gathered and examined "impact" information to determine whether USAID projects accomplished their goals of increasing sustainable local forest management. The evaluation examines the relationships between environmental impact and USAID program strategies using a five-level analytical framework. (Figure A-1.)

In the analytical framework, Level I lists the "**program strategies**" that USAID and the host government employed in implementing social forestry programs receiving USAID support. These strategies include: building community level research, training and extension institutions, introducing new sloping agriculture lands, fostering awareness and formulating public policies that support local forest management.

At Level II, "**program outputs**" are the conditions that have resulted from implementing these strategies. They include: the staffing and equipping regional forestry officers, new training curricula, newly formed local NGOs, new tree species, and management practices identified as sustainable, and changed policies and regulations affecting locally managed forests.

Figure A-1: Framework for Assessing the Impact of USAID Forestry Programs



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The Level III "**program outcomes**" resulting from changes in Level II conditions are the adoption of forest management practices by target populations.

Level IV and V "**program goals**" constitute the biophysical and socio-economic changes resulting from the adoption of Level III program outcomes or practices. Level IV and Level V goals can be viewed and mutually supportive.

For the purposes of the evaluation, Level IV "**bio-physical goals**" are the specific environmental objectives of the program being assessed, e.g., increased tree cover, and less deforestation, soil and water run-off, and wildlife habitat loss.

Level V "**socio-economic goals**" include sustainable increases in income, employment, and overall well-being of program participants. 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 indicator of positive socio-economic impact.

Performance: How well?

In answering the second question, "How?", CDIE's primary concern is the **efficiency, effectiveness, sustainability** and **replicability** of the 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 USAID and host government program investments to which benefits can reasonably be attributed. Because benefits occur into the future, their anticipated value must be annualized, adjusted to net out all costs incurred, and expressed as a discounted present value to compare to project investments.

To assess program **effectiveness**, the evaluation examines how well project sponsored technologies and services (e.g., training) are reaching intended target groups and whether there is equity or bias in access by participating target groups. Effectiveness indicators include trends in the patterns in delivery of services according to the make-up of target groups (e.g., 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 USAID assistance continue or will they be reversed? Will target participants continue to employ newly introduced (Level III) practices? Will new (Level IV) forest management systems thrive over the long-run? Will increased (Level V) incomes, profits and jobs continue after USAID and host government support is withdrawn? Evidence of sustainability includes the continuation

of activities, regulations, price structures and institutions beyond the termination of USAID technical and financial assistance either on their own "internal" momentum or with host government or with other donor assistance. The principle measure of sustainability is the number of beneficiaries continuing to employ project promoted practices after USAID support had ended and the nature of added government and donor support provided USAID initiated activities. Indicators of bio-physical sustainability include trends an inventory of tree species and soil quality in target areas including evidence of any pest damage or effects of soil or water deficiency.

To determine the **replicability** the evaluation examines whether conditions and practices, promoted by the 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 USAID 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 USAID 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 the field, 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 prepared by other donors as well as USAID. Because acquisition of primary data was also called for, the assessment team also visited a number field sites to make visual confirmation of changes that have occurred since USAID support began and to conduct key informant interviews as part of its primary data collection.

The extent of forest management was determined for each of the field sites which the evaluation team visited. "Adoption" rates were calculated on a four-point qualitative scale of ranking

compiled from four qualitative criteria. The criteria are:

- Share of community members participating in social forestry.
- Share of potential hillside areas in project forests.
- Degree to which forest management practices were followed
- Degree to which forests were generating benefits (e.g. revenues, products).

The evaluation team collected data from farmers at the ten sites to examine how extensively they adopted and how well they executed erosion containment practices and adopted soil fertility enrichment techniques. The evaluation examined possible determinants across the ten project sites for their relationship with rates of adoption based on project reports, site visits, an interviews with key staff and farmers.

The field sites varied in physical features and socio-economic conditions as well as in the level and composition of program interventions aimed at fostering adoption. Physical features and socio-economic conditions examined at each site include:

- Physical features
  - Rainfall patterns and rainfall levels
  - Soil acidity
  - Degree of erosion and slope
  - Amount of nearby uncleared forest or uncultivated lands
- Socio-economic conditions
  - Land access and tenure
  - Farm size and farm fragmentation
  - Availability of family and local labor
  - Employment opportunities in lowland cultivation and off-farm labor markets
  - Degree of social cohesion and sense of community

The evaluation was able to control for most of these physical features and socio-economic conditions by selecting ten sites for analysis here that were relatively homogeneous in these features.

APPENDIX B

PERSONS CONTACTED

USAID/Washington

Barnes, Carolyn	CDIE/E/SPS PRISM
Cashion, Jerry	AFR/EA (Former USAID/Mali Evaluation Officer
Church, Phillip	CDIE/E/POA, Assessment Manager
Darkins, William	AFR/SWA Acting Deputy Director
McGahuey Michael	AFR/ARTS/FARA, Agriculture/Natural Resources Officer
Mitchell, Marian	FEWS Project Field Coordinator and Social Scientist
Olson, Craig	ETS Contract Project Manager
Pryor, Anthony	AFR/ARTS/FARA, Agriculture/Natural Resources Economist
Sowers, Fred	CDIE/E/POA, Environment and Natural Resources
Wisler, Carl	CDIE/E/POA ETS contract evaluation Specialist
Young, Mary	CDIE/E/POA ETS contract natural resources specialist

USAID/Mali

Bilodeau, Dennis	ADO, OHVN Project Manager
Camara, Amadou	ADO, Agricultural Economist
Dagamaissa, Abdoulaye	ADO, Village Reforestation Project Manager
Dembele, Augustin	ADO, Farming Systems Research Project Manager
Duarte, Victor	Program Economist
Fofana, Mamadou	GDO/IPM and Locust/Grasshopper Assistance
Getson, Alan	Deputy Mission Director
Kibreab, Tadesse	ADO, Farming Systems Research Project Officer
May, Charles	ADO. Agricultural Economist
McDOnald, Wayne	ADO, Natural Resources Management
McIntyre, Catherine	Acting ADO
Poulton, Robin	GDO, PVO CO-Financing Project Manager
Tripper, Ellen	GDO contract consultant, Forestry Law Revision

CLUSA- OHVN

Diabata, Fousseyni	Assistant, Ouelessebougou Sector

DRSPR(Farming Systems)Mopti

Berthe, Abou	Director

Forestry Service (Eaux et Forets) Bamako

Berthe, Abou Laminu	Assistant Director
Coulibali, Lassana	Director, Division for Conservation of Soils and Water, Supervisor of VRP, President of the Commission for the Revision of the Forestry Codes
Kone, Amadou	National Director of Forestry and Fisheries

Forestry Service (elsewhere)

Ndiaye, Seydou	Regional Director, Region V (Mopti)
Kone, Bather	Co-Director, VRP (Mopti)
Kokaina, Mamary Tidiani	Technical Superviso, VRP, (Mopti)
Diallo, Omar	Nursey Manager, (Fatoma/Mopti)
Timbo, Soumana	Forestry Service Chief (Djenne)
Frontao, Boubakar	Extension Agent, Forestry Service (Fatoma/Moussawel)
Komota, Mamadou	Forestry Service Chief (Bandiagara)
Dembele, Moussa	Forestry Service Chief (Mopti)

Others in Mopti

Amadou Abdoulaye Balobo Maiqa	Governor, Region V

PNLCD(Lutte Contre da Desertification)

Bengaly, Porna Sinaly	Chief of Evaluation Unit

IER/Bamako

Boughton, Duncan	Agricultural Economist DPAER
Diambele, Lassine	Assistant Director General and Seed Specialist
Teme, Bino	Head, DSPRA (FSR) and Agricultural Economist
Tossi, Harouna	Head, DRFH, Forester

Ministere du Developpement Rural (MDR/Bamao)

Toll, Oumar	Technical Advisor
Traore, Moussa D.	Director of Cabinet

Operation Haute Vallee (Bamako)

Coulibaly, Amadou	Chief, Statistics and Evaluation
Coulibaly, Seydou	Assistant Director General and Seed Specialist
Sidibe, Cheikne	Head, DSPRA (FSR) and Agricultural Economist
Toqola, Yaya	Head, DRFH, Forester

OHV (Outside Bamako)

Djiarra, Lassine	Chief of Sub-Sector, Ouelessebougou

World Bank

De Jou, Chantal	Country Economists for Mali and Niger
Sow, Alassane (Pap)	Economist, Agriculture Division, Africa Region

Peace Corps, Mali

Keita, Fafaren	Assistant Peace Corps Director
Craiq -	Peace Corps Volunteer, Gono,Douentza Cercle

AFRICARE

Barnes, Jeff	Country Representative, PVO Co-Financing Project

CARE/Bamako

Steinberg, Doug	Assistant Director, PVO Co-Financing Project, NRMS PVO project

CARE/Djenne

Doumbia, Yaya	Coordinator and Horticulture Advisor
Kiabou, Famakan	Financial Officer

CCA/ONG, Bamako

Dakouo, Jean	Project Officer
Sinaba, Massaman	Permanent Secretary

Near East Foundation, Douentza

Boucoum, Amadou	Coordinator, NEF/Douentza
Djallo, Yamogo	Legal Advisor, NEF/Douentza

Save the Children, Bamako

Laugharn, Peter	Assistant Director, PVO Co-Financing Project Activities
Sidibe, Issa	Program Coordinator, Bamako

Kaban Village/OHV south

Sammake, Bakari	Chief of the Village association
Traore Yacouba	Extension assistant

11 other members of the village association, agriculture and environment committees

Region V

Traore, Adama	Private nursery owner, Fatoma cercle
Togo, Engelou	Entrepreneur and tree planter Fatoma cercle
President	Women's association, Moussawel village, Fatoma cercle
2 other members	Women's association, Moussawel village, Fatoma cercle
Village elder	Representative of elders' association, Moussawel, Fatoma Cercle

8 other men Moussawel village, Fatoma Cercle

Guido, Yussuf	Chief of Village Association, Tougoume village, Bandiagara Cercle

15 other men Tougoume Village, Bandiagara Cercle

2 Women Tougoume Village, Bandiagara Cercle

Djiguiba, Korka	Private Fruit Orchard proprietor. Kori-Kori Village, Bandiagara Cercle
Mme Tata Tiento	Nursery operator/farmer, Soumatogo village, Djenne Cercle
Hamidou Djarra	Master Farmer, Soumatogo village, Djenne Cercle
Agoiba, Hamma	Private Nursery Operator/farmer Gono Village, Douentza Cercle

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