

PROJECT EVALUATION SUMMARY (PES)
PART II

1) Summary

This mid-term review was conducted by Dr. Mason Carter, Head of the Department of Forestry and Natural Resources at Purdue University and J. L. Collom, Associate Director of International Programs at Purdue University, during the period August 30 through September 6, 1984. Purdue is providing the technical assistance to the project. The AID Project Officer accompanied the Purdue personnel on some of the field evaluations.

At the time of the review (Sept. 1984), the progress of the project was substantial but a number of significant issues needed to be worked out at that time. At the present most of them seem to be reasonably concluded.

Although not an evaluation per se, USAID considers the mid-term review adequate enough to describe the activities being carried out and the progress toward meeting project objectives. USAID concurs also with most of the recommendations and has acted on them since the submission of the review.

2) Evaluation Methodology

The review included visits to field facilities and examination of a number of the planting trials which are now underway. a visit to an energy farm, and discussion of charcoal research meetings with the staff of ISA and COENER and with staff of the AID Mission.

3) External Factor

The initial project proposed that trials be established in the Azua region. Although there are two small test sites installed, to date a suitable site and appropriate, collaborative organization have not been found. Transportation of labor and materials from Santiago to Azua is not feasible. Further, Azua is one of the driest regions of the country. Planting without irrigation to assist in seedling establishment is not likely to be successful. Finally, there appears to be a continuing concern over the working relationship between ISA and COENER.

4) Inputs

The availability of vehicles for field research has been a continuing problem on the project. Another continuing problem in the general area of infrastructure is related to the difficulties of communication with the Mao Site.

5) Outputs

Planting trials have stimulated interest of private land owners to plant on their own and to expand beyond experimental trials.

6) Recommendations

Purdue staff made 12 recommendations in closing their review.

1. Establish 5 - 10 ha blocks of each of the three most promising species at Mao and one other zone. Done.
2. Wood produced in clearing land should become source of wood for charcoal conversion. Done.
3. Develop revised plans for kiln comparisons. Done.
4. Redesign charcoal research program to make explicit use of mixed species commonly found in native forest. Done.
5. Define evaluation criteria for charcoal quality by simple consumer preference test supplemented by laboratory analysis. In progress.
6. Prepare detailed plan for next phase of operational studies. Reduce number of species used in research so that studies can be focused on site preparation, spaces, fertilization, etc. Done.
7. Establish a smaller range of spacing appropriate for several species and sites. Done.
8. Develop a budgetary process between ISA and COENER to ensure effective flow of funds for project activities. Done.
9. Introduce small polyculture studies. In progress.
10. Develop plan and agreement for issuing publications. Done.
11. Provide radio communication between Mao and field sites, and telephone communication between ISA and Mao. Done.
12. Extend Purdue contract. Done. A.I.D. agreed. The work carried out by ISA with well conducted TA led by Dr. Knudson is the best work that has been done to date in the Dominican Republic. This fact is widely recognized in the media, local educational circles and by private investors.

7) Lessons Learned

Native Forest. The initial project description did not give adequate emphasis to research on the productivity of the native forest. Even in the dry area represented by Mao, this forest is an existing resource in the Dominican Republic and one which is likely to respond well to management. The project has, appropriately, developed some valuable research in the native forest. Permanent plot work and the partial cuttings in the native forest as well as transects for species composition analysis are all appropriate. It is important to continue to develop the methodology. It appears as though some other plot types might be appropriate, particularly longer but narrow rectangular plots which would enable routine sampling by cutting and weighing of the kind of material produced. Such an approach would be somewhat simpler and more direct in terms of analyzing firewood or charcoal production on such plots than that of measuring stem diameter or counting numbers, etc. There clearly is considerable promise for expanding the capacity of management of native forest to produce fuelwood. Thus, it will also be important to follow-up on the biologically oriented or production oriented research in the native forest with some trials of charcoal production within that variation in species present on these sites.

8) Special Comments or Remarks

ISA and COENER staff are worthy of support. The program needs to translate research into tangible action. The Private sector should take the lead to carry out such action.

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INTERNATIONAL PROGRAMS IN AGRICULTURE

ENERGY CONSERVATION AND RESOURCES DEVELOPMENT

(AID CONTRACT 517-0144-C-00-3009-00)

MID-TERM EVALUATION REPORT

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I. INTRODUCTION

This document constitutes a report on a mid-term review of the Wood Fuel Development Project in the Dominican Republic (AID Contract No. 517-0144-C-00-3009-00). The review was conducted by Dr. Mason Carter, Head of the Department of Forestry and Natural Resources at Purdue University and J. L. Collom, Associate Director of International Programs at Purdue University, during the period August 30 through September 6, 1984. The Purdue contract providing for a program of technical assistance to the overall Dominican project was initiated in early July, 1983, with the arrival of Dr. Douglas Knudson, a long term staff member responsible for the biological portion of the research program and Team Leader for Purdue. The other long term staff member who has been working in the Dominican Republic since November 1, 1983, is Jose Mauro de Almeida, who has had responsibility for the wood conversion and charcoal production research. The initial Purdue contract has a duration of two years, and thus is scheduled to terminate the end of June, 1985. Thus this review occurred slightly after midway through the contract. The review included visits to field facilities and examination of a number of the planting trials which are now underway, discussion of charcoal research, meetings with the staff of ISA and COENER and with staff at the AID Mission.

II. OBSERVATIONS

1. Infrastructure

As the technical assistance portion of this project was initiated in mid-1983, it was necessary to begin work on some of the basic infrastructure required before research programs could be implemented. Unfortunately, the actions required at that time were difficult to initiate because of series of delays in obtaining the release of the peso funds which were to be provided for in-country costs. These problems have been overcome, and funds have been made available on a quite reasonable basis since the early part of 1984. Infrastructure at the Mao site is now in quite good shape. The entire property of approximately 1000 hectares has been fenced. The nursery is in operation; pond building for some irrigation water has occurred and roads are in place subdividing and providing for access to the Mao property. The kiln area and buildings for support of the conversion research are now in place.

In regards to other infrastructure issues, the availability of vehicles for field research has been a continuing problem on the project. While this has been substantially resolved at this point, the field activities are still being constrained by an inadequate number of field vehicles available to provide for the transportation needs of the large number of staff involved in the project, both Dominicans and technical assistance staff.

A continuing problem in the general area of infrastructure relates to the difficulties of communicating with the Mao site. The office available at Mao does not have telephone service which can be

reached from ISA, nor is the nursery site or other facilities in the field at Mao reachable by any kind of communication system. Considerable inefficiencies in the project operation continue to plague the project as a result of the difficulties in communication from Santiago to Mao and internally within the general area of Mao and the field site at Mao. Nursery facilities at Mao while workable at this point also appear to be relatively minimal in size and scope to handle the size planting program which will need to be underway by mid-1985.

2. Research

Basic Studies. The term basic studies on this particular project is used to describe a series of analyses and research areas which are not included in the biological research nor in the charcoal conversion. A number of these are background and/or economic studies. The development of research in this area has been quite good. A number of existing plantations have been measured and productivity of fuelwood projected for several regions and species. Some initial analysis of the fuelwood and charcoal market has occurred and studies on the returns to investments in fuelwood plantations have been initiated. While other activities will be required in this area, this particular research area is off to a good start considering the amount of effort that has been available to devote to it.

Species Trials. Research comparing species is well developed. Initial estimates of the number of sites and the number of species to be tested in the original contract documents and project

descriptions has been exceeded. An adequate number of sites is represented and a very adequate number of species and varieties within species are under trial. It appears that the major concern in this area will be that of keeping the research trials growing properly and free of weeds and animals and other problems which prevent them from being useful as a measure of productivity. It will be extremely important in the future to analyze the trials which have been planted and to narrow down to some smaller number of most promising species for the various regions and sites and to continue to work with those species on other issues related to planting success. Several spacing trials have been started but additional work is required. However, it does not seem reasonable to examine all of the spacings proposed in the original project design. It would be adequate to work with 2 to 4 species and two of the most logical spacings such as 2 x 2 meters and 2 1/2 x 2 1/2 meters. Factors other than total production may effect the species selected for establishment of energy plantations. These would include viability and ability of seed, a particular problem with neem. Other factors are site preparation and weed control requirements, insect and disease problems, and suitability for charcoal production. These issues will need to be examined carefully as the project continues. Our efforts should be concentrated on the two or three species holding the greatest overall promise for each of the major regions being studied.

The initial project proposed that trials be established in the Azua region. Although there are two small tests installed, to date a suitable site and cooperator have not been found. Transportation of labor and materials from Santiago or Azua is not feasible. Further,

Azua is among the drier regions of the country. Planting without irrigation to assist in seedling establishment is not likely to be highly successful. Studies to determine the regeneration and growth of the native forest would be more appropriate with the present resources.

Native Forest. The initial project description did not give adequate emphasis to research on the productivity of the native forest. Even in the dry area represented by Mao, this forest is an existing resource in the Dominican Republic and one which is likely to respond well to management. The project has, appropriately, developed some valuable research in the native forest. Permanent plot work and the partial cuttings in the native forest as well as transects for species composition analysis are all appropriate. It is important to continue to develop the methodology. It appears as though some other plot types might be appropriate, particularly longer but narrow rectangular plots which would enable routine sampling by cutting and weighing of the kind of material produced. Such an approach would be somewhat simpler and more direct in terms of analyzing firewood or charcoal production on such plots than that of measuring stem diameter or counting numbers, etc. There clearly is considerable promise for expanding the capacity of management of native forest to produce fuelwood. Thus, it will also be important to follow-up on the biologically oriented or production oriented research in the native forest with some trials of charcoal production which works within the variation in species present on these sites.

Charcoal Conversion. The development of the charcoal research is still in initial stages. In part, this has been slow to develop because of the necessity of creating some of the infrastructure necessary. It has been necessary to produce, instruct others and experiment with the process of kiln building including material development. Furthermore, the availability of wood supplies for charcoal production has been a problem. It is not yet possible to consider charcoal research using the output from the plantations. It will be several years in the future before plantation wood will be available in the quantity necessary for charcoal research.

Nevertheless, there are a number of significant things which can be done. One of these is to begin immediately the expansion of the charcoal research using the wood available from the native forest at the Mao site. In analyzing the research program to date, it appears that the number of types of kilns for which comparison is planned is excessive. A smaller number of kilns would seem to be adequate to meet the initial needs of most charcoal production. The research plan or the types of comparisons needed also need to be simplified to reflect more appropriately the wood supply available and the variation in wood quality which is present. It is inappropriate to continue the experimentation with pine for charcoal production at Plann Sierra. The opportunities and wood supply at Mao and ISA are adequate for a productive program of charcoal research. This is certainly much more consistent with the types of materials which are currently being used and which will need to be used in the future for charcoal production.

The explosion of kilns at Plann Sierra is an event which warrants careful analysis. But it does not warrant undue concern. Most probably, the following explanation is appropriate:

- Heavy resin concentrations are contained in wood placed in the kiln.
- Burning of wood, as charcoal begins to be produced and particularly under conditions of low oxygen, allows high concentrations of resins to become super-heated above the normal ignition point in a high oxygen environment; sudden availability of oxygen either by shifting of the fuelwood in the kiln or through sudden leakage through the side wall of the kiln resulting from an excessive shrinking of the mortar used to connect the bricks permits instantaneous lighting of large quantities of super-heated resin.
- Ignition and burning of resin and associated gases produces stress on kiln walls and ceiling which is not sustained particularly if the mortar joints are somewhat weak as a result of clay shrinking.

We would not anticipate this problem where hardwood fuels are used such as at Mao. There is no plan to use pine for charcoal production in future operations. Therefore, future charcoal research should be concentrated on hardwood species at the Mao site.

3. Institutional Linkages

It appears there is a continuing need for concern over the working relationship between ISA and COENER. Several areas warrant some effort on the part of all parties involved in order to make sure that the project moves ahead effectively. For example, the processes of budget development, budget projection, and funding transfer are not clear to all parties. There does not appear to be a mutual understanding between ISA and COENER on budgets and funding and this appears to be constraining project progress.

Further, apparently AID is advancing peso funds to COENER but the advance of such pesos funds does not extend to ISA. If this observation is accurate, this would seem to be an appropriate area for action to enhance project activity. There seems to be some difficulty regarding the allocation of funding for personnel. Apparently this process is not flexible enough between ISA and COENER to ensure that people are available to plant where and when such action is called for and to provide for weeding of established plantations established where and when this is called for. As a result there seem to be an adequate number of people available for work as required at the Mao site but inadequate labor to fence out animals and weed plots at a number of other sites around the country.

Reporting on the status of the project also seems to be an area of concern in general. The parties involved in the activities do not seem to know the status of funding, how much has been expended and how much remains for the future. This general problem is hampering project progress.

4. Demonstration Effects

Planting trials have stimulated interest of private landowners to plant trials of their own and to expand beyond experimental trials and plant somewhat larger areas. This is desirable so long as the landowners and the public understand clearly the preliminary nature of the species trials. Extensive planting of unproven species could result in disillusion when plantations of poor growth or survival results. However, large scale plantings of the most promising species are necessary to enhance the demonstration effects. Larger scale

plantings are necessary to determine the problems and issues that arise as one moves to an operational larger scale. Some of the kinds of issues which arise are those related to the difficulties of uniform response of species in the nursery, which is important to enable large scale production. Likewise, problems of site preparation become more evident as do difficulties regarding the economics of clearing and preparation and problems of large scale handling and transportation of seedlings. In order to get into this set of issues, it is going to be important to move on to some larger planting trials with certain species next year. The number of species used in such trials must be very limited. The process of expanding to such larger scale trials will take greater organization and planning on the part of all of those involved in the project.

Demonstration of the potential of several kinds of kilns and more efficient production of charcoal is also an issue. It would appear that the demonstration values are much greater if charcoal activities are further expanded at Mao as compared with at Plan Sierra.

The seminar and workshop plans which have been made already for the coming year seem to be appropriate and should be carefully implemented. Detailed organization and careful work on the part of all involved is needed immediately if this is to be carried out effectively. There certainly are some interesting and useful things to show, describe and demonstrate to a variety of types of people.

Publication efforts on the project to date have been good. The documents are prepared. The research publications appear to be appropriate and effective and whatever difficulties seem to be

preventing their immediate publication and release in the Dominican Republic should be addressed by all those concerned in the project.

5. Technical Assistance

The technical assistance provided for in the Purdue contract has been provided pretty much on schedule. During the 14 months of activity since the contract was signed, the Team Leader and senior scientist, Dr. Knudson, has been present for 14 months. The conversion scientist, Jose Almeida, has been present for 11 months. Short term technical assistance activities have been provided by six different individuals for a total of over 4 man months in the area of tree research. No technical assistance on a short term basis has been provided in the charcoal or conversion research area. It appears to be highly appropriate to initiate some additional action in this area at this time.

6. Training

One long term trainee began an M.S. degree program in forestry in January, 1984 and an application has been prepared and submitted for an additional long term academic candidate who would begin studies in January, 1985.

Short term training programs have occurred for people both in the conversion area and in the species trials and other biological areas. The short term training activities have occurred in Haiti, the U.S., Puerto Rico, Sweden and Brazil. The seminar involving staff from CATIE in Central America has been scheduled for November.

7. Commodities

The equipment purchases have included:

- Equipment for weather measurement;
- Equipment for containerized production of tree seedlings, tinus containers and folding trays;
- Equipment for the establishment of a charcoal testing laboratory, muffle furnace, drying ovens, mettler balance;
- Field supplies for the tree research program.

This equipment has been purchased and shipped to the Dominican Republic. The total amount spent to date for commodities is approximately \$20,000.

III. RECOMMENDATIONS

1. The project should plan to establish during 1985, five to ten hectare blocks of each of the three most promising species at the Mao site and in one other zone.

2. The wood produced in clearing land for the larger scale plantations at Mao should become a source of wood to be used in the charcoal conversion research at Mao.

3. We urgently need to develop revised plans for kiln comparisons involving fewer kilns and larger quantities of fuel at the Mao site. It would be appropriate to use a paired plan for testing kilns which might include such things as traditional dirt piles versus beehive kilns; traditional dirt piles versus a small metal kiln such

as constructed at ISA; a traditional dirt pile versus a 55 gallon drum kiln, etc.

4. The charcoal program of research should be redesigned to make explicit use of the mixed species as commonly found in the native forest.

5. A simple consumer preference test and analysis for charcoal quality supplemented by laboratory analysis would seem to be an appropriate way to address the issue of defining evaluation criteria for charcoal quality.

6. No significant expansion in the number of species being tested is appropriate at this time. There should be a gradual reduction of the species being used in the research so that more detailed studies of site preparation, species, fertilization, etc. may be conducted. A detailed plan is needed for the next phase of operational studies.

7. There would seem to be no real rationale for insisting as part of the overall project design that five year trials should occur on the full range of spacing for several species with spacing ranging from 1 1/2 meters all the way up to 3 x 3 meters. A smaller range of spacing appears to be appropriate for the several species and sites which are important to the project. Previous analyses have shown that it is not necessarily critical to spend this amount of time and effort on spacing per se.

8. A budgetary process needs to be developed between ISA and COENR which will permit more effective communications on this area and which will ensure that the necessary funds for project activities continue to move effectively through this institutional linkage.

9. It would appear to be appropriate to begin some small introduction of polyculture types of studies in the planting program. Such studies might include polyculture of tree species along with cassava on dry sites and with corn or perhaps other crops in wetter areas. Under such a program, trees planted in either single or double rows with wider spacings alternating to permit crop production in the middle, seem to be appropriate kinds of designs. These polyculture studies will require additional help and will require economic analysis to demonstrate the utility and appropriateness.

10. A solid plan and agreement between the various institutions involved regarding the issuing of publications from the project needs to be developed. Publications are now ready and the institutional agreements and the funding and publication process to get them in press and distributed to the people who need to see them in the Dominican Republic needs to be developed.

11. Telephone communication between ISA and Mao and radio communications within the general vicinity of Mao and the field site at Mao needs to be provided by the project. The current allocation and utilization schedule for project vehicles should be reevaluated to determine what constraints exist regarding access for field activities

and improved ways of scheduling utilization of vehicles.

Final Recommendation. Inasmuch as the progress of the project has been substantial to date, but that a number of significant issues need to be worked on it seems to be reasonable to conclude, that the technical assistance activity provided by Purdue should be sustained for an additional period of two years or more. The project in the Dominican Republic is scheduled to have an overall duration of five years. This potential for considerable future contribution through a program of technical assistance was discussed with ISA and COENER and both institutions have recommended that the program of technical assistance continue beyond the current termination date of June 30, 1985. The review at this point in the project indicates that progress has been satisfactory, the project is moving effectively and the project offers significant potential for additional Purdue cooperation. Purdue believes that the project is achieving the kinds of goals which the University expects to be able to contribute to and thus our recommendation is that the University respond favorable to the suggestion that technical assistance be continued for an additional period. In order to ensure that project activity continue through the next year without undue interruption, it is further recommended that within the next 90 to 100 days a plan of work for an extended period of technical assistance be developed.