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MID-TERM EVALUATION OF
MALI A.I. PROJECT 625-0937 09
VILLAGE REFORESTATION

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USAID/BAMAKO AND THE GOVERNMENT
OF THE REPUBLIC OF MALI

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SUMMARY

The Village Reforestation Project (A.I.P. 625-0937) is centered in Mopti and Bandiagara cercles of the 5th (Mopti) Region of Mali. The project is innovative in that it is the first attempt in the Sahelian zone (rainfall 400-600 mm annually) of Mali to carry out a project in village silviculture. Initiated in June 1981 with a proposed duration of 5 years, the project's goal is to contribute to the rehabilitation of Mali's renewable resource base and thereby improve and protect the well-being of the rural population. Village level reforestation interventions provided for under the project will also contribute to the GRM's efforts to check the current trend toward environmental degradation marked by loss of natural vegetative cover and its wildlife habitat together with accelerated soil erosion.

The project, which is basically demonstrational and experimental in its objectives, includes establishment of tree nurseries in each of Mopti, Bandiagara and Djenne Cercles and under the direction of Malian personnel of the Direction Regionale des Eaux et Forets (DREF). Other interventions with active involvement of the beneficiaries (villagers) include plantings of experimental and demonstration plots; village woodlots (primarily for firewood); shade trees for schools, private courtyards, streets and market places; also tree plantings for soil fertilization, erosion control, windbreaks, living hedges and food (fruits).

The present evaluation of the project was made by a joint 5-man American-Malian team of specialists in economics, sociology and forestry to review progress on the project during its first 2 years of life and to recommend modifications to improve the quality of project outputs during the remaining 3 years of the project. Recommended modifications include (1) a phasing down of emphasis on village woodlots as those are not considered to be economically or socially viable;

(2) increased emphasis on tree plantings for soil fertilization, erosion control, shade and other amenity uses; (3) increased training of Malian personnel assigned to the project in technical management, animation and vulgarization (extension work) in villages; and local cost accounting of operations by function and objective for technical and economic analysis.

1. INTRODUCTION

1.1. General Background

As has been pointed out in a recent report by CILSS (May 1982) forest and forest products serve many functions in Mali essential to the social and economic well-being of all sectors of the population. These functions include domestic uses (fuelwood for cooking and heating, traditional foods and medicines); agricultural uses (nitrogen fixation, soil fertilization, forage for livestock and domestic animals); cottage industry (charcoal for energy needed in brewing, forging, tool and pottery making); larger industry (breweries, bottling, cigarette and brick making, etc.); esthetic uses (shade for schools, private courtyards, streets and market places); and ecologic uses (habitat for wildlife and soil erosion control).

1.1.1. Yet since the prolonged drought of 1968-1973, the forests of Mali have come under increasing stress. The rapid population growth (2.6% increase per year) leads to accelerated land clearing for farming, to overgrazing and excessive branch cutting for livestock feeding, and tree cutting for construction and fuelwood. As a result of these pressures there is strong current trend toward environmental degradation marked by progressive loss of the natural vegetative cover and its wildlife habitat, together with accelerated soil erosion. This trend has recently been aggravated by a series of years of below-normal rainfall which have diminished the natural regenerative capacity of the vegetative cover. To check the degradational trend and to recover in some measure its forest capital the GRM, through the Direction Nationale des Eaux et Forêts (DNEF) and other agencies, is presently embarked on some 15 projects of forest interventions with primary objectives in research, commercial silviculture, village silviculture, or mixtures of all three. Mali A.I. project 625-0937 - Village Reforestation,

with which this report is chiefly concerned, is one of those in the village sylviculture category.

1.2. Project Description

The overall goal of the Village Reforestation Project is to contribute to the rehabilitation of Mali's renewable resource base and thereby improve and protect the well-being of the rural population (Project Paper). To achieve this goal (1) tree nurseries (pepinieres) have or are being developed in each of the Mopti, Bandiagara and Djenne Cercles of the Fifth (Mopti) Region; (2) forestry personnel of the DNEF community development agents and Peace Corps Volunteers have been assigned to the project at the cantonnement level; (3) some experimental and demonstration plots and village level woodlots have been established or are under development in Mopti and Bandiagara Cercles. Provision was also made from a data collection and periodic reporting.

1.2.1. Once the above infrastructure is fully operative and with an AID grant of \$655,000 (\$495,000 original plus \$160,000 supplemental) available over a 5-year term, it was proposed to establish community woodlots (bosquets) in approximately 10 villages per year with the active participation of the beneficiaries together with interventions in individual tree plantings along roads, in schools and private courtyards and in market places as well as windbreaks, field and boundary plantings and live fences (hedges). To conserve fuelwood a small number of improved stoves would be built and tested in villages. Although the Project Agreement between the GRM and USAID authorizing the project was signed in September 1980, the funds necessary for implementing the project were not released until June 1981, which thus becomes the effective starting date of the project with a termination date now projected in July 1986.

1.3. Present Project Evaluation

The present mid-term evaluation is that called for in the Project Paper at the end of the first 2 years of the project life. The scope of the evaluation, however, was considerably more elaborate than that identified in the Project Paper because it is anticipated that the present Village Reforestation Project may be reoriented toward different objectives. The present team was asked to carry out not only the evaluation of the existing project but also the formulation of proposals for the institutional, social, economic and technical requirements of an expanded project in the Mopti Region.

1.3.1. This report presents the results of a field and office evaluation of the current status and progress of the Village Reforestation Project during its first 2 years of life. The work was carried out by a team composed of an institutional specialist, an economist and a forester, provided by the International Science and Technology Institute, Inc., Washington, D.C. under contract to USAID; a Malian forester of the DNEF and a Malian sociologist on detail from B.E.C.I.S. Logistic support for the team was provided by the USAID project manager and his Malian coordinating officer. Early work in evaluation included reviews of antecedent documents related to the project and also interviews with USAID/Bamako personnel; the Director, Associate Director and Division Chiefs, DNEF; the Director, PIRT and the Associate Director, INRZFH; and the Director, CARE, Mali. Field work on the evaluation included interviews with the Governor, Fifth Region; the Chiefs of the Mopti, Bandiagara and Djenne Cercles; the Regional and Cercle Responsables of the UDPM; and the Regional Director, Fifth Region and Cantonement Chiefs, DREF of the same cercles. Other interviews were held in the directorates of the Operation Mils Mopti (OMM), the Operation Riz Mopti (ORM), and the Operation de Developpement de l'Elevage Mopti (ODEM) at Sevare. Inspections were made of the

three project nurseries in each of Mopti, Bandiagara and Djenne Cercles as well as of representative woodlots, demonstration and experimental plots and individual tree plantings in schools, courtyards and market places. Also visits were made to some 14 villages in the Mopti and Bandiagara cercles where discussions were held with villagers, on various economic, social and technical issues related to the project.

1.3.2. The field work on the evaluation covered a 10-day period between June 9 and 19, 1983 during much of which time the evaluation team was accompanied by the Regional Director and/or other DREF personnel assigned to the project. Also during this period numerous informal discussions were held among the project personnel and the evaluation team members on economic, social and technical aspects of the project with formal critiques by the evaluation team with project personnel on completion of tours in each of the Mopti and Bandiagara cercles. At all times the discussions were lively and the critiques of the evaluation team were received in an open-minded and cooperative spirit. For this and all the support and hospitality received from the chief of the project, project personnel and others, the evaluation team expresses its gratitude and best wishes for a successful completion of the project.

1.4. Methodology of the Evaluation

After collection and review of existing data and reports available at the DNEF, the USAID and in the Project Manager's office and various meetings and discussions (see 1.3.1.), the evaluation team began actual field work which was carried out in three ways:

1.4.1. Sampling

At each of the two stations (Mopti and Bandiagara) of the project identical sampling procedures were followed. The sampling was conducted in three phases.

First, all the villages already included in the 1981-82 campaign were visited. Then a representative number of those villages proposed for extension actions under the project during 1982-83 were visited. Finally, in order to obtain as representative sample as possible, visits were made to villages which had already been contacted for interest in participation in the project but not retained because of specific constraints or lack of motivation.

The sampling method cited above permitted: verification of the impact of the project through those activities carried out in 1982-83; and decision as to the acceptability and reproducibility of the project in new villages.

A total of 15 villages were visited of which 7 are in Mopti Cercle and 8 in Bandiagara Cercle. The breakdown in the overall sampling is shown below:

	<u>GROUP I</u> Villages where project is already operating	<u>GROUP II</u> Villages to be included in the 1982-83 campaign	<u>GROUP III</u> Villages not retained in the project	TOTAL
Mopti Cercle	Sampara, Manako, Diambadougou, Fatoma (4)	Peressougou, Daladougou (2)	Jakouti (1)	7
Bandiagara Cercle	Daukombo, Kokolo, Diambalole, Daudoli Kor-Kori (5)	Dioumbioulou, Tentenboulou (2)	Golokoundo (1)	8
TOTAL	9	4	2	15

1.4.2. Collection of Data

Sociologic data were collected through qualitative inquiry whose objective was to disclose the village behavior patterns and to propose hypotheses to explain the opinions, attitudes, and aspirations of the villagers or obstacles to change. The sociologist led discussions among the villagers on themes which had been

previously identified as being of interest to the project. To minimize the effects of large groups, an attempt was made in each village to limit the number of participants. Supplemental meetings were especially organized with participation of women in those villages where this was possible.

Technical data were collected in visits to nurseries and experimental plots during which questions were asked of the nursery chiefs, the station chiefs and the project director. Visits to the village woodlots, shade trees, roadside plantings, etc. were made in company with the extension agent. At village woodlots the foresters made sample inventories of dead vs live seedlings, surface areas planted, percent of success, work schedules, state of development of plants, methods of planting, spacing and depth of planting holes, species used, nature of the soil, dates of planting and replanting, enclosures (protection), watering, possibilities for expansion of areas of planted, intercalary planting with other crops, and cultivation patterns.

Economic data were collected by the economist while working both with the sociologist and the two foresters. With the sociologist he collected qualitative information on village labor systems and their constraints. With the foresters he concentrated on the economic feasibility of village reforestation interventions particularly the village woodlots.

1.4.3. Critiques of Project Activities

After visits and inquiries, the evaluation team held formal critiques at Bandiagara and Mopti with project personnel and the project chief on the sociological, economic and technical aspects of project activities. Complementary information was provided by project personnel and suggestions were made by the evaluation team to improve project operations.

2. ADMINISTRATIVE AND INSTITUTIONAL EVALUATION

2.1. Extent to Which Project Objectives are Defined

In the Project Paper objectives are not clearly defined as to quantity and quality of outputs, the methodologies to be employed, and the planning of specific actions to be undertaken under the project. This deficiency has made execution of the project difficult as the Malian forestry personnel at the working level still do not understand clearly the objectives of the project. To remedy this situation the evaluation team recommends frequent informal meetings among the station chiefs, the nursery heads, the extension agents and Peace Corps Volunteers Bandiagara and Mopti Cercles for exchange of views on project progress and problems, potential solutions, and opportunities for new departures. Such meetings might be held at monthly intervals. The station chief of the Djenne Cercle should be included in these meetings from time to time, as he now operates in almost total isolation.

2.2. Institutional Structure of the Project

The present institutional structure of the project impedes the decision-making process in attaining project objectives. Thus those at the working level (station chiefs and below) do not have (or do not perceive that they have) responsibility for the planning, organization and execution and wait for directives, from a higher administrative level or, more often, content themselves with the guidelines provided by the Project Paper. The evaluation team recommends the station chiefs and below be given clearly defined authorization and responsibility for making decisions directly effecting day-to-day field operations.

2.2.1. The evaluation team commends GRM and USAID for having set up the project in the "line" of on-going DREF activities rather setting it apart as a separate activity. As a line activity it provides an excellent mechanism to deliver

essential training in the management, technical and extension skills needed by DREF personnel in social forestry.

2.3. GRM Project Administrative and Management

The evaluation team notes that all the GRM administrative and management personnel directly concerned are well-informed and well-aware of the scope and purpose of the project. As the project is basically experimental and demonstrational, it would have been better to have a simpler, more flexible administrative structure so that decisions can be made in an efficient and timely manner and as close as possible to the point where action is required.

2.3.1. The evaluation team notes that there is presently no Technical Associate (Adjoint Technique) assigned to work with the Regional Director Fifth Region, even though such associates are commonly assigned in other regional offices elsewhere in Mali. In this regard the evaluation team strongly recommends that a Technical Associate be assigned to the Fifth Region and that the technical direction of the project be placed under his surveillance. Such a move would serve to improve control over the technical quality of the project outputs and also relieve the Regional Director, who already has heavy administrative responsibilities over DREF activities elsewhere in the Fifth Region.

2.4. USAID Project Management

USAID has, thus far in the project history, emphasized administrative and financial accountability but too little attention has been given to the technical quality of project operations. As the project emphasizes experimentation, demonstration and extension, the evaluation team recommends increased USAID inputs of technical assistance. This could take the form of short field or on-site seminars by short-term expatriate and/or Malian experts in social forestry, knowledgeable

in the technical problems of small-scale tree nurseries and the management of experimental and demonstration plots. Ideally repetitive visits by the same expert(s) would assure continuity and consistency of results.

2.5. Collaboration Between DNEF, DREF, USAID and Peace Corps

Collaboration between USAID, DREF and Peace Corps personnel at the Regional, Station (cantonement) and lower levels appears to be excellent. Also collaboration between DNEF and USAID at the national level is excellent. Between USAID and the Peace Corps at the national level collaboration appears to be tenuous.

2.5.1. The collaboration between USAID and DNEF leads inevitably to joint management and joint decision-making in the project. This arrangement also leads to delays in responding rapidly and effectively to critical and/or time-dependent needs in a project located 650 Km from Bamako. The evaluation team notes that unforeseen delays have occurred from time to time as a result of co-direction of the project.

2.6. Efficiency of Systems of Intercommunication

Mechanisms exist within the DNEF for communication and coordination with other forestry projects in Mali. (There is, for example, a periodic report of activities released by the DNEF). However, the Village Reforestation Project at the field operating level does not appear to receive technical information from other DNEF village reforestation projects such as the Project pilote de Reboisement Villageois de Fana-Koulikoro; the Project Forestier de la Region de Sikasso (volet 4), or the Project de Reboisement-Kayes, for example. The evaluation team recommends that greater efforts be made to assure an active lateral dissemination of technical information between projects with comparable objectives within DNEF, particularly by its Division de Conception Projet et Programmes and its Subdivision de Reboisement et Amenagement.

2.7. Administrative and Technical Monitoring

Periodic DNEF-AID missions carry on-out site visits and make cogent observations and suggestions. However, these critiques have mostly been made by persons based in Bamako and there is little evidence that the critiques have been followed up by tangible improvements in field operations. This again is another argument for stronger control over the technical quality of project operations through a Technical Associate (Adjoint Technique) at regional level. (See item 2.3.1, this section.)

2.8. Efficiency of Personnel Utilization

The DREF and Peace Corps personnel assigned to the project are young and inexperienced. The Community Development Agents (on detail from the Ministry of Agriculture) and the Peace Corps Volunteers are doing a particularly effective job in animation and vulgarization (extension) in the villages. The CDAs were not fully trained, as proposed in the Project Paper, but are nevertheless learning as they go along. There is evidence, however, that further on-site training of the technical personnel assigned would be desirable as suggested in item 2.4.

2.9. Allocation and Use of Financial Resources

As far as can be judged the project personnel are using all the financial resources available to the project including construction, commodities, training and operating expenses. There is a need, however, to develop a cost accounting system, at project field level, that can be used for economic analyses as well as the technical efficiency of various project components by function and objective. This is further discussed in the Economic and Technical Evaluations.

2.10. Allocation and Use of Physical Resources

The physical resources of the project are used to their capacity but not always properly. (For example, quite often seedlings and other materials must be

transported to villages by mbylettes because the project pickup trucks have been diverted to other non-project uses.)

2.11. Procurement Procedures

The procurement procedures for the project are long and slow as most replacement parts for vehicles and mbylettes, nursery supplies, office and extension equipment, etc. must be procured in Bamako. Two "Bourga" handpumps for the Fatoma and Bandiagara nursery wells were procured from a local manufacturer in Mopti. Though of somewhat clumsy construction, the pumps seem to stand up well under active use. They have been maintained by an ODEM mechanic at Sevaré. Fuel and lubricants for vehicles are obtained locally.

2.12. Project Reporting System

An elaborate system for project reports is provided for in the Project Paper (see PP, pages 46-49) including monthly, quarterly and annual reports on technical, administrative and financial aspects of the project. While most of these reports have been faithfully submitted by those responsible, the reports are largely descriptive and make little or no effort to analyze or interpret the significance of the results obtained.

2.13. Ability of Project Management to Utilize Reports

Because there is little evidence that the reports being made and the data being collected in the project are being analyzed or interpreted, there is evidently little use being made of these in management decisions. The fact remains, however, that if the reports and data being collected were analyzed and interpreted, the management's perception of the project and the quality of its decisions could be improved. The quality and needs for reports are discussed in more detail in the Technical Evaluation.

2.14. Management Training of Project Personnel

At the DREF level there is need for improved project management. With respect to the station chiefs' additional training leading to enhanced capability for analyzing the technical and economic efficiency of project operations is very much needed. This is further discussed in the Economic and Technical Evaluations.

2.15. Project's Construction Component

Construction on the project is behind schedule. At the Fatoma nursery wire fencing with a gate are completed as are the two banco buildings called for in the Project Paper. However, the storeroom which is used for nursery cultivating implements and supplies has not yet been equipped with shelves and hooks for separating and sorting these. At the Bandiagara nursery the wire fencing is complete but a gate has not yet been constructed. Construction on the two buildings called for in the Project Paper has not yet begun so nursery tools and supplies are stored in a temporary mat shed. The lack of well-organized and permanent storage facilities for nursery implements and supplies has doubtless had a negative effect on the efficiency of operations. This problem is discussed more fully in the Technical Evaluation.

3. FINANCIAL AND ECONOMIC EVALUATION

3.1. General Economic Considerations

3.1.1. The ecological and economic importance of trees to the Sahelian region, and to Mali in particular, have been well documented. The Government of Mali has only limited, and clearly insufficient, means to stem and reverse the process of deforestation. Thus in 1983 domestic funds for all forestry and water resource activities amounted to some 1,400 million FM, that is, at less than US \$2 million at current exchange rate (\$1 = 750FM). Of this amount 526 million FM came from

budgetary allocations, 659 million FM represents the estimated receipts and expenditures of the self-financing Forestry Fund, and the balance the estimated regional expenditures.^{1/}

TABLE 3.1

Budgetary situation of the Direction Nationale des Eaux et Forets, 1983
(in '000 FM)

	Proposed ^{2/}	Actual ^{3/}
Personnel Budget	498,000	481,000
Operating Budget	452,000	45,000
Forestry Fund	650,000	*
Regional Expenditures	**	224,000***

Notes:

* The Forestry Fund is self-financing; The Fund's expenditure level depends on the actual receipts.

** Regional budgets are not available at the Direction Nationale level.

*** Estimated on basis of incomplete information; See footnote 1.

^{1/} Category C and D personnel and temporary laborers working in the Regions are paid out of regional funds. The latest available figures are for 1982, in which year regional expenditures for the whole country (except for Koulikoro and Sikasso, which failed to report) amounted to 134 million FM.

^{2/} DNEF program submitted to the Ministry of Finance.

^{3/} Budget approved by parliament.

3.1.2. As will be noticed, budgetary allocations for operating purposes are extremely low, amounting to less than 10% of the personnel budget. The situation is slightly alleviated by a 90 million FM Forestry Fund allocation for operating purposes (1983 budget). This allocation is mainly used for the purchase of gasoline and of spare parts. Nevertheless, the situation remains critical. Investment funding is more readily available. In 1983, the Forestry Fund allocated 262 million FM to investment in plant and equipment, and 211 million FM to natural resource development. This latter category includes such activities as forest protection and management, nurseries, industrial forests and fishery development.^{1/}

3.1.3. As of 1983, 73% of the personnel budget (351 million FM) was allocated to the regions, of which the 5th Region received an estimated 47 million FM. However, of the operating budget only 33 percent, that is 14,7 million FM, was allocated to the regions. The operating expenses allocation for the 5th Region is estimated at 1,900,000 FM.^{2/} The eight cantonnements each received only 30,000 FM per quarter to cover all their non-personnel operating costs. It goes without saying that such minuscule allocations severely hamper the forestry service's activities.^{3/}

^{1/} The remaining budgetary categories are personnel expenditures, 37 million FM, operating expenditures (as previously mentioned) 90 million FM, and miscellaneous 50 million FM. This last category includes such items as library expenses, prizes for the best village woodlot, etc.

^{2/} Amounts actually allocated per region are not available as of this writing. We know, however, that the 1983 DNEF budget proposal included 244 million FM for all regional purposes and that the budget, as approved by parliament amounted to 14.7 million FM, that is, 6% of the amount requested. The request for the 5th Region was for 29 million FM. Assuming that the region received the same percentage of the request as all regions taken together, we obtain the 1,900,000 FM.

^{3/} The gap between DNEF budget allocation request and the actual budget reflects the overall financial stringency facing GRM.

3.1.4. The evaluation team was very favorably impressed by the ability of the DNEF to carry out its various activities despite the severity of the financial constraints. It is also eminently clear to us that with better financing the service can improved its performance and enlarge the scope of its activities. With proper design there is, therefore, large scope for constructive aid.

3.2. Economic Premises of the Village Reforestation Project

3.2.1. The Village Reforestation Project in the Mopti and Bandiagara Cercles was conceived not as a commercial venture, but as a socially beneficial program. The implicit assumption was that reforestation would be profitable to villagers if they were given subsidies in the form of seedlings and of technical know-how. Village reforestation was expected to bring benefits to other sectors of the community large enough to outweigh the cost of the subsidies. If these conditions were satisfied, the project would be beneficial to the country even without external financing, and it could continue in the future without such aid.

3.2.2. The Project Paper contains only a cursory economic analysis: at the time the project was undertaken, the relevant data were few and unreliable. Indeed, one of the explicit purposes of the project was to generate information needed for the appraisal of costs and benefits of village-level reforestation activities.

3.2.3. Such figures as were presented in the Project Paper gave little reason to believe that the project, as originally designed, would profit the villagers. The claim was that village woodlots, the most important of the contemplated activities, would yield a 10 percent return on investment, which is lower than the 12% rate used to compute present values in the same paper. Thus, even if the figures are taken at face value, the village woodlots would fail to pass the cost-benefit test.

3.2.4. It appears, moreover, that the Project Paper calculations of village woodlot benefits have an upward bias, while cost calculations have a downward bias.^{1/} It seems, for instance, that the benefit calculations neglected the fact that a woodlot begins to yield firewood seven years after planting. Taking this delay into account and applying the 12% discount rate reduces the present value of benefits by one half. The calculation grossly overstated the village-level value of firewood. The benefit calculation, as stated on p. 10 of the Project Paper assumes that wood in villages may be valued at 67.5 FM/Kg. In the same report, on p.33 it is stated that firewood, as in 1980, was priced at 3.000 FM/stere, which, counting 270 Kg/stere amounts to 11.1 FM/Kg. This figure, as we verified in the course of our field investigation, appears to be more nearly correct than the figure of 67.5 FM/Kg. Moreover, it was unrealistic to assume, as was done in the original calculation, that the opportunity cost of the labor needed to cut firewood in the woodlot would be negligible or even negative: in all likelihood the cutting would be done by men whose labor, even in off-peak periods, commands a positive and non-negligible wage. Correction of any one of the above biases would show woodlots to be uneconomical from the village point of view.

3.2.5. The dubious profitability of the village woodlots raises the issue whether villagers should be induced to engage in activities of unproven economic value. One could claim, perhaps, that, insofar as participation is voluntary, the villagers are free to reject ventures which, to them, appear to be unprofitable.

^{1/} The Project Paper gives only a vague description of the calculations underlying the figures indicated in the text; some (but almost certainly not all) the points enumerated below might have, in fact, been taken into account by the authors of the proposal. Clearly, however, a basic error was made in computing the village-level value of firewood. The correction of just this one error shows that the proposed action was uneconomical.

This argument runs, however, counter the basic premise of this project, and of all rural extension work. This premise is that experts possess more knowledge than the farmers, and that farmers who follow the experts' advice fare better than those who do not. The farmers of Mali live close to the subsistence level and can ill-afford to take risks. Moreover, if they are given bad advice now, they will be less prone to follow good advice in the future.

3.3. Private Profitability of Village Woodlots^{1/}

3.3.1. Given the importance attached to village woodlots, we conducted a cost-benefit analysis of a woodlot program under several alternate technical and economic assumptions. Our methodology is consistent with Asif Shaikh's though the technical specifications are somewhat different.^{2/} For instance, Shaikh assumes that woodlots would be protected by a wire fence. The actual practice in Mopti and Bandiagara Cercles is to protect young trees with thorny branches - a less expensive method, which is reflected in our analysis. We also improved the accuracy of Shaikh's data by gathering information in the course of our field inspection.

3.3.2. The question which we addressed is whether under the best circumstances a village woodlot would be profitable to the villagers. We therefore assume (1) that an adequate terrain, with a nearby water source could be found; (2) that the planting of a woodlot would not reduce the area of adequate land available

^{1/} For a more technical description of the analysis, see Annex 3-1 at the end of the Financial and Economic Evaluation.

^{2/} Asif Shaikh et Patricia Larson, Les Aspects Economiques de la Foresterie Villageoise: Un Cadre Methodologique, AID Washington, D.C. The Shaikh - Larson paper is discussed in Section 3.1.7.

available for field crops, and that (3) good forestry practice would be followed. Our field inspection has shown that all three conditions are rarely, if ever, met so that woodlots are likely to be less profitable than shown in our calculations.

3.3.3. Our computations show that at current prices the discounted present value of the costs of a 1 ha woodlot equals 254,000 FM. With firewood priced at village level at 5,000 FM/stere the discounted present value of benefits is estimated at 173,000 FM. If tree watering is reduced to half the optimal level, or if it is entirely eliminated, the costs are substantially reduced, but so is the yield, and therefore the benefit, and the woodlot remains unprofitable.

3.3.4. If the relative price of firewood were to rise in the future - as it is likely to do - the benefits of a woodlot would be higher. However, even if the relative price of wood increased at 3% per annum - which means that wood prices, relative to other prices would more than double over the life of the project - a village woodlot would not pay for itself.

3.3.5. We also addressed the question of the value of annual output which would make a tree plantation profitable to the villagers. Our calculations indicate that a plantation would have to yield at least 71,000 FM worth of product per annum, starting with the 7th year, and continuing for 20 years. This means that the product per hectare should be almost three times as valuable as firewood. In other words, it is not profitable to plant trees with firewood as the main product. It might be profitable, however, to produce firewood as a by-product of a higher value tree crop.^{1/}

^{1/} See Technical Evaluation

3.3.6. We conclude that village woodlots are not profitable to villagers: the planting of such woodlots reduces, instead of improving, the villagers' well-being. It is therefore recommended that the village woodlot program be de-emphasized and phased out. It is also recommended that the possibility of producing firewood as a by-product of trees planted for economically more viable purposes be investigated, and that the approach be fostered at the village level.

TABLE 3.2*

Present value of costs and benefits of a 1 ha village woodlot

	<u>Cost/ha</u>	<u>Benefit/ha</u>	
		at constant fire- wood prices (5,000 FM/stere)	at prices rising at 3% per year
"Best practice"	254,000	123,000	173,000
Watered at 50% of standard	182,000	92,000	130,000
Rain-fed	110,000	-36,000	52,000

3.4. Economic Limits and Possibilities of the Project

3.4.1. It is estimated that a 3 ha woodlot is needed to provide firewood for a family of 10. A 300-person village would thus have to establish and manage a 90 hectare forest to meet firewood requirements. In most of the villages visited by our team no more than 1 to 3 has of suitable land could be located, and, in some, the areas were even smaller. It is unlikely, therefore, that the program could satisfy more than, say 3% of village needs. With village population growing at over 2% per annum, the program would, at best make marginal contribution to the solution of the fuel problem.

* For data and methodology, see Annex 3-1.

3.4.2. The project can, however, play a very useful economic role if the primary purpose is tree growing rather than firewood production. Even in the absence of "animation et vulgarisation" the demand for trees exceeds nursery production. Tree nurseries, if economically managed, can, therefore, satisfy a felt need, and increase social well-being.

3.4.3. The spread of technical know-how, involving the demonstration of methods of successful planting and care of trees can also be of great use. There is evidence that farmers in the Mopti-Bandiagara area do not have much expertise in tree culture and that could profit by being shown a better approach.

3.4.4. There is also room for introducing to the farmers new ideas, e.g., the use of trees to control soil erosion. These new ideas should be sound, from the farmers' point of view. The extension workers should shun propaganda; they should bring practical solutions to the farmers' problems. If they succeed in doing so, the project may prove to be socially profitable.

3.4.5. A further activity, calling for a longer time perspective, is to foster private, village-level, nurseries. Within the remaining time period available to the project, extension workers might devote part of their time to instruction on how to lay out and manage small, village-level private nurseries geared to produce, say, 500 trees. As an inducement a farmer who is willing to devote a small parcel of land and some labor to his nursery could be offered a guarantee that the project would purchase from him a certain number of trees at a price sufficient to cover costs (say 150 FM/tree). Such trees could be planted in a public space in the village. The nursery owner should be free to sell the balance of his crop or put it to his own use. The nursery owner would thus, in his own self-interest, become an advocate for tree planting and promote the cause of reforestation.

3.4.6. To finance the subsidy to the private, village-level, nurseries the project could raise funds by selling a set fraction of the trees produced in the Fatoma and Bandiagara stations to interested individuals and institutions. It is suggested that the possibilities and conditions of such sales be given serious attention. Subject to the Regional Director's approval each cantonnement should develop its own approach to commercialization.

3.5. Analysis of Project Cost

3.5.1. The original funding for the five year term of the project amounted to \$592,500, of which \$495,000 was contributed by USAID and the balance by the Government of Mali.^{1/} The Government grant covered staff salaries and the cost of land, while the USAID moneys were to be allocated for construction, purchase of equipment, operating expenses, salary supplements, and drivers' and workmen's wages.

3.5.2. From the original budget it is possible to make an approximate allocation of costs to (a) tree growing and extension work, and (b) experimentation. The cost of the latter component is estimated at \$32,000^{2/} the bulk of the expense (\$560,500) representing the cost of growing trees and of village extension work (Table 3.3.)

^{1/} In addition \$160,000 was granted by AID for the Djenne nursery.

^{2/} This estimate is made by allocating to experimentation the following budget items:

Tools for experimentation	\$ 872
Fencing of experimental parcel	2,556
20% of construction costs	14,034
20% of Peace Corps stipends	600
20% of office equipment costs	940
Wages of stipends of station (chiefs and technicians)	6,000
	<u>\$28,902</u>
Pro-rated salaries of station chiefs technical	3,100
	<u>\$32,002</u>

TABLE 3.3

Estimates of Recurrent Costs, Village Reforestation Project
(in U.S.\$, 1980 prices)

<u>Category</u>	<u>Amount Budgeted, 5-year period</u>	<u>Est. Useful Life (Years)</u>	<u>Annual Cost</u>
<u>Construction</u>			
Office & storage facilities	8,750	15	583
Well at nursery	11,000	20	550
Village wells*	50,000	20	2,500*
Reservoir	420	5	84
<u>Equipment</u>			
Four-wheel drive vehicles	34,000	5	6,800
Mobylettes	12,800	2 1/2	2,440
Light truck	10,600	5	2,120
Handpumps**	4,833	3**	967**
Tools for nurseries	10,610	2	2,122
Tools for experimental plots	872	2	174
Fencing-nurseries	7,568	10	757
Fencing-experimental plots	2,556	10	256
Fencing-demonstration plots	3,832	10	383
Office equipment	9,400	5	1,880
Extension work equipment	15,475	5	<u>3,095</u>
SUB-TOTAL			22,211

<u>Operating Expenses</u>			
Fuel	86,638		17,328
Salary supplements	37,500		7,500
Wages	55,500**		11,100**
Subsidy to Peace Corps	3,000		<u>3,000</u>
SUB-TOTAL			<u>36,528</u>
TOTAL (excluding village wells)			77,739

* Village wells were excluded from the calculation on the ground that in most cases villages selected for tree-planting have an adequate water supply.

** Handpumps are being used instead of the motor pumps foreseen by the project; additional labor is hired with the money thus saved.

Sources: Project Paper and estimates of handpump costs made by the Mission.

3.5.3. The original program foresaw a first year tree production of 20,000, second year production of 40,000 and 60,000 per year thereafter for a total of 240,000 over the five year period. It follows that the program called for a production cost per tree of \$2.36 which, at the then prevailing exchange rate was equal to 954 FM.

3.5.4. It is more meaningful, however, to consider the project as a going concern. According to the Project Paper the nurseries were supposed to produce at a rate of 60,000 trees per year. The recurring costs of the project can be computed by summing up current costs and the annual depreciation on plant and equipment. According to the budget, and without making allowance for inflation, the recurrent costs are estimated at \$77,739 per year. Of this, an estimated \$4,200 is for experimentation, and the balance for tree-growing and extension. Dividing this last number into the number of trees, we obtain the cost of \$1.23/tree, or 496 FM/tree, counting \$1 = 405 FM.

3.5.5. The cost per successful tree is a yet more important figure. Current experience shows a 50% success rate: 1 out of 2 nursery plants grows into a tree. The project cost per successful tree is, therefore, equal to \$2.45 or 993 FM at \$1 = 405 FM.

3.6. Information and Control

3.6.1. According to the Project Paper,

"The experimental nature of the project dictates the need for a vigorous data collection effort. Sufficient quality and quantity of data must be collected and analyzed to enable AID and GRM to make decisions and recommendations on the appropriateness and effectiveness of the project's approach to reforestation." (p.45)

3.6.2. To date the project has generated virtually no economically meaningful data. The survey used as an aid to help select the project villages is, from an economic point of view, poorly designed and poorly administered. No logbooks are kept pertaining either to work performed by the villagers on the project, or by project personnel. Most serious of all, the accounting system yields no economic data. We shall begin by discussing the last problem.

3.6.3. The current accounting system is as cumbersome as it is uninformative. Annual budgets are prepared by DNEF in Bamako, in consultation with the Regional office at Mopti, and coordination with AID. The budgets need dual DNEF-AID approval. Quarterly budgets are prepared in similar fashion; AID advances money to DNEF on a quarterly basis upon presentation of accounts for the previous quarter, while DNEF makes advances to the Regional office to cover expenses paid in Mopti. The DNEF quarterly report is supposed to present a consolidated statement of the previous quarter's expenses paid from the Bamako and the Mopti accounts. In practice the Mopti accounts reach Bamako with a time-lag: for instance the May 31, 1983 statement sums up the expenditures paid by the Bamako office from project inception through May 31, 1983 and expenditures made by the Mopti office from project inception through February, 1983. Thus with a triple accounting system (Regional office, Mopti; DNEF, Bamako; and AID) it is impossible even to get a consistent statement of expenses incurred as of any date.

3.6.4. Expenses are recorded by broad categories: construction, equipment, operating expenses, personnel training, and miscellaneous. No record is kept by type of activity. It is impossible, for instance, to find out what the cost of experimentation is or the cost of production. It is likewise not possible to compare the costs incurred on behalf of the two stations, Fatoma and Bandiagara.^{1/}

^{1/} For lack of such figures the analyses in this report had to be based for the most part on data given in the project 5-year budget.

3.6.5. There exists a record of answers to village questionnaires administered prior to the selection of project sites - a lengthy and complex questionnaire at Fatoma, and a simpler one in Bandiagara. We analyzed the Fatoma questionnaire and found it uninformative from an economic point of view. Most of the questions elicited vague, imprecise, unquantifiable answers. Moreover the polling method (interviews with the village chief or with a single group of elders) raises serious doubts about reliability of the answers. The doubts appear justified in the light of the answers, given by different informants, in a village which, perhaps, unintentionally, was surveyed twice. Table 4 gives a comparison of some of the answers to simple base-line questions.

TABLE 4

Some results of two successive surveys conducted in Niakongo in 1982 and 1983

	<u>Date of Survey</u>	
	<u>June 17, 1982</u>	<u>April 22, 1983</u>
Total number of inhabitants	615	170
Males	325	97
Females	290	73
Economically active population	300	147
Seasonal workers	35	20
Seasonal out-migrants	60	100
Area cultivated (mil & sorgho)	1,600 ha	155 ha

While there are no other examples of a village having been surveyed twice, internal evidence (e.g. ratios of economically active to male population) cast serious doubt on survey reliability.

3.7. Suggested Information and Control System

3.7.1. If the project is to yield data on the success or failure of village-level reforestation activities, it is essential to set up without delay a simple, yet adequate system of information.

3.7.2. A recent paper by Asif Shaikh and Patricia Larson provides a comprehensive guide to the collection and use of data pertinent to the economic analysis of village reforestation projects.^{1/} The paper discusses sources of information, and methods of imputing costs to inputs for which market prices are unavailable. The authors correctly point out the need for specifying the timing of inputs: the cost of labor in peak agricultural demand periods is much higher than the off-peak demand cost. To arrive a cost appraisal, it is, therefore, important to maintain a journal stating the timing of activities.

3.7.3. The paper discusses the distinction between private and social profitability of projects and points out (i) that only the socially profitable projects should be undertaken, and, (ii) to insure private participation, projects should be privately profitable.

3.7.4. The Shaikh-Larson paper provides an excellent guide for project appraisal at the planning stage. There is danger, however, in overloading a small, on-going project with excessive data collecting requirements. We propose, therefore, to introduce in the Village Reforestation Project an informational procedure consistent with, but simpler than, the Shaikh-Larson proposal.

^{1/} Shaikh, Asif and Larson, Patricia, Les Aspects Economiques de la Foresterie Villageoise: Un Cadre Methodologique, AID, Washington, D.C.

3.7.5. The basic organizational device is to keep records by type of intervention or activity. It is suggested that costs should be divided into the following categories:

- A. Cost of nurseries
- B. Costs of demonstration plots,
- C. Costs of village woodlots
- D. Costs of other collective plantings (trees in schools, public places, etc.)
- E. Costs of other plantings (field trees, individual compound trees, individual compound trees, etc.)
- F. Overhead costs

Distinction should also be drawn between (i) investment costs (purchase of inputs which last more than one year) and, (ii) current costs.

3.7.6. At the village level, records should be kept of inputs provided by the villagers, i.e. the number of man-days spent on various activities, the quantity (and, if possible value) of other inputs, if any. In recording the amount of labor used the type of labor (men, women children) and the date should be specified. It has been suggested that the books containing such records might be kept at the village, and the entries made by the extension agent, or by a villager actively engaged in the reforestation program.

3.7.7. At the cantonment level time sheets should be kept for every individual and every activity. There should also be vehicle logs, stating distances travelled by origin, destination, and time and distance travelled.

3.7.8. The division into basic categories should be preserved at the regional level. Purchases should be identified by station, and whenever possible, by purpose.

3.7.9. The design and operation of the system requires cooperation between a trained accountant and a forestry technician. It is therefore strongly recommended that a qualified accountant be included in the project staff at the regional level. The accountant could keep the books, and also conduct periodic cost analyses by activity, thus providing a much-needed and now missing check on efficiency and generating quantitative information on project effectiveness.

3.7.10. It should be noted that the system of analytic accounting outlined above is fully compatible with the AID system; it is simply a matter of coding the entries and of sorting. For a small project analytic accounts can be compiled by manual methods with the aid of a small calculator.

3.7.11. The consolidation of all financial activities and of accounting at the regional level would greatly simplify the system and lead to increased control and responsibility of the project head. Purchase in Bamako could be done through a purchasing agent, with all payments made by, and all moneys paid into, the project account at Mopti. The DNEF in Bamako could, of course, continue to provide overall guidance and participate in the formulation of annual budgets, but it would be relieved of the burden of accounting activities.

3.7.12. The system of record-keeping outlined above yields data on costs. Data on benefits can be obtained by attaching prices to output figures provided by the logbooks of project outputs. Given the small scale and the short span of the project, the assignment of benefit values and cost-benefit analysis might be relegated to the time of the final project evaluation.

3.7.13. In order not to overload the project with paperwork, it is suggested that all other information-gathering activity be reduced to the essential minimum. Selection criteria for sites should be carefully defined, and questions should be

confined to those essential for the selection process. A questionnaire, if one is needed, should be short, and the veracity of answers should be checked by independent questioning of several informants. A long questionnaire administered to a single group, which gives a collective answer, is useless.

ANNEX 3-1

Cost-benefit analysis of a village woodlot

We consider the costs and benefits from a 1 ha village woodlots which yields 5 steres of firewood starting at the end of the 7th year, and for 20 years thereafter, at which time complete replanting is required.

We assume that labor is the only scarce input, and that the tools used for staking, holing, fencing, and weeding are those which would be used in the cultivation of 1 ha of millet. We ignore the cost of implements for watering and wood cutting, hence our calculation gives a slight downward bias to our cost estimates. We also assume that land has zero opportunity cost, i.e., that its withdrawal from (potential) agricultural use does not diminish the village's ability to produce food. In villages where agricultural land is scarce, and in which, for technical reasons, a woodlot cannot be planted on land unsuitable for farming, the loss of farm output due to land withdrawal constitutes an additional cost item.

We estimate that the process of preparing, planting and first year maintenance of a 1 ha woodlot takes 123 man-days, of which 20 or 21 man-days fall within the peak season of demand for labor in millet cultivation. The cultivation of 1 ha of millet takes, according to the Operation Mil, 61 man-days of which 21 days fall within the peak demand period. Since, in peak demand periods, labor is fully occupied in the fields, the planting of a 1 ha village woodlot entails a 1 ha reduction in millet cultivation for one year, or its equivalent. Notice that we do not assume that the woodlot occupies land that would otherwise be sown in millet, but merely that the labor used in preparing and planting the

woodlot could be used in millet cultivation, hence the value of the millet crop foregone is the relevant opportunity cost.^{1/} According to Operation Mil, a 1 ha village plot of millet yields, on the average, 600 Kg; the 1982-83 village level price of millet is given, by the same source, at 125 FM/Kg. It follows that the gross value of the average yield of 1 ha of millet equals 75,000 FM. From this sum we have to subtract the cost of seed and of fungicides, estimated at 1,900 FM/ha, thus obtaining a net value of 73,100 FM/ha. This value is produced by 21 days of peaktime labor and by 60 days of off-peak labor.

We have now computed the opportunity cost of the peak-time labor and of half the off-peak-time labor needed to establish a village woodlot. We are left with the problem of costing 60 days' worth of off-peak labor.

At off-peak times villagers may engage in a variety of chores, such as tool repairing, they may opt for leisure or - with increasing frequency - they may undertake temporary outmigration. In all villages visited by our mission a substantial proportion of working age men - in one case as many as one half - outmigrated in slack season, leading to, what can be termed a "labor shortage". Village informants quoted to us off-peak wages ranging from 600 FM to 1,000 FM per day; these rates were confirmed by the Operation Mil and the Operation Riz. Taking into account that employment on a woodlot obviates the need for job search we took a lower figure, that of 500 FM/day, to represent the opportunity cost.^{2/}

^{1/} We could have, of course, priced labor at the going wage. We found, however, that wages quoted to us varied from village to village and that they seemed to fluctuate over time within the peak demand period (wage rates quoted to us ranged from 1,200 FM/day plus food to 2,000 FM/day plus food, food being valued at 500 FM/day). In our opinion a calculation in terms of opportunity cost of millet is likely to be more nearly accurate.

^{2/} Notice, however, that work on a woodlot is in the nature of a corvee: the payment, if any, is deferred for at least 7 years - hence the "shadow wage" might be higher than the going daily wage.

The same off-peak (shadow) wage rate is used to complete the cost of tree watering and of wood cutting. Twice-weekly waterings during the first two years, with each tree receiving 20 liters of water per watering requires 320 man-days. We make the optimistic assumption that, with such treatment, a hectare will produce 600 trees (out of 625 trees planted at a spacing of 4m x 4m), that is, that there will be a 96% survival rate. Once a week watering at 20 liters per tree reduces labor to 160 man-days, but it also reduces the rate of survival which we (optimistically) assume to equal 75%. Finally, with a rain-fed woodlot there would be no labor used in after planting (if there is a first year drought) the survival rate will be close to zero, while a drought occurring during the second year would severely damage the crop. On the average, "good" rainy seasons occur about one year out of two: we therefore, assume (very optimistically) a 30% survival rate for rain-fed plantations. The cutting of wood in a 1 ha woodlot, using hand tools, takes some 2 1/2 man-days per year.

To express all costs as a single figure, it is necessary to discount future expenditures. In line with the original Project Paper we have adopted a 12% discount rate. The same discount rate is used to express future benefits in terms of present value. The discount rate which we use is lower than the consumption - loan rate at village level. Such loans, contracted to tide over some families when millet reserves are exhausted, and repaid when the new crop comes in, carry interest of more than 20% per annum. Such loans are in the nature of short-term emergency devices and they, probably, overstate the market-clearing long-term rate, appropriate for investment calculations.

We measure benefits in terms of the discounted present value of the product of the woodlot. This simple device obviates the need for vexing implicit price calculations, such as the calculation of the shadow price of women's time saved by the woodlot.

If firewood is priced at 5,000 FM/stere, that is at the upper end of the range of village-level prices observed by our mission, none of the woodlots (fully watered, half-watered, rain-fed) passes the profitability test. All three types of woodlot also fail the test under the assumption that, over a 27-year horizon, firewood prices will rise by 3% per annum relative to the general price level.

While woodlots are an unprofitable proposition, higher unit value tree crops may pass the benefit test. Using the analytic framework discussed above we calculate that for a plantation which would yield 66,000 FM at the end of the seventh year, and continues to yield at the same rate for the next twenty years would just break even. Since the reduction in the quantity of crop increases the probability that borrowing will be necessary, it is appropriate, to apply, for one year, the consumption loan rate of interest. As a consequence, the break-even sum is raised to 71,000 FM/ha/year.

4. SOCIOLOGICAL EVALUATION

4.1 Village Action

4.1.1. Implementation of Village Action

4.1.1.1. Organization

Except for some specific individual initiatives, the project activities revolve around collective work. It is the village itself which serves as the action group. In fact it is the young men and women who carry out the work of tree planting and maintenance under the supervision of the elders. This principle of the social division of work being identical everywhere in the project, its utilization varies according to the specific organizational conditions prevailing in each village. In those villages where this principle still remains strong, the traditional groupings of young people, as among the Walde (Peul) and Mond

(Dogon), attempt more or less to serve as a base for collective action. However, as these self-help and multi-functional groupings are gradually breaking down (under external pressures), it is organizations of a political type (village committees) which are now more in evidence. One, then, is dealing with a combination of traditional and modern modes of organization with a predominance of the latter. There are a number of examples.

(1) At Fatoma the reforestation activities have been organized by setting up two work groups each one having its day for watering of tree plantings. Responsibility for and supervision of the work lies with the village committee.

(2) With respect to Sampara, Kokolo and Kori-Kori, the same system operates but, nevertheless, there are particular differences in each village. For example, at Kori-Kori the work is divided among three groups of young people each group taking its turn in the watering of the plants. At the head of each group is an individual designated by the village committee. Here the young women are not asked to participate. At Kolokolo, groups of three individuals are assigned to water a certain group of trees. At Sampara each tree has been assigned to the care of two individuals who report directly to the village committee. Finally, at Diambadougou, three groups each with 10 individuals has been set up. Maintenance is carried out in rotation with each group watering the trees for three consecutive days.

The real possibilities for discipline and control of the work to be done are not particularly well-defined in the different village committees. In all the villages visited, the ultimate recourse is always to the traditional authority existing in the community. The young people must obey their elders and relieve them of the burden of heavy physical labor. The control of recalcitrants and

the bringing of them around to this point of view is the responsibility of their parents. Then sometimes, as at Fatoma, it is because of a seasonal lack of labor that the work is not done, as happens traditionally among the Walde (Peul). Finally, there is recourse to another form of control. The recalcitrant is made to provide double the amount of labor in tree maintenance (watering) that he would normally be asked to perform. For the implementation of the different work arrangements described above meetings are held at varying intervals, but generally about every two weeks.

One can have certain reservations about the efficiency of village action. Presently, the authority of the elders is in a state of decline and the traditional means of control of all village activities now seem tenuous. (See Migration.) Even though it would be tempting to attribute the low rate of success of collective efforts in reforestation to the above trends in village action, these must be necessarily considered together with the entire system of social and physical constraints which determine the receptivity of the villages to the reforestation efforts.

4.1.1.2. Differential Receptivity

There exists a difference in receptivity between the two stations and within each of them. The task of separating the psycho-sociologic aspects from the material (water, soil, labor, etc.) aspects is not easy. It is quite certain that these two aspects interact. In effect, it is difficult to have trees planted by villagers who do not always have sufficient drinking water, who do not always have labor available, and who often lack land which can be made available for tree plantations. From these facts the remarks which follow do not pretend to encompass the problem. Rather they serve for orientation in a complex process where the availability of resources can play a preponderant role.

Receptivity between the Stations

In a general way the Dogons are more sensitive to trees than are the Peuls. This is manifest notably in attitudes toward trees and in the place they occupy in the exploitation of forest and agricultural resources. Among the Peuls virtually any tree is subject to branch cutting to provide feed for livestock. In the Fatoma area, for example, except for the Acacia albida, which is even exploited like the rest for feed during the dry season, no special exception is given to other tree species. In the Dogon country the situation is quite different. In addition to the Acacia albida the wild fruit-yielding species are carefully protected. For example, the cutting of the tamarind, the néré (locust bean tree), and the karité (Shea butter tree), among others, is strictly forbidden. The exploitation of the fruits and leaves is subject to strict regulation: each family or individual harvests the trees in his field. Among the Dogons there exist a number of activities related to the harvesting and utilization of forest products that do not exist or are poorly developed among the Peul: shea butter, fruit juices and drinks, condiments and flavorings, etc. This characteristic is confirmed by the important part played by these products in the domestic economy and local markets. This takes place through the Dogon women who visit different markets and buy condiments very often with money made from the sale of the fruits and leaves of wild trees.

In the checking off of needs a different response was noted between the two ethnic groups. The Peul villagers in the Fatoma area asked mostly for mango, guava and orange trees, that is fruit trees suitable for exploitation in orchards. It is possible that the proximity of Mopti with its potential market for fruit products was a determining factor in these requests. Nevertheless, the tradition of the tree and its place in the environment, seems also to constitute a determining factor as is attested by the example of the Dogons. They asked mostly

for wild fruit-yielding species that they would foresee planted in their fields or as these species exist in their natural environment. One can note here there is a manifestation of a perfect integration with the forest-agricultural environment.

Receptivity within the same station

Fatoma Station

Within this station Manako and Sampara are particularly notable in their receptivity to project interventions. For these two villages the sociologist noted in the interviews an openness of mind corroborated by a strong and favorable response to the extension efforts of project personnel. The reasons can be found in the following:

- The relative wealth of the villages;
- The nearness of the rice plantations of the Operation Riz Mopti which serve to reinforce the extension efforts of the project, of the OMM and of the Six "S";
- The existence of numerous literates in the villages;
- The existence of weekly cross-roads markets at Fatoma and Sampara;
- And the state of mind of the village chiefs who have themselves a close understanding with the project administration and, therefore, distrust less project extension agents.

In contrast at Takouti the villagers seem adverse to all ideas of village reforestation in spite of numerous visits by the project extension (A.Y.) agents. (See Constraints to Village Action and Perception.)

Bandiagara Station

Two types of receptive villages were noted. In one type are Dandoli and Kokoli villages which have already been sensitized by the Catholic Mission. Having also benefitted earlier from the services of the same extension agent while he worked with the Operation Mil, strong personal relations have developed between the villagers and the agent. Moreover, he lives at Dandoli.

In a second type two examples of positive leadership were noted. At Kori-Kori the school master contributed enormously to the planting of trees by giving an example himself with the help of his students. Finally, at Doukoumba the very strong personality of the village chief contributes to the carrying into effect of project actions.

4.1.1.3. Women's Participation

The participation of women in the project remains very weak.

Participation in Decision Making

Habitually, the women do not attend meetings organized by the project, although they participate willingly in those concerning policy. Their participation in these meetings is limited in the great majority of cases to the presence of their president or vice-president. Nevertheless, they attended, in most of the villages, the first meeting of the extension team when the scope and objectives of the project were presented. All goes on as if it were only the business of men. Moreover, outside the cities of Bandiagara and Sevaré where certain functionaries and/or their wives have asked directly for improved stoves, it is the men who are always engaged instead of women, in the program of their construction.

Participation in Village Actions

In this regard the situation varies from village to village. Four cases are presented. At Manako, Sampara, Diombolole the young girls participate irregularly in the watering of tree plantings. Special mention should be made of Doukumbo where a migration (exodus) of young men has led the young girls to maintain the tree plantings during the entire dry seasons. In all these villages the organization of work which associates girls and boys is of long standing. It contributes to a healthy rivalry permitting young people to excel. In addition,

at Diombololé the participation of older women is evident in the provision of rope and utensils for watering. This contribution, modest in itself, is a unique manifestation of organized participation by the women themselves in the project.

On the other hand at Kori-Kori the villagers are opposed to mixed work. This village recently converted to Islam, seems to have adapted a conservative, even austere, view of mixed work. Because of this, the village elders counsel the boys and girls against working together.

At Dioundioulou, even though participation of women in other types of work in the fields does not pose a problem, it is rarely directed toward the watering of kitchen gardens or of tree plantings. This can be explained by the fact that traditionally during the vegetable growing season the women are busy gathering wood and spinning cotton. There would thus have been a progressive dissociation between other work of concern to women and the tree watering activities.

Finally, in all the villages where construction of improved stoves has been started, the women have not taken part in the action. Not having themselves knowledge of masonry work, they have been victims of the bad faith and indifference of the men.

4.2. Constraints to Village Action

Village action is up against a series of interdependent social constraints. In analysis, however, one cannot but think of them as a whole.

4.2.1. Production Schedule

The period recommended for the planting of trees occurs in the rainy season. But it is also the busy work season for the cultivator. In the Dogon country, before the rains the villagers are busy gathering thatching for roofs and in the transport of manure to the fields. With the first rains comes the need for repairing house roofs and drains, the spreading of manure in the fields and the

sowing of seed. The list of different activities in which the villager/cultivator is fully involved could be considerably lengthened. In October, well before the harvest, he prepares the vegetable gardens which will keep him busy until March/April, which is the beginning of the next growing season. Now in the Dogon country, taxes are paid almost exclusively from the revenues obtained from vegetable gardening, there where it is practiced. One can then easily understand why the villager is not particularly disposed to put aside his normal agricultural activities for some other activity with which he does not clearly identify. Also from this comes the feeling, sometimes encountered during visits or meetings relating to the project, of disinterest or boredom with the proceedings.

Another constraint occurring in the production schedule is the custom of allowing livestock to graze in the stubble fields after the harvesting of crops. This custom leads to losses of new nearby tree plantings especially where they are not protected by enclosures.

4.2.2. Migration

Even though it provides a means for payment of taxes and also a margin of income security for rural communities, migration from the villages has served to slow down reforestation activities in both the Fatoma and Bandiagara stations.

Since the drought of 1968-1973, entire families of the Kounari go more and more frequently to the rice producing areas along the Niger seeking seasonal employment. Thus from November to June the villages are found virtually empty and the lack of labor poses a serious problem for maintenance of tree plantings. However, this problem is relative and varies from village to village. The scale of migration seems to depend on the relative poverty or wealth of the village. Fatoma, for example, is an attractive place, in which young migrants from neighboring villages like to stay. On the other hand at Daladouguru and in other

generally emancipated villages, the new social condition began in relative poverty where poor lands have not been sufficiently productive to sustain the young people. Thus migration has been accentuated by the combined action of droughts and impoverished lands not providing adequate return for labor invested. The alternative of moving into new and richer lands does not exist because of high population density. Thus the constraint is magnified.

In the Dogon country, out migration of young men, according to assertions of the elders is on the increase. At Golokoudo it was said that in one family, 9 out of 10 boys had departed in different directions. The eldest brother who had remained did not hide his desire to imitate his younger siblings, if the impending rainy season did not prove to be favorable. At Dioudioulou it was noted that threats to leave home permanently (migrate) were being used by young men to obtain satisfaction from their elders. Through these examples it is possible to see some modification intervening in the social context of migration. In time it could pass from the traditional kind where young men were designated to leave the village in search of gainful employment to pay taxes. Presently, migration takes on a more personal nature with destructive effects in the social structure, in that the migrant has at times broken with his family.

With the departure of the boys and young men, there is a scarcity of labor during the vegetable growing season. The problem is even more serious in that the migration becomes a bottleneck. The lack of labor and the lack of water correspond with the season when men, animals and trees have the greatest need for water and/or maintenance. To get around this difficulty requires adjustments in the combined availability of water and labor. Because of the large number of trees to be watered, the lack of water and labor leaves little scope for village woodlot interventions. The alternative lies in individual tree plantings requiring less water and less labor.

4.2.3. Needs and Motivations

For increased involvement of the rural population it is essential that their needs and motivations be clearly revealed. At this stage of the project, village needs do not seem to be satisfied. These needs are the planting of trees for shade and more particularly for fruit which can improve dietary deficiency. It is quite probable that by introducing fruit trees improved motivation of the beneficiaries will result. By way of illustration, two cases can be cited.

At Dandoli it was noted that fruit trees distributed to the villagers and planted in the fields were much better taken care of than the trees in the neighboring village woodlot. This observation was confirmed by the declaration of the village chief that "we need, above all, fruit trees!" It appears at present that the need for shade trees, even though it exists, cannot be compared with that for fruit trees. This makes one suppose that the villagers are more sensitive to the fruits than to other aspects of the tree. This phenomenon can be understood when one knows that the inhabitants of the area live at a subsistence level or even less where the primordial need is, before anything else, to eat. Motivation is thus conditioned in first place by this situation, even including the need for shade and firewood.

With respect to Sampara, motivations vis-a-vis forest species seem to be sort of neutral. The villagers do not want to take on the planting of a new village woodlot because they are waiting to watch the progress of the first one. When they were asked if they were satisfied with the first woodlot, they replied that they did not know since they had not yet seen the results. One can bet that the reply would have been different if it had dealt with fruit trees, because the people of Sampara are motivated by a bias in favor of orchards. If the project were to promote this, one could fear that an accentuation of social inequalities within the village community would result, to the detriment of those who do not have experience in orchard care, nor capital nor land.

4.2.4. Availability of Lands and Land Tenure

In all the villages visited, the parcels for village woodlots have been obtained at the expense of cultivated or fallow lands. It is the richest families who have agreed to make the sacrifice. In places as at Diombolole, the parcel is far from the village, located in brush fields which, with the distance increases the problem of watering. When one considers the poor availability of land in the Kounary and in the Dogon plateau, one understands better the importance of this constraint. The villages are not generally disposed to increase the size of their woodlot. Worse yet, as at Takouti, no one wishes to donate a parcel voluntarily. This situation constitutes an important impediment to the furtherance of actions in village woodlot installations.

At Peressougou there is not only a problem of availability of land, but also of land tenure. The village was established only six years ago by two Dogons. The land belongs to the Diall families of Sevaré whose ancestors had fled from Shékou Amadou. On return from exile, thanks to the French occupation, they preferred to establish themselves at Sevaré while keeping Peressougou for pasturage of cattle enroute to the grasslands of the Niger delta. The village is administratively illegal because it was built without official authorization. From this fact, it is the ancient rights of the Peul families (Diall) which are applied with the complicity of the administration. First, the land is available, but it cannot be exploited without the authorization of the Diall. The villagers (Dogon) are disposed to undertake reforestation actions as the lands are ceded to them for this purpose. Second, the Dogons complain that after having developed the lands, they could be later taken away. It is for this reason that the developer of a private woodlot at Peressougou does not wish to enlarge his parcel even though he has the desire and courage to do so.

4.2.5. Contradictions within the Village Social System

It is often believed in the analysis of rural societies that these are very homogenous and that they dispose of very powerful mechanisms for conformity and the maintenance of the status quo. Certain observations made in the project area tend to contradict this hypothesis. The apparent contradictions are those of a social system on the point of change.

In the Kounary the villages are generally made up of socio-ethnic groups who are trying to maintain or to change their identity, status, and place in the social scale. During the visit of the sociologist to Fatoma, the theme of the village woodlot provoked a backlash in the audience. After inquiry it was apparent that individualism is highly developed and that the groups making up the village were more or less in discord. The committee of young people which had been elected three months before had not yet held its first meeting. It can be seen that under these conditions village action can encounter considerable difficulty in the implementation of reforestation interventions.

The villages of the Kounary are characterized by heterogenous clans with interests at times contradictory. One finds the Rimaibes (farmers, former slaves of the Peuls trying to affirm their newly emancipated status); the Peuls (pastoralists, with whom a distaste for physical labor and self conceit is rooted in their historical domination of the Rimaibes); the Diawambés (traders); and some Bambara and Dogon families. Especially at Fatoma it is the Rimaibes which are most numerous. However, it is in this clan that things do not go well, owing to old rivalries and covetousness. Some remarks made during discussions in the village left the impression that certain individuals were not disposed to share in the future benefits of village woodlots with some families whose children had long since left the village and hence had not participated in the care and maintenance of the tree plantations. The question of the future distribution of benefits

was thus posed. The idea was inscribed in filigree that once the trees were mature, the risks of injustice and of diversion of benefits are not to be brushed aside. This attitude would be characteristic for those villages where a Peul minority still holds the reins of power.

From the foregoing analyses it is evident that the villager prefers to work for his own benefit. This observation was confirmed at Takouti when the village chief affirmed that reforestation efforts would only move ahead by means of administrative coercion.

There exists, then, in most of the villages only a weak capability for collective action. This is borne out in large measure by the absence of collective tree plantations as contrasted with a considerable number of private or individually managed tree plantations.

At Dandoli the villagers have the same feeling. The explanation lies in the property system and the relative usufruct of the trees. For trees planted individually, the rights would be those of the villagers-themselves while in the case of collective property it would be necessary for the village chief to accede them. The land tenure system in the Dogon country throws some light on this subject. The cultivated and brush lands belong to the village chief who assures their management in distributing fields to individual cultivators. The trees in these fields, which may have been planted by an individual or have grown there naturally, also fall under his management with respect to cutting rights. Nevertheless, the cultivator benefits from the usufruct of the products of these trees on the condition that they are located in his field. For a collectively owned parcel, the rights of the village chief are still less equivocal. If there are fruit trees in this parcel, the fruits will be gathered at his request, presented to him and he will make appropriate distribution to the heads of family. For wood it is he alone who will decide how to dispose of it insofar as managing the land.

Without placing in doubt the reassuring words expressed by the chiefs of those villages which were visited with respect to the equitable distribution of benefits, one can understand that the villagers as a whole may be tempted by other alternatives.

4.2.6. Perceptions of the Project

Even though there exist in the area a long tradition of tree planting for shade and for orchards and increasing difficulties in the provision of firewood, the objectives of the project do not appear to be entirely understood by the villagers. Project activities suffer from some misunderstandings resulting from incomplete or biased views of the villagers. Several situations are presented below:

They understand that the project intervenes in the domain of the tree; that is perfectly understood, but they are incapable of stating precisely the scope of the actions.

The objectives of the project are reduced down to those actions which can be effectively achieved in the village itself. This is due to the fact that many foreseen actions are unknown in the area, as improved stoves, wind breaks, erosion control, etc.

The feeling in certain villages is that the trees belong to the project which is the master control. At times the villagers spoke of "your" trees when speaking of them with the sociologist. At Diombololé, notably, the villagers explained that they had always considered the tree plantings as imposed on them. But, they recognize that now they feel somewhat more at ease about these.

The last situation, which derives from the preceding, was found where certain villagers thought that the project had immense financial and material resources and that these had not been put, by the extension agents, at their

disposition. This phenomenon was reported by the agent himself. It certainly explains a propensity among the villagers for intransigence in their demands. At Dioundioulou this feeling was found to be very strong: no village woodlot, if the project does not also dig a well. The situation is the same at Takouti.

4.3 Role of Animation-Vulgarization (extension)

4.3.1. Activities in Animation-Vularization (extension)

4.3.1.1. Relations with Other Entities

There exist in the Mopti Region several projects interested in reforestation interventions. Five can be identified of which two intervene directly in the project area and collaborate with the Fatoma and Bandiagara stations in the project. One can distinguish on the one hand PAM, CARE and ODEM and on the other Six "S" and the Catholic Mission at Bandiagara.

PAM project: This project has undertaken the planting of neem trees along the embankment between Sévaré and Mopti. Shallow wells-(puisards) have been dug for watering the trees. Also the project paid the workers in kind with flour, semolina, grain, oil, different preserved foods and milk.

CARE: This project will have its headquarters at Koro and Douentza. It is proposed to work with village associations. The collaboration and contribution of the DREF of Mopti will be limited to the provision of two persons in charge.

ODEM: In an annual conference concerning the grasslands of the Niger delta, the Operation Riz Mopti was asked to release certain parcels which are no longer reached by flood waters. These former rice paddies will be converted to pastures for local pastoralists who will be responsible for making improvements. Tree plantings are foreseen around the margins of improved areas.

Six "S" project: (Savoir Se Servir de la Saison Seche au Sahel) This project is one of the promoters of improved stoves in the Mopti Cercle. It organized during April-May 1983 a seminar on alphabetization which brought together individuals from certain villages and also from different technical services. During the seminar the project introduced technical themes which were discussed and led to recommendations and proposals. As part of this program improved stoves were constructed at Dagawomina permitting the participants from a number of villages in Mopti Cercle to become familiar with this new technology.

Catholic Mission of Bandiagara: This is certainly the entity which collaborates most closely with the project. They operate only in Bandiagara Cercle. Their technical interventions include: the digging of wells for which labor, food and the costs of maintenance are the responsibility of the beneficiaries; the distribution of fertilizers on demand with reimbursement spread out over a period of two years; and the distribution of medicines and construction of roads. Outside of the above activities, the Mission assists those villages included in the program in their relations with the administration. Their extension procedure consists in selecting in each village a representative, who is at the same time an animateur-vulgarisateur (extension agent) and also a preacher. Although it may be difficult to evaluate the real degree of adhesion to the Catholic faith, it is necessary to recognize the efficacy of this system. Three villages which are also in the village reforestation project attest to this.

	Wells	Fertilizers	Roads	Extension
Diombolè	2	x		x
Kokolo	2	x	x	x
Dandoli		x		x

The collaboration of the Mission with the Bandiagara station consists in sensitizing the villagers on the problems of reforestation each time that a well is dug. They also put water points at the disposition of the villagers thus providing support which favors project objectives. They also provide villages with plants which they grow in their nursery at Bara-Pireli.

4.3.1.2. Relations with Indoctrinated Villages

If the human relations between project personnel and the beneficiaries can be qualified as excellent the relations with respect to the work to be done are only passable. The villagers do not always do what the extension agents expect of them. Moreover, the villagers are always in agreement with new proposed initiatives, but then do nothing to bring them into being. Finally, the advice of the agents is not always well followed out. Three examples can be cited: damage caused to tree plantings because of delays in constructing protective enclosures against depredations of livestock; poor maintenance of tree plantings; and finally, for the improved stoves, the villagers have not established schedules or assembled the necessary materials for their construction. They always postpone these actions each time the extension agent visits the village. In spite of these difficulties, there is an exchange between project personnel and the villagers which translates into a certain agreement. The villages very often call on the extension agents when negative changes are noted in tree plantings and when problems occur with termites or the cutting of trees in the village. However, the villagers do not made the effort of going to the station headquarters when problems occur. Rather they wait until a visit of the extension agent occurs to present their problems, when it is often too late for effective intervention.

As for the animateurs-vulgarizateurs (extension agents) they systematically request advice from the villagers concerning all actions that they propose, that

is, traditional means of termite control, nature of the soils, all experience relative to local village initiatives in tree planting, notably on the subject of different tree species and their problems, etc.

4.3.1.3. Role of Peace Corps Volunteers

There are presently two volunteers attached to the project, one each in the Fatoma and Bandiagara stations. Their work is much appreciated by their project colleagues and especially by the villagers. The volunteer assigned to the Fatoma station works on the demonstration plot and also works as an extension agent. The volunteer at Bandiagara works as a third member of the extension team. Even though their knowledge of forestry is not complete, one must recognize their willingness to participate, their fortitude and especially their excellent adaptation to local conditions, including a good working knowledge of the Peul and Dogon languages. These manifestations of identification with the villagers have a definite positive influence on extension efforts.

The volunteer of Fatoma has been on duty almost two years and his contract is due to expire in October 1983. Thus, it is necessary to take measures to obtain his replacement now. In this regard the project extension team hopes that his replacement may be a woman as she would have greater potential impact in the feminine milieu of the villages, particularly with respect to the deployment of improved stoves.

4.3.1.4. Efficacy and Impact of Extension Actions

At the present time in the project life it is difficult to measure the impact of the project interventions.

Extension actions can be categorized in two groups with respect to the relative ease of their acceptance. In the first group are those innovations which fit in with traditional practices of the villagers without upsetting their

life style. Such are the techniques of hole digging for tree plantings, of cutting and trimming, and of intercallary cultivation of leguminous crops (niébè and peanuts) in the parcels of young trees. The adoption and acceptance of intercallary cultivation follows traditional practice in the area. Certain villages (Kori-Kori, Kokolo and Doukombo) have not hesitated to use the village woodlots in this manner. In other villages, the 1982-1983 campaign will provide opportunity for putting into practice this technique which has the advantage of preserving cultivated areas, as small as they may be. Finally, it was confirmed at Fatoma that the tree planting technique of the project was much more efficient than that the villagers had always practiced, as measured by the rate of success of project tree plantings.

In the second group of innovations are those which require adaptation on the part of the villagers and which are contrary to old habits and customs. It is here that most difficulties are encountered. The case of the improved stove is particularly notable. The impact of this innovation has been weak and its diffusion extremely limited. A total of five improved stoves have been constructed, two at Fatoma and three at Manako. At Fatoma stoves were built at the home of the school master and at another private home. Certain women assisted in their construction and some women have come to inspect them. However, the village president of the women's committee herself had not yet seen these stoves and as a consequence many of her fellow women citizens could only speak rather vaguely about them. It is thus not surprising that at Diambadougou, which is situated only 2 km from Fatoma, there was not one woman who had ever heard about the improved stove. The visit of the evaluation team made it possible to make a point of this absence of communication. After having sensitized the villagers, the sociologist exhorted the women of the two villages to inspect the demonstration stoves. (See Technical Evaluation.)

At Manako, in spite of the conjunctive action of project personnel, of the DNAFLA and of the Six "S", the stove is still a failure. The reasons given by the villagers are numerous. Some said that, up until recently, no one had taught them how to make them. This is not a valid reason, when it is known that the young people of Manako and Fatoma participated at the stage when the stove construction was in progress. Moreover, the efforts of the extension agents in this regard can be verified.

Another reason, which is more likely, lies in the attitudes of two women encountered in the village. One woman had access to two stoves, one of which had been built in her kitchen. The second woman for her part was using only one of them built in the courtyard of the house. After a 2 weeks period of utilization they both gave up the stoves as they both recognized that they were economizing on firewood by conserving heat and reducing smoke. To the question of why they were not using the stoves, they replied that they were used to traditional stoves and that "the women were not accustomed to rest".- This somewhat devious reply becomes more comprehensible when one considers it in its social context. In fact, women as well as men in the rural environment, have a tendency to believe that work, well done, must always be self-satisfying. The satisfaction of a duty done for these women lies in the search for firewood and the hours spent in the kitchen. Moreover, they complain that if they do not have difficult tasks to accomplish, they do not feel physically well. It is also necessary to recall that the gathering of firewood, even if it is at times done individually, is an occasion for the women to meet away from the village to exchange notes and gossip. It is also very probable that the two women were made the butt of jokes by others in the village. This is not surprising when one understands all the forms that can reinforce the resistance to change in the rural environment. Finally, it must be noted that the improved stove which served for demonstration is situated

in a large uninhabited courtyard. This new site being completely different from that in which the women were accustomed to cook, it is possible that this factor had a certain influence on their behavior.

4.3.2. Constraints to Animation-Vulgarisation (extension)

The motivation of project personnel is not yet strong. They are nevertheless confronted by a series of linguistic, psychologic organizational and material constraints which effect the efficiency of their work.

4.3.2.1. Linguistic Constraints

In the two stations there are 6 extension agents, only one of which has no need of an interpreter when he contacts the villagers. At Fatoma the leader of the extension team and the agricultural monitor who replaced the community development agent do not speak the Peul language. Here it is always necessary to resort to an interpreter which can lead to frustrating results. At Bandiagara the problem is not so acute. Here the station enjoys the services of a former monitor of Operation Mills, who already has seven years experience in the project area. Although the problems of language and intercommunication do not pose a problem to him, the same cannot be said of the team leader.

4.3.2.2. Psychologic Constraints

These lie in three categories. The first lie in interpersonal relationships among project personnel. These have already been mentioned without the sociologist having had occasion to go farther into the details. The second constraint concerns repressive activities in the Bandiagara cantonment. In effect the villages of Doukombo and Djombodjenenke were verbally chastised for the cutting of green wood. The extension agent is afraid that this measure can only serve to make his work more difficult. He is afraid that the villagers will adversely

associate him with this action thinking of him as a sort of "Trojan horse" of the DNEF. He also fears that the psychologic barrier, which has traditionally existed between the rural population and the foresters, and which has been on the way to disappearing, now risks the possibility of reconsolidation. Finally, the extension agent brought up the inappropriateness of slide projections being used for extension efforts vis-a-vis local realities. He manifest some concern on this subject being afraid that slide projections from another context could result in an opposite effect from that intended.

4.3.2.3. Organizational Constraints

A certain absence of coordination between the extension agents and the tree nurseries can be noted. The nurserymen have always had to work without knowing what the basic demands for trees are. It is to be hoped that in time this gap in communication will be corrected.

In addition it was noted that program activities and monthly visits are sometimes not fully recorded or are even falsified for different reasons. At Bandiagara the inquiry which should have determined the choice of new villages for the 1982-1983 campaign had not taken place. The station had information forms for only the first 5 villages which had been inventoried. It is necessary to mention, concerning this inquiry, that the questionnaires contain only marginally utilizable information and their design is not yet perfected. It is nevertheless necessary to recognize the efforts that have gone into this work. A training seminar was organized in December 1982 at national level for the extension agents of the DNEF which took into account the experience gained in the Project de Reboisement de la Region de Sikasso. That seminar provided opportunity for comparison of information forms already existing in DNEF cantonments with the forms utilized at Sikasso.

Finally, at Bandiagara and at Fatoma the extension teams have no program control records. Thus, certain information with respect to the date of execution of certain actions is lacking and impossible to verify.

4.3.2.4. Material Constraints

Finally, in materials domain the following should be taken into account:

- delays in the payment of salaries and subsidies;
- low monthly subsidies and per diem;
- irregularity in the replenishment of PAM provisions;
- insufficiency of fuel allotments;
- dilapidated condition of the mobylettes;
- absence of medicine chests for the project;
- absence of extension and forestry technical literature in French;
- and need for training through technical literature, study tours and seminars.

4.4. Conclusions and Recommendations

From what was apparent during the course of this evaluation, it can be said that the sociologic aspects of the project are satisfactory. From the fact that the evaluation was made after only two years of project life, it is difficult to say if the trends and constraints which were observed will amplify or diminish. It remains certain that the success of the project will depend in a general way on the social evolution of the extension efforts. This will demand on the part of the extension agents a capacity for imaginative action and self-criticism and being able to adapt to new situations. Because the villagers are being asked to accept innovation^s with which they are unfamiliar there^{is} acceptance to these will depend on psychic attitudes, thus changes will only be gradual. Certain attitudes are brought to mind in this regard. The first refers to the understanding of

the villagers who do not know how to do anything other than that which they have always done, that is, technological innovations, new types of trees, etc. The second attitude concerns the incapacity of the villager to try to do that which he should do because of objective reasons, that is, finance, water, land, materials, etc. Finally, the third attitude lies in the reticence of the villager who knows what he should do and has the objective means for doing it, but refuses to do so because of certain behavioural reasons and values, that is, traditionalism, fear of change, etc.

To overcome these constraints, certain recommendations can be made. In the domain of village action it will be necessary:

- (1) To make the villagers more responsible for the maintenance of the trees. Maintenance could be reorganized by wards, by families and even by individuals. The failure of one in these groups could be compensated by the others. In addition to the council or village committee, it is necessary to have an intermediate echelon who should be the young people. The participation of the young girls in the watering tasks should be encouraged everywhere.
- (2) To not undertake collective actions of the village woodlot type except where there is a real demand from the villagers. The extension of this type of intervention should be slowed down.
- (3) To determine again the future distribution of benefits at village level where this is necessary. This measure will permit, among other things, a rectification of the notion that the trees planted will belong to the project. It should also create a greater sense of identification of the villagers with the trees which they will have planted.

- (4) To increase motivation by increasing introduction of fruit trees which does not necessarily mean that the project should intervene in orchard culture.
- (5) To encourage individual tree plantations through aid to private initiatives.

In the domain of animation-vulgarization (extension) it will be necessary:

- (1) To improve the data collection system through improving the information forms presently available in the stations.
- (2) To concentrate efforts on popularizing the improved stove. The project should look for a stove of better construction and deploy them in larger numbers. The extension agents should be reinforced in this effort by a specialist in improved stoves. The support of a woman, Malian preferably, speaking the local languages is desirable for a better penetration of the feminine milieu.
- (3) To put into practice new extension interventions such as the fight against erosion through the planting of trees.
- (4) To take into account a possible future expansion of the project and for the extension agents who should preferably be natives of the area in which they are operating in order to overcome the language problem.
- (5) To utilize in an enhanced fashion, audio-visual techniques, always on the condition that the slides and themes be appropriate in the local context.
- (6) To improve the working conditions of the extension agents in putting at their disposal better logistic support and motor fuel in sufficient quantity. Also their further training through study tours, seminars and through the acquisition of literature on extension techniques in the French language.

5. TECHNICAL EVALUATION

5.1. Technical Basis of Project Activities

The planning for implementation of project actions does not describe in detail the objectives to be attained nor the work to be done. There is no master work plan for the 5-year period nor plans for yearly operations. Planning based on the precise objectives to be attained each year and overall should be developed for coming years.

In the execution of project actions in 1982 and 1983 those in charge of the project have used the planning proposed in the Project Paper to set up an annual work program which is only a yearly work schedule. The methodology and objectives are not described.

5.2. Technical Management and Administration of the Project

The project at the field level is carried out by the Direction Regional des Eaux et Forêts (DREF) of Mopti and the forest cantonments (stations) of Mopti and Bandiagara. It is supervised (at national level) by the Direction National des Eaux et Forêts (DNEF) and the USAID/Bamako. We cover in this discussion, more specifically, the management and administration of the project at the regional (Mopti) level. Other administrative issues are discussed in the institutional and administrative evaluation.

5.2.1. Management of the Project

The Regional Director of Waters and Forests of the Mopti Region (Directeur Regional des Eaux et Forêts de Mopti) is at the same time director (manager) of the project at regional level. At this level he decides, coordinates the station actions, supervises these actions, manages the funds assigned to regional level with the assistance of a non-professional accountant, furnishes reports of activities, and manages the equipment, materials and personnel of the project.

We must also point out that, in addition to the responsibilities of project supervision, he is also charged with his duties for supervision of the regular program of Eaux et Forets in the Mopti Region. The conception, coordination and day-to-day supervision of the project also need more personnel at the regional level. For this reason we recommend the utilization of a Technical Associate (Adjoint Technique) attached to the Regional Director to assist in:

- (1) determining the objectives and conception of work programs;
- (2) conceptualizing topics for animation and vulgarization (extension);
- (3) preparing technical documents concerning these topics;
- (4) indoctrinating and training agents to carry out effectively extension tasks;
- (5) programming extension actions of the agents with the station chiefs;
- (6) overseeing the achievement of objectives and of programs with respect to the tree nurseries, tree plantings, and improved stoves;
- (7) and evaluating the results.

The Technical Associate would also coordinate technical supervision missions as needed and also visits of the chiefs of the technical divisions of the DNEF, thus assuring a technical and methodologic support for the project. He would also provide logistic support for short-term consultants and thus would serve to complete the technical framework of the project.

5.2.2. Stations

The chief of the forest cantonment is also station chief. He thus works half time on the project with the collaboration of an associate in charge of experimentation, with another in charge of a nursery, and a team of three persons in charge of animation-vulgarisation (extension). As the chief of station has

the same constraints on his responsibilities as the Project Director (who is also Regional Director of Eaux et Forets) we recommend that an Adjoint Technique be assigned to each cantonnement chief to assist in the following tasks:

- planning of work of the nursery;
- choosing of villages to be integrated in the project;
- identifying of actions to be undertaken;
- programming the extension agents, the means required and the overseeing of their activities;
- scheduling of the reforestation (tree planting) work.

All these tasks should be planned with the collaboration of the nurseryman and the extension team.

5.2.3. Proposals for Better Organization in the Execution of the Project in Coming Years

The Project Director should develop a document, before the end of 1983, entitled master plan for the two coming years (1984 and 1985) in which he will outline a two-year program of activities, detailed budgets for each activity and a summary budget. The document should be approved by the DNEF and USAID/Bamako and will afterwards serve as a basic document for project actions in 1984-1985.

An annual operational plan for 1984 should be prepared immediately and approved to serve as a basis for the 1984 program. A structural reorganization in the Regional (Project) Director's office should be effected before the end of September 1983 with the assignment of an Adjoint Technique (Technical Associate) of the Project Director (Chief). His practical training should be accelerated by a 6 to 12 weeks study tour at the CESA0 in Bobo Dioulasso in Upper Volta and follow up visits of Bois de Village (Upper Volta) for one week and the Project Forestier of Sikasso for one week. At the level of the stations the assignment of an Adjoint Technique of the Chief de Cantonement as the individual responsible

for all technical actions of the station such as: experimentation, demonstration, nursery, woodlots, extension, and improved stoves. He (the adjoint) will then be the chief of the agents working in the field, under the Station Chief, to coordinate their activities and oversee their execution. A pyramidal working framework will thus be created where:

- (1) the Regional Directorate will ensure conception and overall supervision;
- (2) the Stations ensure diffusion; and
- (3) the villagers carry out activities along lines developed with extension agents and according to accepted work schedules.

5.3 Description of Activities Undertaken from June 1981 to June 1983

5.3.1. Nurseries^{1/}

The project has created three nurseries of 1 ha each at Fatoma (Mopti), Bandiagara and Djenné. The first two were started in the second half of 1981 and that at Djenné in September 1982. Their situation in June 1983 was as follows:

5.3.1.1. Fatoma Nursery

Infrastructure: Two small (4x4 m) banco buildings of two rooms each. One building serves for storing tools and lodging for the caretaker. The other serves for offices of the station. The buildings, which were finished in the first part of 1983, are well constructed. A wire fence (Ursus type) enclosure is installed around the perimeter of the nursery and of the experimentation parcel. The entrance gate and the interior of the tool store room (hangers and shelves) have yet to be completed.

^{1/} See "Note technique sur quelques principes de base concernant les pepinieres villageoises, Direction Nationale des Eaux et Forets, Mai 1983."

Equipment: One well 18 m deep with concrete headwalls and lined with concrete rings and fitted with a "Bourga" hand pump. Also 3 collecting basins well distributed in the nursery.

Available Tools

10 watering cans
5 hoes
5 knives
3 rakes
3 wheel barrows
1 pulley
5 shovels
3 picks
Rope (50 m)
2 machete
10 buckets
2 pruning shears
1 crow bar

Complements to be Acquired

Pegs
Hammers
Spade shovels
Axes
Pitch forks
Pulverisors
Sieves
Eight meter rule (scale)
Portable seed beds
Bulls-eye level
Square
Plumb line

Available equipment has already been in use two (2) years, is poorly maintained, and is insufficient for the work to be done.

Personnel:

Public service: One inexperienced technician of Eaux and Forets.

Temporary: Six laborers (1981-1982) increased to 10 laborers beginning in 1983.

Remarks: The labor force is excessive with respect to the work to be done in this nursery. Five laborers would be sufficient.

Organization: Lack of documentation on nursery operations and on planning of the work. Irrational use of time and labor.

Nursery layout: The nursery has an elongated shape and is not practicable for operations. It should be of square or rectangular outline (70 x 150m). The walkways (principal and secondary), the wind breaks, and the compost pits are yet to be constructed.

Production of plants in 1982 and 1983:

Tree Species	Bare roots		Pots		Total	
	1982	1983	1982	1983	1982	1983
Neem	6,039	15,188	165	70	6,204	15,258
Albizzia	237	291	-	-	237	291
Prosopis ch.	1,123	118	17	14	1,140	132
Calliandra	112	-	9	11	121	11
Sesbania	-	1,275	-	250	-	1,525
Tamarindus	192	117	12	9	204	126
Leucena leuc.	957	510	-	272	957	782
Cassia	18	1,170	18	-	36	1,170
Eucalyptus	-	163	-	285	-	448
Parkinsonia	-	1,402	19	-	19	1,402
Prosopis juli.	-	1,500	-	265	-	1,765
Total	8,678	21,734	240	1,176	8,918	22,910

Remarks: In 1982 10,000 plants in pots of Eucalyptus from the OAPF were produced in this nursery.

Commentary: There is no seed stock. The production target of 10,000 plants in 1982 was not attained. The residence time of the plants in the nursery in 1982 was 8 to 10 months. The Neem was the most abundant species produced followed by Leucena and Prosopis chilensis. Production by bare root predominates. One local species (Tamarindus) was produced in the 1982 and 1983 programs. A production of 20,000 plants is expected to be attained or even surpassed in 1983. The Neem still is the most important species

produced followed by Prosopis juliflora, Sesbania and Parkinsonia. The residence time of the plants in the nursery in 1983 is also 8 to 10 months. The plants used for reforestation in 1982 and 1983 are not of good quality, especially the Eucalyptus produced from one-year germination. We formally counsel against the use of this species in 1983. The growth in pots is poor since 10,000 pots have been available since July 1981. We suggest that pots be utilized for local species and the Eucalyptus in coming campaigns.

5.3.1.2. Bandiagara Nursery

Infrastructure and equipment: The buildings have not yet (June 1983) been built. They will be of the same type as those at Fatoma. The equipment and tools are available and are the same as those at Fatoma. The gate has yet to be constructed although a wire fence enclosure is in place. Collecting basins for watering have not yet been constructed.

Personnel: Same as that at Fatoma.

Organization: Same as that at Fatoma. However, the quality of the work is better here. There is no seed stock.

Nursery layout: Same observations as at Fatoma. The layout of the nursery is practical. However, it is necessary to reduce the number of trees in the nursery.

Commentary: The production target of 10,000 plants was equalled and exceeded in 1982. The Neem was the most abundant species produced followed by Néré and Albizzia. From this stems the efforts which have been made with local species which were produced essentially in pots (2 years). The production target of 20,000 plants in 1983 was not attained. The quality of the plants used for reforestation is poor: 10 to 11 months stay in the nursery (bare roots), certain Nérés in pot were only 2 months old.

Production of plants in 1982 and 1983:

Tree Species	Bare roots		Pots		Total	
	1982	1983	1982	1983	1982	1983
Neem	8,192	11,455	303	206	8,495	11,661
Albizzia	1,204	1,126	-	-	1,204	1,126
Prosopis ch.	-	39	-	-	-	39
Sesbania	-	460	-	-	-	460
Leucena	-	106	-	-	-	106
Parkinsonia	-	108	-	-	-	108
Prosopis juliflora	457	-	-	-	457	-
Acacia albida	44	-	58	-	102	-
Delonix regia	122	-	-	-	122	-
Néré	201	-	1,986	619	2,187	619
Karité	-	-	74	-	74	-
Détarium	-	-	1	-	1	-
Balanites	-	-	334	27	334	207
Moringa	-	-	-	455	-	455
Total	10,220	13,294	2,756	1,487	12,976	14,781

5.3.1.3. Djenné Nursery

Covers 1 ha on the levee of a distributary of the Bani River on the outskirts of Djenné. The installation work began in September 1982 and is still in progress. A well for watering the nursery was completed in June 1983 with a large collecting basin (2.5 m³). The tools are of the same quality and quantity as in the other two stations. The wire fencing for enclosing the nursery is at hand, but has not yet been installed.

Personnel for the nursery include 5 laborers. The nurseryman has not yet been appointed. Thirty seed beds have been built since the beginning of installation work. Some 4,500 Neem and 379 Néré are available for the 1983 campaign (not yet planned). Some seeding has been done for 1984. The nursery area is presently protected by a thorn brush enclosure and guarded by a laborer. We note that there has been considerable delay in the installation of this nursery.

5.3.1.4. Conclusions and Suggestions on the Nurseries

The Fatoma and Bandiagara nurseries are 2 years old and the one at Djenné is 10 months old. Construction work is behind schedule and there is still more work to be done on completion of buildings, gates, storerooms, and enclosures. Also nursery improvements for seedling cultivation are behind schedule.

The available equipment for watering (wells, pumps and collecting basins) is sufficient. However, the nursery supplies and tools already provided are worn and insufficient. They should be replaced and augmented. The public service employees of the nurseries lack experience and should be given further training. The number of laborers assigned should not exceed 5 per nursery. The nursery work should be carefully planned and closely followed. The production from the nurseries is commensurate in quantity with the needs of the tree planting program, however, the quality of the production is clearly inadequate. The production methods should take into account the specific needs of each species. The exotic species for bare root plantings should be retained for a long period (1 to 2 years) and local species should generally be grown most often in large pots for 6 to 12 months.

5.3.1.5. Proposals for Management and Planning in a Nursery

The nursery of a station, because of its importance, its size and its operational mode requires rigorous planning of all work and needs in plants and

materials. Efficient management of the nursery makes it possible to furnish at the proper time the plants needed for reforestation. It also demands full utilization of labor and available materials.

Planning is contained in three documents: the annual program; the monthly program; and the weekly program.

The annual program contains general information on the two campaigns of reforestation that are going to follow and on the means for work that the nurseryman is going to have at his disposal. It contains the following elements: The choice of species; the number of plants by species; the methods of growing them; the annual budget; the purchase of supplies and equipment; and the general work schedule. The annual program should be prepared by Project Chief (Regional Director); the technical associate (Adjoint Technique) of the Regional Director; the station chief; and the nurseryman.

Schedule for the annual program:

Species	J	F	M	A	M	J	J	A	S	O	N	D	Month	
	1	2	3	4	5	1	2	3	4	5	-	-	-	Weeks
--	
--	+	+	+	+	+	+	+	+	+	+	+	+		
--	0	0	0	0	0	0	0	0	0	0	0	0		
--	/	/	/	/	/	/	/	/	/	/	/	/		
--	X	X	X	X	X	X	X	X	X	X	X	X		
--	-	-	+	+	+	0	0	0						
--	in different colors							- collection of seeds						
--								+ building of seed beds						
--								0 seeding						
--								/ lifting, transplanting, selection						
--								X putting in place of materials for the pots.						

The monthly program sets up the activities for the coming month in order of priority and importance. This program grows out of the general schedule of the annual program. It contains the following elements: work to be completed; new work to be done; important dates to be met (seeding dates, seed collection dates, treatment); materials (supplies) to be ordered; any special problems. The monthly program should be prepared by the station chief; the technical associate of the station chief; the technical associate of the Regional Director; and the nurseryman.

Schedule for the monthly program:

Schedule of activities from to

Activities	Quantity	Planning					Observations
		1es.	2es.	3es.	4es.	5es.	
<u>1. Growing in pot of</u>							
1.1. gathering of materials			X				
1.2. germination bed	Exple 3					X	
-				X			
-							
<u>2. Collection of seeds</u>							
2.1. Neem	Exple 10 kg					X	
2.2. Albizzia	Exple 4 kg		X			X	
-						X	
-							
<u>3. Seeding</u>							
3.1. Neem	Exple 5 kg			X	X	X	
3.2. Albizzia	Exple 20 seeds	X					X
-							
-							
<u>4. Lifting - Transplanting</u>							
4.1. Parkinsonia		X		X		X	
4.2. Néré			X		X		
-							
-							
5. <u>Collection of manure</u>	Exple 10 kg				X		X
6. <u>Preparation of seed beds</u>	Exple 1000 kg	X		X		X	
7. <u>Ordering of materials</u>				X		X	

The weekly program sets up the work for the week. The work activities of the laborers (watering schedule, etc.), utilization of vehicles, gathering of seeds, transport of sand, manure, plants, etc. It should be prepared by the station chief, the nurseryman, and the bossman of the laborers.

Schedule for the weekly program:

Week from the to the

Day	Activities	Person responsible
Monday		
Tuesday		
Wednesday		
Thursday		
Friday		
Saturday		
Sunday		

The daily record and content of documents. The daily journal of the nurseryman reflects his work and contains a chronical of all important work: (seed-ing dates, species, density); date of transplanting and of respacing; treatment (date, product used and dosage); diseases; and collection of seeds (quantity and origin).

The record file of the nurseryman should contain documentation on: the layout of the nursery (scale 1:250 - 1:50 on page A3); personnel records; inventory of supplies and material; records of species (date of collection, date of seeding, etc.); and annual, monthly and weekly programs.

5.3.2. Experimental Plots

The Mopti and Bandiagara stations each have an experimental plot of one hectare adjoining the nursery and enclosed with it. Some trials have been undertaken in these plots. That of Mopti was followed from 1982 to 1983 and that of Bandiagara was a failure from the beginning. For the 1983 campaign there are still no procedures set up for trials. For this type of action it is premature to pass judgement so we are inhibited from making proposals for applied research. The trials should be made compatible with what is done in other interventions in the project.

5.3.3. Demonstration Plots

The demonstration plots or woodlots are each one hectare in area and are installed near principal roads where they can be easily seen. That of the Mopti station has been planted in: Neem (0.50 ha with a 4 x 4 m spacing for 312 plants); Prosopis (0.25 ha with 6 x 3 m spacing for 78 plants); and Parkinsomia (0.25 ha with a spacing of 6 x 3 m for 78 plants). The plot is enclosed with thorn branches, has a well and is watered by two laborers. The vegetative condition of the trees is satisfactory and the rate of success is 60% in June 1983.

The demonstration plot of Bandiagara has been planted in: Neem (0.50 ha with a 4 x 4 m spacing for 342 plants); Albizzia (0.25 ha with a 4 x 4 m spacing for 165 plants; and Parkinsonia (0.25 ha with a 4 x 4 m spacing for 165 plants). The plants are protected by individual enclosures. The plants are watered by villagers to whom they belong by water carried from a river 300 m away. The rate of success in June 1983 is 30%.

The status of the Mopti demonstration plot is still not definite. Intercalary cultivation was not undertaken in 1982 in this plot, but the villagers have been encouraged to try such cultivation in 1983. The Mopti demonstration plot was

realized within the budget of the project and should be a model for village woodlots, the planting of living hedges, wind breaks, and associations of trees with agricultural crops. It should also belong collectively to a village and be maintained by the village collectively or belong to a private individual. The animateurs-vulgarisateurs (extension agents) should encourage other villages to come and visit this plot.

5.3.4. Village Woodlots

5.3.4.1. Project Objectives 1982-1983

The reforestation campaign for 1982 foresaw 10 ha of collective village woodlots or individual woodlots for the two stations or 5 woodlots to be installed per station. For the 1983 reforestation campaign 20 ha of collective village woodlots or individual woodlots were foreseen for the two stations or 10 ha per station.

5.3.4.2. Project Results 1982-1983

See following Tables A, B and C.

Table A: Village woodlots 1982-1983 (List)

Fatoma (Mopti) Station				
Village or individual	Trees planted			Total area (ha)
	Species	Area (ha)	Total (ha)	
<u>1982 (completed)</u>				
1. M. Sidibé, Fatoma	N EU	0,12 0,13	0,25	0,25
2. Diambadougou	N PRO	0,16 0,09	0,25	0,25
3. Sampara	N	0,25	0,25	0,25
3 villages of which 1 parcel is privately owned		0,75	0,75	0,75
<u>1983 (Provisional program)</u>				
11 villages of which 2 are privately owned		8,50	8,50	8,50
1. Fatoma/Oumar Sidibé	EU N	0,37 0,38	0,75	0,75
2. Sampara	EU	0,75	0,75	0,75
3. Peréssougou/E. Togo	EU	0,25	0,25	0,25
4. Diambadougou	N LEU	0,50 0,25	-0,75	0,75
5. Daladougou	N LEU EU	0,50 0,25 0,25	1	1
6. Manako	LEU PRO EU	0,37 0,38 0,25	1	1
7. Paré	N PRO	0,34 0,16	0,50	0,50
8. Kourga	N PRO EU	0,20 0,19 0,12	0,50	0,50
9. Niakongo	N PRO	0,75 0,25	1	1
10. Koubel Gaoundé	N PRO	0,38 0,25	1	1
11. Diaborki	N PRO EU	0,50 0,50 0,50	1	1

Bandiagara Station

Village or individual	Trees planted			Total area (ha)
	Species	Area (ha)	Total (ha)	
<u>1982 (completed)</u>				
1. Kokolo	N	0,37	0,56	0,56
	ALB	0,18		
	NERE	0,09		
2. Diombolo-leye	N	0,40	0,59	0,59
	ALB	0,09		
	NERE	0,09		
3. Doucombo	N	0,50	0,75	0,75
	ALB	0,20		
	NERE	0,05		
4. Kori-Korimar Sidibé	N	0,30	0,43	0,43
	ALB	0,07		
	NERE	0,06		
5. Dondoli	N	0,50	1	1
	ALB	0,25		
	NERE	0,25		
<u>5 villages (none private)</u>		3,33	3,33	
<u>1983 (Provisional program)</u>				
<u>10 Villages (none private)</u>		6,35	6,35	
1. Bendieli	N	0,50	1	1
	ALB	0,30		
	NERE	0,20		
2. Tégrou	N	0,30	0,90	0,90
	ALB	0,40		
	NERE	0,20		
3. Songho	N	0,25	0,50	0,50
	ALB	0,13		
	NERE	0,12		
4. Diombo-djenninko	N	0,25	0,50	0,50
	ALB	0,13		
	NERE	0,12		
5. Pourally	N	0,18	0,25	0,25
	ALB	0,50		
	NERE	0,03		
6. Boro	N	0,29	0,50	0,50
	ALB	0,20		
	NERE	0,01		
7. Sinkarma	N	0,40	0,60	0,60
	ALB	0,19		
	NERE	0,01		

Bandiagara Station (continued)

Village or individual	Trees planted			Total area (ha)
	Species	Area (ha)	Total (ha)	
8. Tognun	N	0,29	0,50	0,50
	ALB	0,20		
	NERE	0,01		
9. Tintimbolo	N	0,40	0,80	0,80
	ALB	0,30		
	NERE	0,10		
10. Dioudjoulou	N	0,40	0,80	0,80
	ALB	0,37		
	NERE	0,09		

Table B: Village woodlots 1982-1983

Distribution collective and private

Station	Year	Number of participating villages	Areas collective (ha)	Number of privately owned	Areas private (ha)
Mopti	1982	3	0,50	1	0,25
	1983	11	7,50	2	1
Bandiagara	1982	5	3,33	-	-
	1983	10	6,35	-	-
Total		26 villages	17,68	3	1,25

Table C: Village woodlots 1982-1983

(Recapitulation)

Year	Station	Number of villages participating	Area by year (ha)	Total Area (ha)
1982	Mopti	3	0.75	4.08
	Bandiagara	5	3.33	
1983 (proposed)	Mopti	1	8.50	14.85
	Bandiagara	10	6.35	
1982 + 1983				18.93

List of abbreviations for Tables A, B and C

- . ha : hectare
- . N : Neem (*Azadirachta indica*)
- . Eu : *Eucalyptus camaldulensis*
- . Pro : *Prosopis chilensis*
- . Leu : *Leucena leucocephala*
- . Alb : *Albizzia lebeck*
- . Néré : *Parkia buglobosa*

Commentary on project results with respect to those proposed

The results attained at the Mopti station with respect to those proposed were 15% in 1982 and 85% in 1983.

At the Bandiagara station the results achieved were 66% of those proposed in 1982 and 63% in 1983.

The cumulative results for the two stations in 1982 was 40% of those proposed. The provisional cumulative results for the two stations in 1983 are 74% of those proposed. The Mopti station made the greatest progress in increasing its rate of success while the Bandiagara station maintained essentially the same level of success.

5.3.4.3. Characteristics of the 1982 Village Woodlots

5.3.4.3.1. Dates of Planting

In the 1982 woodlots the dates of planting were essentially in August. The agents considered it undesirable to plant before that time owing to the lack of rain earlier in the planting season. Planting should normally be done toward the end of June and in the first part of July in average seasons.

5.3.4.3.2. Area of Village Woodlots

The village woodlots have a minimum surface area of 0.25 ha and a maximum of 1.0 ha. The average is 0.60 ha. An increase of average surface area in 1983 is expected over that of 1982. We recommend a target of 1 to 2 ha on the average for collective woodlots and 0.5 ha for private woodlots each year.

5.3.4.3.3. Species Used for Reforestation

The species used for reforestation interventions during 1982 and 1983 are as follows:

Neem	Néré	Leucena
Albizzia	Prosopis	

We recommend a greater diversification of species in reforestation actions during coming years.

If the present rate of success is maintained, only 60% of the proposed results will be achieved, if the number of participating villages is tripled over that of the preceding year. The expansion of areas thus depends on the number of new villages because the villages already participating are extending their woodlots to attain one hectare in Mopti station and those in Bandiagara station do not foresee any expansion.

Private village woodlots are present, but not numerous in the Mopti station and do not exist at all in Bandiagara station. The average size of those inspected is 0.62 ha. Collective village woodlots are widely present in both stations and average about 0.68 ha in the villages participating in the project. The Neem was used in 70% of the collective village woodlots installed in 1982 and 46% of the woodlots in 1983. An average of 58% of the woodlot plantings were Neem in the two campaigns followed by Albizzia with 21%, Néré with 9.5%, Eucalyptus with 6.25%, Prosopis with 5% and Leucena with 0.06%. Leucena and Eucalyptus were introduced beginning in 1983.

5.3.4.3.4. Status of Village Woodlots

At present village woodlots are mostly collectively owned and maintained there now being 26 woodlots in the two stations of which only 2 are privately owned. The stimulation of privately owned woodlots is recommended.

5.3.4.3.5. Work Schedule

The following work schedule was carried out in 1982.

January to April:	Sensitization and gathering of information in the vil- lages
May to June:	Village profiles obtained; choice of planting sites; distribution plan for the plants by species and numbers
June to July:	Staking and digging of planting holes
July to August:	Planting
September:	Weeding and replanting
September to December:	Constructing enclosures
Oct. 1982 to May 1983:	Watering

In 1983 the work schedule is as follows:

January to February:	Preparation of programs at the office level for the 1983 campaign
February to April:	Sensitization and gathering of information in the villages
March to June:	Village profiles obtained; choice of planting sites; distribution plan for the plants by species and numbers
May to June:	Staking and digging of planting holes

Commentary: The proposed annual work plan for 1982 was followed except for delay in planting owing to lack of rain early in the 1982 season. It has not been followed in 1983, especially for the villages which began participation in 1982.

Proposal for work schedule for village woodlots

Month	New woodlots	Woodlots 1 year old	2 years old	3 years old
Jan.	(1) Discussion on criteria for choice of the site including intercalary cropping	(1) Caretaking plus village evaluation	(1) Visit to the woodlots	(1) Visit to the woodlots
Feb.	- " -	(2) Discussion of needs for watering	(2) Shapping	(2) Shapping
May	(2) Choice of site plus delimitation of site	(3) Demonstration of watering technique	(3) Construction of enclosures	
April	(3) Staking of hole sites and demonstration of hole digging	(4) Watering	(4) Watering	
May	(4) Hole digging and basining of the holes	(4) Watering plus information on intercalary cropping construction enclosures	(4) Plus information on intercalary cropping	(3) Information on intercalary cropping
June	(4) Intercalary cropping	(4) Intercalary cropping	(4) Intercalary crops	(4) Intercalary crops
July	(5) Planting plus intercalary cropping	(5) Replanting plus intercalary cropping	(5) Replanting plus intercalary cropping	(4) - " -
Aug.	(5) - " - - " - plus weeding plus replanting	(5) - " - - " - plus weeding	(5) Plus weeding	(5) Weeding
Sept.	(6) Enclosing - caretaking	(6) Enclosing - caretaking	(6) Enclosing caretaking	
Oct.	(7) Cleaning plus enclosing plus caretaking	(7) Cleaning plus enclosing	(7) Cleaning	(6) Cleaning
Nov.	(7) Plus evaluation	(7) - " - Evaluation	(7) Plus evaluation	(7) Evaluation
Dec.	(7) - " -	(7) - " -	(7) - " -	(7) - " -

5.3.4.3.6. Choice of Sites

The sites for village woodlots are generally agricultural lands of good quality normally used for cultivation of millet. They are thus suitable for tree culture. Use of fallow lands for woodlots is rare. We recommend that sites be selected with the villagers that are not necessarily agricultural.

5.3.4.3.7. Staking and Hole Digging

The individual sites for the planting of trees are generally made by the villagers who use a hoe to mark the position of the planting hole. They follow a cord on which has been painted at the position of the hole. This technique is used especially in the Bandiagara station. In Mopti station classic staking of holes is more used more frequently. The holes are dug with hoes with dimensions of 30x30x30 cm, 40x40x40 cm and rarely 50x40x40 cm. We recommend the marking of sites by hoe and holes with dimensions of 70x70x70 cm or at the least 60x60x60 cm.

5.3.4.3.8. Tree Planting

We have not been able to verify if planting techniques are correct (straight planting, proper hole completion and filling, etc). The young plants are not always transported in covered vehicles. The recommended time for planting has not been followed.

5.3.4.3.9. Replanting

Replanting has normally been done one month after the first transplanting and throughout the year for those parcels which are watered. However, the quality of replants cannot be assured.

5.3.4.3.10. Intercalary Cropping

Intercalary cropping was recommended somewhat late by the extension teams and it has not been done in most of the woodlots. We recommend intercalary cropping in all village woodlots with crops which do not compete with the trees.

5.3.4.3.11. Cultivation and Maintenance

There has been no soil cultivation and maintenance consists only of weeding. We recommend cultivation of the soil where this is necessary and where it would favor tree growth such as in clayey and lateritic soils.

5.3.4.3.12. Protective Measures Against Livestock and Termites

Individual protective enclosures and rarely perimeter enclosures have been made with branches of nearby thorny bushes or trees. Enclosures of this type are essential to protect young trees against the depredations of livestock. Individual enclosures often have to be replaced several times a year owing to destruction by animals, wind storms, etc. Also the individual enclosure impedes the development of the young tree by blocking the growth of its crown. Again they do not permit proper watering because the edges of the basin around the tree are outside of the enclosure. The perimeter enclosure is more effective for overall protection, but it involves a cutting of surrounding natural vegetation for its fabrication. We propose a type of rectangular individual enclosure woven from millet stalks and/or reeds that would have a width slightly greater than that of the basin around the tree. We have observed the evidence of termite damage in plantings of young trees, particularly Eucalyptus. Although it would be desirable to have on hand a supply of termiticides to control this damage, the stocking of such termiticides cannot be recommended because of the potential health hazards to the rural population involved in the procurement, stocking, distribution and local supervision of their use.

5.3.4.3.13 Watering

Watering in the woodlots is undertaken from the beginning of the dry season until the first rains, but it is not regular or sufficient. The trees are watered once or twice a week from wells constructed in the woodlots or from village

wells. Often water is carried from a tank or river as far as 300m away. The usual watering provided for each tree is about 10 liters which is clearly insufficient. The evaluation team recommends no watering of the trees until late (March to June) in the dry season when it is truly necessary and then 2 to 3 times per week with 20 liters per watering per tree.

5.3.4.3.14 Losses in Tree Plantings

There are many losses in tree plantings caused by the destruction of livestock (30 to 40% loss) and also termite damage (5 to 10%). Other sources of loss have not been determined.

5.3.4.3.15 Choice of Species

The species that are being planted are appropriate to the stations except for the Albizzia which is present in all the woodlots of Bandiagara no matter what the terrain. The Prosopis is often planted in sites where it is not appropriate. We note that the extension team does not often take into account the nature of the soil when choosing appropriate tree species.

5.3.4.3.16 Plant Development

We have already observed that the development (maturity) of plants used for tree planting is not sufficient.

5.3.4.3.17 Spacing Utilized

Spacings presently used in three planting in the stations are 3 x 3 m; 4 x 4 m; 6 x 3 m and 7 x 7 m. At Mopti the 4 types have been utilized while at Bandiagara only the 4 x 4 m and 3 x 3 m have been used. We recommend that the 3 x 3 m spacing be abandoned and suggest that other spacings be utilized taking into account the species, the planting sites and different tree species and agricultural crop associations.

5.3.4.3.18 Percentage of Success

The percent of success ranges from 0 to 47% in the village woodlots planted in 1982 that were visited. The two stations register about the same percent of success but the weakest is at Mopti and the strongest at Bandiagara. The overall percent of success for the two stations was 30% in the 1982 campaign. This is very low for the enclosed and watered woodlots. The evaluation team believes that a success percent of 80% should be attainable and should be required in the village woodlots so that the villagers do not become discouraged.

5.3.4.3.19 Work to be Done in the 1982 and 1983 Woodlots

The necessary replantings will be undertaken in all woodlots. This work has been programmed for the 1983 campaign. The hole digging, the enclosures and even restaking are to be undertaken. In the Mopti station, the villagers will replant the 1982 woodlots while extending them. In the Bandiagara station the 1982 woodlots will only be replanted as necessary with no extensions. The time for replanting is behind schedule as the extension agents began with new tree planting. The evaluation team recommends that work schedules be carried out at the same time in both the old and new woodlots.

5.3.4.3.20 Motivation and Receptivity of the Rural Population During the Two Campaigns of 1982 and 1983

The villagers are aware of the usefulness of trees and the role they fill in the environment. They perceive the advantages of trees and expect much from the woodlots which they install. They wish to continue with project interventions. This is the reply to such questions as: why do the villagers want trees? do the villagers want trees planted and why? are the villagers receptive? (Questions of the extension agents)

5.3.5 Shade Trees

All the villages brought into the project in 1982 have received important numbers of trees for shade often as great as those provided for village woodlots (notably in the Mopti station). The sites planted include private courtyards, markets, schools, public buildings (mosques and government centers). Visits to these plantings has permitted us to affirm that these are actions welcomed by the villagers because the trees are often well-taken care of, particularly in the market places and school yards. The percent of success is satisfactory. The Mopti station has done well in popularizing this type of reforestation while Bandiagara station is still timid, having in view some failures owing to lack of maintenance. The plants being furnished for these actions are not of good quality. The evaluation team recommends an intensification of plantings of shade trees with well performing species that have stayed in the nursery at least two years (high branches and crowns).

5.3.6 Trees for Alignments

This type of intervention was carried out in the 1982 campaign in two villages in Mopti station and one in Bandiagara. More than 1,000 plants were utilized. Visits to some of the sites have led us to conclude that these were even less successful than the collective village woodlots. Maintenance of the alignments was not carried out effectively. In 1983 only one new village is programmed for an alignment. Those carried out in the two villages in 1982 have not been programmed for replanting. No alignments are programmed for 1983 in Bandiagara station. It seems to us that the same emphasis should be placed on tree alignments as that placed on shade trees. Tree alignments should receive the same maintenance as shade trees and the trees selected for them should be of the same quality as those for shade.

5.3.7 Living Hedges

In the 1982 campaign no attempt was made to extend this type of reforestation intervention and only one such action is programmed for the 1983 campaign. We think this type of action has possibilities in the Mopti Region and should be popularized.

5.3.8 Wind Breaks

No action was taken in this domain in 1982 but is programmed in 1983. Here again we consider interventions in wind breaks to be of importance equal to those for living hedges.

5.3.9 Animation-Vulgarisation (Extension) Activities

Each station has an extension team composed of: a DREF technician serving as team leader; agricultural monitor (community development agent); and a Peace Corps Volunteer.

Throughout the 1982-83 campaigns this team has worked in the villages following the schedule previously described. The extension methods utilized include the sensitization of rural populations to reforestation problems in general and the significance of trees in particular. The methods of popularization (vulgarization) are not perfect because the technical themes for action in the project are not adequately developed. This derives from the diffusion of information withheld by the extension agents. The imperfections in the execution of tree plantings derives from the lack of technical experience of the extension team. It is also noted that there is a lack of supervision and control of these activities by the station chiefs. The evaluation team saw here the need for training within the project itself of the extension teams through annual or more frequent sessions. The extension agents should also have at their disposition well-designed technical schedules (forms) by themes in order to assure an appropriate flow of information from the project to the villagers and also an annual schedule of visits to the villages according to the themes to be discussed with the villagers.

5.4. Improved Wood-burning Stoves

Action has been taken to meet the extension goals for improved wood-burning stoves that are fixed in the Project Paper. Most of these have been built in Bandiagara and Sevaré with village extension only in the Fatoma arrondissement.

The basic problem appears to be the lack of technical and social soundness of the stove model being used, and a lack of understanding of the social and technical aspects of improved stoves on the part of the extension agents. Improved stoves in Mali were introduced by Peace Corps health workers with the goal of removing smoke from the kitchen without much thought being given to stove efficiencies. Thus a model was developed with a chimney and no damper which is probably less efficient than a well-shielded three-rock stove. The social analysis of cook stoves in the Project Paper states that in Mopti region "even during the rainy season the majority of the cooking takes place outside". If this is the case then why were the project stoves built inside? There is one exception in which a stove was built outside for instructional purposes in a seminar. It was used for two weeks and then abandoned. None of the project built stoves are being used. In most cases, it was observed that there were 3-rock stoves nearby (usually outside) that were being used.

There was one case of spontaneous replication in the village of Manako. The builder observed the techniques being taught at the seminar and then independently built a stove for his niece. The design was a departure from the design demonstrated at the seminar and for this reason the stove works fairly well. The interior wall in effect divided this model into two stoves. Only the side with smoke vent integrated into the pot hole was used. The chimney side was abandoned. This stove is occasionally used by the young woman. She stated that it saved wood but she could boil water faster on three rocks. This is normal for high mass stoves as it takes longer to reach a steady state, as much of the

initial heat goes into the walls. If an item were to be cooked for a long period of time there would be a wood savings. However, to boil water the three rock stove, which is next to the wall and well-shielded, would probably be at least as efficient and maybe more efficient. It would also definitely be faster. The woman stated that she preferred to gather wood rather than to save wood by using the stove. Also if she doesn't constantly work hard she doesn't feel well! The USAID Project Coordinator (also a woman) had earlier reported the same statement in talks with other women in other villages. The gathering of wood is probably a valued social contact with other women or a chance to be alone at a location away from the village. It is also true that those who are used to constant physical exertion feel different when the work rhythm is broken. This is but one example of the complex social constraints encountered in stove work. (See Sociological Evaluation)

5.4.1. Conclusions and Recommendations on Improved Wood-burning Stoves

It is counterproductive to popularized stoves which do not work or are not accepted. Also it makes it extremely difficult to popularize a good stove, because everyone thinks that stoves don't work. Most of the literature, planning and policy statements refer to stoves models that were tested to find the most efficient and then deployed. Unfortunately, this approach is the most common, but is also the reason for a notable lack of success in most stove programs. The major component for stove success is social acceptability; technical soundness is only important if the stove is acceptable.

Africans, and Sahelians in particular, are world class #1 experts in banco construction. They don't need instruction in use of materials except for the reaction of that material under heat. What is needed is instruction on design criteria to meet the specific needs of village women. These needs will vary from

village to village and often from household to household. A standard stove model, model, just will not fit. Stove vulgarizateurs (extension agents) need to be trained in how to assist village women to design their own stoves for their own needs and not simply how to reproduce a standard model. It is recommended that there be a moratorium on stoves in this project until a highly qualified stove extension and design specialist is assigned to the project to train stove extension agents and designers, preferably women. Larry Jacobs and his wife Sandy of Approvecho Institute are specifically recommended as being probably the best qualified at this approach. Most of the other organizations involved in stoves use the standard model approach.

5.5. General Technical Recommendations

5.5.1. Techniques

5.5.1.1. Village Woodlots

The minimum requirement for success of village woodlots in this zone are:

1. availability of 10 ha for 10 consecutive plantations of one hectare each located on good soil;
2. 60 x 60 x 60 cm planting holes dug on time;
3. fencing or individual protection provided on time;
4. 20 liters of water, two or three times a week for each plant during the dry season;
5. a guardian; and
6. appropriate species selection for soil conditions.

It is obvious from the above requirements that given:

1. scarcity of cultivable land;
2. seasonal scarcity of labor;
3. scarcity of water;

4. low economic return for fuelwood; and
5. questionability of community motivation; village woodlots at the present time are really not a viable alternative in the project area.

Village woodlots should be undertaken only when demanded by villagers individually or collectively. This option should not be pushed by extension agents and should be undertaken only when the six minimum conditions listed above are agreed to. In case of collective action a further agreement of distribution of outputs is needed.

This (1983) year's campaign is already in place and should proceed as planned but with a change of emphasis to take place during the final two years of the project. This means, however, that work begins now in the nursery. Also the extension teams need to be reoriented now.

5.5.1.2. Amenity Trees, Agro-forestry and Sylvo-pastoral Interventions

These social forestry interventions have been neglected thus far in project history in order to meet the 5 ha per year cercle plantation goals specified in the Project Paper. As they were not presumed to count toward project goals, they were not emphasized. The goals should be reoriented to the number of trees planted and not to surface blocks of trees. In spite of relative neglect, these interventions have been the most successful aspect of the project because they are fulfilling the felt needs of the villagers.

5.5.1.2.1. Shade Fuelwood Sylvicultural System

In response to village demands for shade trees, emphasis should be placed on planting of shade trees in and around villages. The villagers are quite willing to plant, water, and protect these plantings. Species can be varied but

emphasis should be placed on the Neem as it has a fairly rapid growth and withstands pollarding. Robust stock of 2 years in the nursery should be used in large planting holes, 60 x 60 x 60 cm minimum, and preferable larger as the soils in the villages are very compact. Soils in the villages are also rather rich and if watered sufficiently, the trees should grow very well. After the plants are established and reach a height of about 3 meters the terminal is cut to induce lateral branching. Four or five laterals are selected as standards and trained horizontally by attaching weights to them. This forms the tree structure with spreading flat top which produces good shade and a nice place to work or sit. Subsequent growth will be from the standards as vertical shoots. These shoots can then be cut annually or seminannually to produce fuelwood of the proper size for use in improved stoves with only a minimum of cutting and no splitting. The wood is produced above animal height without the need to reestablish the plants after each cut.

5.5.1.2.2. Agro-forestry

There is at present a very old agro-forestry system in place and being used by villagers. This is the grain-livestock system using *Acacia albida* for animal feed and soil fertility maintenance along with associated livestock for manuring. This system should be fully utilized by the project to increase tree planting and to assist in the increase and enrichment of *Acacia albida*. Also, it can be used in the installation of windbreaks on northeast sides of fields, field border plantings, and live fencing. There is need for caution in taking into account the effects of horizontal root systems on adjoining crops. Only those species which will not compete with crops for scarce soil water should be used.

5.5.1.2.3. Fruit Production

No effort should be made by the project to establish commercial fruit production although this is often requested by the villagers. However, fruit trees such as common mangoes, detarium, annona, ficus, lannea, etc. should be included in species mix for planting.

5.5.1.2.4. Erosion Control

In the Bandiagara plateau there are possibilities for erosion control and bank stabilization interventions using trees and shrubs possibly in combination with minicatchments. If used in combination with trees, small diameter multi-stemmed bushes can be cropped for appropriate stove-sized wood. These could be grown along ravines, stream banks, or in soil pockets in rocky ridges.

5.5.1.2.5. Sylvo-pastoral Interventions

Specifically for the Peul, emphasize planting of tree and bush species for improving milk production should be emphasized in conjunction with "harrama" land for the sedentary herd. If fuel wood happens to be a byproduct so much the better but management should stress fodder for milk production.

5.5.2. Training

In general the training aspects of the project have been weak. Suggested training activities include:

1. an evaluation at the end of year's campaign followed by a "seminar de recyclage" for animation/vulgarization (extension agents) and nursery chiefs. This should be followed by planting of the next campaign;
2. retraining of the extension team as stated in the section on improved stoves;
3. training in soil conservation techniques;

4. training in silvo-pastoral techniques; and
5. continuous technical training by the project direction.

5.5.3. Experimentation

This component of the project is giving problems in both the Mopti and Bandiagara stations. There is too much emphasis being placed on a formal statistically and scientifically valid approach that is not needed at this level. What is needed is more of a simple grass roots, trying out of new ideas, approach. There is no space, time nor technical competence to carry out valid trials for exotic species. All project personnel should be animated to use the land for searching out answers to local problems. Emphasis should be on local species.

Some suggestions are:

1. What are the maturation dates for seed of local species?
2. What kind of pre treatments are needed for these seeds?
3. Can any of these be direct seeded?
 - a) do they need pre-sprouting?
 - b) can this be done in:
 - damp sand;
 - compost;
 - how deep should they be seeded;
 - what kind of pre and post germination soil preparation is needed?
4. Can any of the local species be vegetatively propagated?
5. Nursery practices for local species: spacing, growth, transplanting, hardening off, etc.
6. Do any local bushes have fuelwood production potential i.e. fast growing, multi-stemmed, cut annually?

7. Try some species that are reported to be unpalatable to livestock on the outside of the fence.
8. What species other than Neem have cropping potential by pollarding?
9. What species have potential for growth on rocky ridges?
10. What species are useful for érosion stabilization?

Decisions on what to do and how to do should be made at the cercle level without necessity of formal proposals and approvals at a higher level. Technical advice should be sought from outside the project if needed. Villagers know local trees and can provide information if they are approached properly. There should be a rainguage at all cercle nurseries and rainfall data should be kept for use in experimentation as well as nursery records. The experimentation now being carried out at Fatoma should continue in view of the time and effort already invested but additional ideas also need trying.

5.5.4. Village Involvement

If the purpose is locally autonomous, decentralized environmental management, we can assume the eventual structure will be local villages responsible for their own management and production of forest products needing only technical advice from DREF extension personnel. Cercle nurseries would then be responsible for producing trees for administrative services and DREF plantations.

1. The first step is to decentralize seed collection. When a village requests certain species they should be required to furnish some seed. This involves the village from the beginning of the tree growth cycle. This will also result in a wider genetic base. These seeds can be grown in the nursery and weak stock weeded out.

2. The next step in the decentralization of tree production is with village nurseries. This is possible now in several villages where individuals are growing fruit trees and gardens. There would need to be an agreement that DREF would purchase a percentage of stock at a price that would cover costs, the rest could then be sold. Neem would be appropriate in the beginning as it is easy to grow. This would leave the cercle nursery to concentrate on more difficult species along with Neem to help meet demands.

Since the great drought (1968-73) villagers, in general have believed that it is impossible to plant trees and have them live. The project has turned this attitude into knowledge and confidence that they can indeed plant trees.

Annex 5-1

Sahel woody species that are not palatable to livestock

Adenium obesum		
Annona senegaleusis	Fruit	
Bredelia ferriuginea (Soudan)		
Burkea africana		
Calotropis procera		
Cocculus pendulus		
Combretum glutinosum		
Combretum micaranthum		
Combretum molle		
Combretum mignicans		
Crossopterix febrifuga (Soudan)		
Detarium microcarpum	Fruit	
Diospuros mespiliformis	Fruit	flooded zone
Erythrima senegalensis		

6. GENERAL CONCLUSIONS AND RECOMMENDATIONS

6.1. With the changes suggested below and those discussed in more detail in the institutional, economic, sociologic and technical evaluations it is recommended that the project continue during the remaining 3 years which have already been programmed.

6.2. The technical evaluation of the project concludes that it is technically possible to install village woodlots and presents a procedural outline, with work plan and schedule on how best to choose a site, install, operate, and manage an ideal village woodlot. However, in the economic and social evaluations it is concluded that village woodlots are not economically or socially viable and suggests that they be phased out in favor of other forestry interventions provided for in the Project Paper. Moreover, it is concluded that there is vast scope for forestry interventions including village-level tree plantings for shade trees, soil-enriching field trees, fruit trees, trees for erosion control, road alignments, windbreaks, living hedges, etc. Multipurpose planning could also include firewood production.

6.3. One of goals stated in the Project Paper is to encourage "local autonomous decentralized environmental management". For this reason and in the view of (1) the difficulties in the procurement, stocking, distribution and local control of termicide use; (2) the potential health hazards to the population; and (3) the problems entailed in the safe handling of termiticides, it is recommended that Eucalyptus with its dependence on termicide inputs be phased out of the project and that the 2 to 10% loss to termites in other species be accepted.

6.4. The evaluation team concludes that the efficiency of the nurseries is low because of poor management. A much higher output could be obtained with presently

available resources. There appears to be a lack of motivation and initiative at all levels in the project. It is recommended that a program for the sale of plants produced in the nurseries be established. Plants could be sold to interested individuals and institutions.

6.5. It is recommended that promotion of village-level or private nurseries be tried out as a method for reducing cost per tree and of increasing incentives for reforestation. It is in the self interest of the private nursery owner to promote the sale of trees and thereby also promote reforestation.

6.6. The evaluation team recommends that in addition to conventional tree plantings of shade trees, especially trained and pollarded shade trees with potential for firewood production be tried out as part of project activities. (See section 5.5., General Technical Recommendations.)

6.7. Fruit trees, such as mangoes, detarium, etc. should be included among the species available for village level plantings.

6.8. The evaluation team recommends that further extension activities with improved stoves in the project be deferred until a highly qualified stove extension and design specialist is assigned to the project.

6.9. The evaluation team concludes that there is a need for additional training at all levels for project personnel in all technical and socio-economic aspects of the project. Particularly critical are technical management, animation and vulgarization (extension); and development of a local level cost accounting system by function and objectives, suitable for technical and economic analyses. These topics are discussed in more detail in the economic, sociologic and technical evaluations of the project.

6.10. The evaluation team recommends inputs of technical assistance to the project. Such assistance could be provided by experts of the DNEF through the utilization for training of funds allotted to the project. Other AID funds could be utilized to provide short-term expatriate technical assistance.

6.11. It is recommended that a Technical Associate (Adjoint Technique) be assigned to the Regional Director's office in Mopti.

6.12. A system work schedules in the station (cantonement) office and files for each village included in the project should be established in order to facilitate management of project operations.

6.13. It is recommended that an analytic accounting system be established. For this it would be necessary to engage the services of a professional accountant. It is recommended also that project accounting be concentrated at regional level.

ANNEXItinerary of the Evaluation Team

June 2, 1983 (Monday) through June 8 (Wednesday):

Contacts, meetings and discussions with individuals in USAID, DNEF and others related to the project. Review of project and related documents.

June 9 (Thursday):

Travel Bamako to Mopti

June 10 (Friday):

Visits to government officials (5th Region) and to DREF

June 11 (Saturday) to June 14 (Tuesday):

Visits of inquiry in project activities in the Mopti Station, DREF

June 15 (Monday) to June 19 (Sunday):

Visits of inquiry in project activities in the Bandiagara Station, DREF

June 20 (Monday):

Working visit to the Douentza Cercle

June 21 (Tuesday) to June 22 (Wednesday):

Working visit in the Youvaraou Cercle

June 23 (Thursday):

Visit to the Djenna Station, DREF

Return to Bamako

June 24 (Friday) to July 2, 1983:

At Bamako

Preparation of report on the project evaluation