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EVALUATION OF

MALI LAND USE INVENTORY PROJECT

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MALI LAND USE INVENTORY EVALUATION

I. INTRODUCTION

A. PROJECT GOAL: The overal goal to which this project is to contribute is the rational allocation of Malian natural resources by the GRM. (USAID Project Paper)

B. PROJECT PURPOSE: The purpose of this project is to compile and evaluate basic information on Mali's natural resources that is necessary for informed decisions on resource allocation and, by training Malians to carry out resource inventories and plan use of resources, to build a Malian capacity for continuing work in this field. (Project Grant Agreement)

C. PROJECT ACCOMPLISHMENTS PROPOSED: The proposed accomplishments are as follows: (1) the collection and processing of existing data and establishment of a natural resource data bank; (2) the provision of color-enhanced LandSat imagery for field inventory and black-and-white imagery for resource map publication; (3) the inventory of natural resources with emphasis on soils, vegetation and water; (4) the interpretation and evaluation of land and water resources; (5) the production and printing of final reports and an atlas of accessory maps; (6) the training of all Malian technicians and staff members assigned to the project; (7) the establishment of permanent headquarters for a natural resource inventory and planning unit within the GRM; and (8) the purchase of project equipment.

D. PROJECT BACKGROUND AND DESCRIPTION

Mali lacks a broad base of known resources capable of exploitation ad must continue to depend upon the agricultural sector for most foreign exchange; food, fiber and animal products account for over 94 percent of the value of exports. Yet, in recent history, Mali has shifted from a position of self-sufficiency in overall agricultural production and consumption to one of deficiency, thus requiring considerable amounts of foreign exhange to finance food import tion.

The project is presentlv a two-year effort by the GRM, the United States and France, aimed at providing a resource inventory incorporating information about soils, vegetation, water resources and present land use for the Government of the Republic of Mali, and helping to establish a national resource planning unit.

The data collected and mapped will be analyzed and evaluated in order to produce estimates of land potentials under present physical and human conditions and under various assumed levels of investment in the agricultural sector, and will act as a base for national level planning decisions on development and management fo Mali's resources.

The project, as originally designed in the Project Paper included the whole of Mali with varying degrees of emphasis. Specifically, the

GRM desired that the whole republic be considered in some sort of appraisal and that the so-called agricultural zone (livestock and crop production) of about 520,000 km^2 be mapped and appraised at a reconnaissance level.

Subsequently, the Contract Agreement deliniated a project area with its eastern boundary at 1° E., its northern boundary at 17° 30' N., and its southern and western boundaries the borders of Mali. At the time of this report the project area extent is defined as approximately 575,600 km^2. For the areas in excess of this and located north ofthe loop of the Niger River, the study will be strictly limited to the zones of particular interest to GRM. A map of the project is appended.

II. PROJECT SETTING

As originally conceived in the Project Paper (PP) of July 1978 the Mali Land Use Inventory was to have its seat in the Institute of Rural Economy (IER) of the Ministry of Rural Development (MRD). The IER is responsible for socio-economic research, surveys, analyses and planning, including agricultural resources. At the time of implementation of the Project in November 1979 through a contractural agreement between the Malian Ministry of Rural Development and TAMS, as contractor, the seat of the project was still in the IER, MRD. In September 1980, however, the project and personnel were administratively transferred to the National Directorate of Water and Forests, the research and planning arm of the Ministry of Livestock, Water and Forests. (Organization Chart Appended). This administrative change

does not appear to have led to any significant modifications of project goals, purpose or scope of work as originally conceived in the PP or in the TAMS/GRM contract. The economic, social and political conditions have not changed substantially since the project was designed.

III. ASSESSMENT OF PROJECT'S CONCEPTUAL FEASIBILITY

A. VIABILITY OF PROJECT OBJECTIVES

Briefly stated, the project objectives are:

(a) to compile the necessary information about Malian natural resources (soil, vegetation, water) in order to assess their potential for agricultural and range development and, subsequently, to permit informed decisions on resource allocation; and

(b) to develop among Malians the capacity for natural resource inventorying, assessment and planning.

Given the dearth of natural resource data and the national institutional weaknesses, the project objectives were well formulated. From the standpoint of land resources inventory the project is innovative and will establish a very useful information system for the development objectives of the country. The training component in resource inventories and evaluation is a necessary complement if the maps and reports generated are to be effectively utilized by the GRM and if an institutional capacity for natural resource research and planning is to be established.

The greatest shortcoming in the project design was lack of provision for a realistic timeframe in which to complete both

the technical and training components. Project history to date has shown that emphasis upon data collection and analysis and generation of maps and reports has been at the expense of institution-building. This problem is elaborated upon in the Project Implementation section.

One other weakness in project objectives is the emphasis on a continuing capability of resource inventory at reconnaissance scales. With termination of the project the reconnaissance work is complete. Rather, project design should emphasize progressive training that would produce a Malian capability to undertake resource inventory at increasingly larger scales, to the point of producing maps for farm unit planning at scale 1:20,000 and irrigation planning at scale of 1:2,000.

B. VALIDITY OF LINKAGES

1. Inputs and Outputs

(a) Input elements

-Personnel Services (GRM, contractor, USAID)

-Participant training program

-Commodities and Equipment

-Other Project Expenditures

(b) Output elements - tangible

-Land Resource Inventory: narrative report, soil-vegetation and water resources maps, interpretive charts and maps, tabular data.

-A repository in Bamako for resource documentation

-An Office of Resource Inventory and Evaluation

(c) Output elements - intangible

-Malian capability for enhanced research and planning and to undertake detailed resource and evaluation work

It is logical to expect that outputs (tangible and intangible) would be achieved if all inputs were provided according to the project design. However, given the short timeframe allowed for implementation it is not feasible to provide all inputs, particularly those in the area of participant training. Consequently, the number of trained personnel as outputs will be significantly lower than planned.

2. Outputs and Purpose. It is reasonable to expect that if design outputs were achieved, the project objectives would be realized. Given the technical inputs/outputs, the objective of assessing Malian natural resource potential for development should be achieved. In light of reduced training inputs/outputs, however, institutional capacity for natural resource inventorying, assessment and planning will not be fully developed as purposed unless changes are made in the implementation schedule and in the types of training to be provided.

3. Purpose and Goal. The achievement of the program goal does not automatically follow from the project purpose. The completion of a land use inventory can certainly assist in locating

priority resource areas, but the inventory is only a tool in development planning. Additional measures will need to be taken at the end of this project to insure the use of this valuable tool. Accordingly, the project will directly contribute to the broader objective of rational allocation of Malian agricultural and natural resources.

C. VALIDITY OF ASSUMPTIONS

Those assumptions identified at the design stage have proved to be valid but several important assumptions which could have a significant impact on achieving project objectives were left unstated.

1. Input Assumptions. It was assumed that FAC would provide its technicians on schedule but no assumptions were made for the provision of other inputs. Unforeseen delays in commodity and equipment delivery were experienced which have caused serious implementation delays. While GRM has provided personnel, it was incorrect to assume that it could make sufficient funds available to support them in project activities in balance with support received by expatriates. It was also an invalid assumption that the GRM would be able to adjust priorities in the face of internal developments in order to provide adequate office space.

2. Output Assumptions. The availability of qualified Malian counterparts was correctly assumed. The Evaluation Team perceives that there exists a small but significant number of graduate-level technical personnel capable of translating a proper training and experience into on-going accomplishments. There exists as well an appreciable resource of undergraduate technicians, qualified and

motivated for higher-level education and advanced training. However, the Project Paper fails to identify the status of the in-country resource; reference to educational institutions, the kinds and degrees of specialization, as well as education trends.

3. Purpose Assumptions. The assumption that full cooperation and support of the GRM and French agencies and organizations would be given is valid for the establishment of an Information Data Base. The Project Paper neglects assumptions that could affect the objective of developing a national capability in resource inventorying and planning. Will current Malian technicians return to their respective pre-project services or will they remain in the National Directorate of Water and Forests? How will the activities of the new service be financed? Do sufficient GRM funds exist to maintain and utilize this newly developed capacity?

4. Goal Assumptions. The existence of a dominant socio-economic rationale in the allocation of development resources is not the sole assumption for achieving goal targets. Do the necessary administrative structures and financial resources exist to insure that data developed will be utilized in development planning and decision-making? Will the Ministry be able to convey to other ministries and potential users the interpretation and practical applications of data? These issues are important unstated assumptions because they will effect whether or not the successful achievement of project purpose will subsequently contribute to the program goal.

IV. ASSESSMENT OF PROJECT IMPLEMENTATION ARRANGEMENTS AND PERFORMANCE

A. IMPLEMENTATION/OPERATIONS PLANNING

The greatest shortcoming in the project design was lack of provision for a realistic timeframe in which to complete both the generation of data analyses, maps and reports while at the same time training a cadre of Malians to understand, interpret and utilize the generated products. The project design as set up in the PP and continued in the project agreement and the TAMS/GRM/contract allowed only 2 years for completion of a volume of work and training that would realistically require at least 3 years and possibly as much as 4 years for orderly completion. The compressed timeframe has had a much greater negative impact on training and institution-building than on the technical side of the project.

In addition, though, negatively effecting the technical work was the lack of provision of an adequate start-up period for procurement of appropriate remote sensing imagery, vehicles and equipment <u>before</u> arrival of the full staff of expatriate technical personnel and Malian counterparts to the project. Project history to date has indicated that a start-up period of 10 months to a year is necessary, in a project of this magnitude, for acquisition of Computor Compatible Tapes (CCTs), for processing of the preliminary images from the CCTs, for field checking and evaluation, and for subsequent color balancing and final image production. A skeleton staff on the project is all that would be necessary during the start-up period. As far as can be judged from the PP implementation plan only 8 weeks was allowed for start-up time for

preparation and delivery of imagery before the arrival of expatriate technicians. Also the PP implementation plan appears to have allowed only one month for procurement of office and field equipment before arrival of the full technical staff.

As it turned out, the project work schedule was set back 8 to 10 months because of long delays in the delivery of enhanced color imagery essential to the technical objectives.

It is now apparent that an extension of at least 6 months will be required for orderly completion of the project.

RECOMMENDATION: At least a one-year start-up time should be scheduled for future resource inventory projects similar in magnitude to the Mali Land-Use Inventory Project, if effective use of remote sensing technology is to be made, and additional time should be programmed to insure completion of training and effective institution-building.

B. PROJECT ORGANIZATION ADMINISTRATION

1. Major Responsibilities

(a) The Consultant (TAMS, Subcontractors)

The Consultant assumes overall responsibility for the following:

(1) Collection and documentation of existing data

(2) Color-enhanced LandSat imagery through ERIM, its subcontractor

(3) Land resources inventory and survey which will focus on soils and vegetation

(4) The interpretation and evaluation of land and water resources data compiled during the project.

(5) Preparation of maps and overlays at 1:500,000 as follows:

-existing land use maps showing general categories of land use such as agriculture, rangeland, forest, etc.

-soil/vegetation classification

-agricultural potential maps, indicating land use alternatives and most effective land use, derived from the USDA Land Capability Classification

-water resources potential map based on the base water resources maps showing the potential of water resources for agricultural production.

(6) Printing of reports and maps, to be delivered to the GRM six months after completion of the work in Mali.

(7) Training (on-the-job and seminars, as well as assisting in the selection of Malian candidates for advanced U.S. training)

(8) Obtaining flying services required

(9) Purchasing all equipment necessary to carry out the project work, except project vehicles and other items already purchased by AID on behalf of the GRM

(10) Preparation and submission of progress reports

(11) Employment of professional expatriate personnel, including entering into subcontracts with specialist firms as required.

(12) Employment of secretaries and typists, translators, chauffeurs/mechanics, guards, and others.

(13) Responsibility for all project equipment and vehicles of project.

(14) Supervision of its own staff and the technical inputs of the two member team provided by FAC.

(b) GRM

(1) The GRM will assign approximately twelve technicians to the project who will be supervised by the Malian project director. The technicians will assist the Consultant in carrying out the project work.

(2) The GRM will provide or cause to be provided to the Consultant all existing information including documents, maps, aerial photographs, applicable to the project.

(3) The GRM will provide adequate office space for all the Consultant's resident and short-term staff, counterpart staff, and staff provided by FAC.

(4) The GRM will provide eight four-wheel drive and two 4-door sedans.

(5) The GRM will assist the Consultant and personnel with regulatory formalities in Mali.

(c) FAC

FAC will provide two expatriate technicians to the project:

(1) a hydrogeologist, to collect documentation on ground water in the area; and

(2) an agronomist, to work in the interpretation section of the project collecting and mapping demographic information on humans and livestock, transhumant movement, and farming patterns.

(d) USAID

(1) Coordinate with GRM and Contractor to define project terms of reference

(2) Conduct project monitoring and evaluation

(3) Provide contract funds for the U.S. technicians and their support costs

(4) Furnish contractor implementation funds for the functioning of the project

(5) Purchase project vehicles and provide funds for temporary office space

(6) Provide funds for payment of counterpart salary bonuses and per diem.

2. General Assessment of Performance

The project is being implemented in a very professional manner despite numerous difficulties. The counterparts appear to be motivated and work well together. Consequently, good progress is being made toward the achievement of project objectives.

The work is being carried out by a host country contract team. The contractor is TAMS Engineering and Architects with two sub-contractors:

-Environmental Research Institute of Michigan (ERIM), Ann Arbor, Michigan;

-American Ag International, Inc. (AAI), Tucson, Arizona

The contract team is composed of multi-national expatriates specialized in the field of soil science, range ecology, tropical agronomy, socio-economics, hydrology, and resource planning. Also, FAC has furnished a hydrogeologist and a tropical agronomist. The hydrologist has recently left the project. There are Malian experts serving as counterparts for most of the expatriate staff.

There have been slight differences of emphasis between the parties in terms of project objectives. The contractor (TAMS) is firmly committed to fulfilling its obligation to furnish the natural resources report and maps (The Land Use Inventory). In practical terms that means a lot of hard field work to collect the necessary data to complete the mapping and reporting.

They are just getting into the evaluation and interpretation of the whole process so it is difficult to comment on inputs there.

Because of the delays in delivery of color-enhanced imagery coverage of the project area, it was necessary during preliminary stages of the project to adapt field surveys and studies to imagery of limited quality, as well as to conventional aerial photography and topographic maps. This deficiency has delayed progress in the preparation of a map of the natural regions and in the production of soils/vegetation maps, all of which require interpretation of the enhanced imagery. In contrast, this deficiency has not seriously effected progress on the establishment of the information data base, the analysis of hydrological data, and the preparation of preliminary hydrologic maps which are not dependent on the availability of the enhanced imagery. This work is on schedule and near completion.

To some extent, institution-building has suffered with the emphasis given to the generation of the technical products. Although this was inevitable given the inadequate design-stage planning, the Malians are more interested in the present training of national technicians assigned to the project as homologues and in the longer-term utilization of data after the reporting and mapping is complete.

USAID seems to be sensitive to commitments beyond just completing the maps and report and the complementary seminar(s) to explain them.

Among the parties (GRM, TAMS, USAID and FAC) involved in the project, there appears to have been a reasonably clear definition and understanding of relative roles and responsibilities. Nevertheless, there have been shortfalls in carry out responsibilities that have affected the rate of progress on the project. Among these are the following:

-Because of lack of financial resources the GRM has not been able to meet its full responsibilities in providing office facilities for the project personnel and their equipment nor adequate financial support for the Malian personnel assigned. It has been necessary for USAID to subsidize these needs.

-The TAMS sub-contractor (ERIM) has not been able to produce enhanced LandSat imagery needed for the project because CCTs have not been delivered to the sub-contractor on a timely basis by EROS and NASA.

LandSat imagery for the project has still not been completed. ERIM is the sub-contractor responsible for custom producing the imagery from Computer Compatible Tapes (CCTs). CCTs are furnished by EROS Data Center (EDC) in Sious Falls. On November 21, 1979, ERIM placed an order for 40 CCTs with EDC. By February 12th ERIM had 24 CCTs out of the 40 ordered. Upon receipt of the first CCTs ERIM digitally mosaiced the images and formatted them to correspond to the IGN topographic map sheets of 1:200,000. Debugging and software was developed using real data. Finally 24 images at a scale of 1:200,000 arrived in Bamako out of a total of 65 required images. A preliminary

evaluation of their quality was made. The images were used in reconnaissance work and tested under field conditions and at the end of March a summary evaluation was made and communicated back to ERIM. The problems included:

a. Color matching of adjacent sheets;

b. Exposure (light vs dark tone areas);

c. Color (blue vs yellow tones);

d. Resolution (lack of clarity or focus);

e. Data gaps.

The late arrival of imagery has definitely hampered overall field effort and mapping was not started until October, although reconnaissance for the whole country was carried out using available images and topography maps.

ERIM still has not delivered all the images contracted for and has required that the project pay an additional $32,000 for adjustments, as mentioned above, to the images. Also, there was a lack of total images to cover the whole project area, and the requested increase would pay for the 3 or 4 additional images required. There appears to be some question about ERIM's responsibility to furnish a 1:1,000,000 scale mosaic--whether or not that was a part of their contract with TAMS. It appears clear that it is. It is difficult to determine what steps have been taken by ERIM to obtain the additional CCTs and deliver the required imagery so stated on their contract with TAMS.

USAID has generally done a creditable job in the monitoring of the project. However, there apparently was no clear perception of the

great importance of having the enhanced color imagery on hand for field work, training and interpretations. It would seem that if this had been perceived early in the project history,USAID would have been able, through its Office of Science and Technology, to put pressure on EROS and NASA for more prompt delivery of the CCTs to the sub-contractor. On this problem there may have been a lack of communication between USAID and the contractor.

There is little question about the high utility of the color enhanced imagery for reconnaissance soils and vegetation surveys and evaluation. However, the PP was overly optimistic in projecting the utility of this type of imagery to water resources surveys and evaluations. For these, the utility is marginal, particularly in the case of ground-water parameters and somewhat less so for surface water. Most ground-water phenomena are not visible to the LandSat eye and most significant ground-water data for resources evaluations must be collected from conventional well inventories, compilations and areal interpretations. With the exception of the survey of flood flows, streams, ponds and lakes, most surface-water parameters are time-dependent and cannot be defined from LandSat imagery.

Concerning the legends soon to be adopted for the final 1:500,000 imagery and overlays, it is recommended that they be in adequate detail and simple terminology to allow maps to be used with a minimum of difficulty, and to allow the maps to have meaning without accompanied documentation.

3. Effectiveness of Information Flows.

There is good communications between the parent agency (National Service of Waters and Forests) and the project, and between the agency and the Ministry. USAID appears to be involved effectively in this flow of information. Time is consummed however, in making decisions between the GRM and USAID. Also, as an observation, FAC does not appear to have shown much interest in following this project.

C. TECHNICAL EVALUATION

1. Summary of Broad Approach

Data collection in the field is performed by integrated teams that comprise soil scientists and range ecologist and include, on occasion, other specialists according to need.

Field data is determined for point locations by on-site inspection and detailed description. Then, the decisions on classification and inclusions in map units are related to "signatures" of the base map and extended to adjacent areas by comparative analogy.

"Color enhanced LandSat imagery" at a scale of 1:200,000 is used as a mapping base for delineations of homogeneous map units. In final processing, field data will be evaluated, correlated and mechanically transferred to the final publication base: "black and white LandSat imagery", Band 7, at a scale of 1:500,000.

Units of mapping will take the form of Soil/Vegetation resource units, which are natural and recurring ecological combinations of soils and related plants. The collection of data for compiling the Soil/Vegetation Map involves the identification of plant communities in relationship to soil taxonomy (soil identification), and coordinating the two in defining a particular soil/plant unit on the landscape and on the LandSat imagery. The technique requires a great deal of coordination between the soil scientists and the plant ecologists.

The inventory of soils and vegetation must be defined as a reconnaissance level effort. Map units may be either single member units (consociations) or associations of two or more taxonomic units (complexes). Transitional areas between two distinct units would possibly be mapped separately at a more detailed scale.

In summary, the record of the reconnaissance survey of Mali's agricultural resources will comprise two documents:

- Narrative Report
- Atlas of Maps

2. Soil Resources

a. Soil Classification System. The system of soil classification chosen by the Consultant, in accordance with host country objectives, is USDA SOIL TAXONOMY. The level of classification for soil taxonomic units which will characterize the ecological units of the legend is the Subgroup Class of the system. This is a level of moderate specificity, providing a soil class that yields a maximum of morphological data for the resource site, relative to the scale employed. The Subgroup class is further qualified by a phase modifier, referring to soil depth, texture, stoniness, drainage class or other; the result is a soil concept that goes far in connoting agronomic features useful in capability appraisal.

An accessory feature to this project's conception, an issue lacking emphasis in design analysis, is that the inventory

marks the most extensive use of USDA Soil Taxonomy to date in Sahel-Sudano regimes--if not the whole of Africa. There is involved an important "testing" of that system. USDA Soil Taxonomy is only provisional for many tropical soils; many subgroups are unidentified or need intergrading and the list of great groups may be incomplete. The experience to date, as reported to the Evaluation Team by project pedologues, shows a remarkable gap in Ustalfs and Ustults, with many more taxonomies to be encountered.

It is recommended that the Consultant accurately characterize all taxonomies of appreciable extent, and for types not identified in the system to date, utilize guidelines of Soil Taxonomy to arrive at a tentative class name. It is recommended that newly identified classes, where firm and agronomically meaningful, be mapped consistently in field operation and that they be ordered in the project Identification Key, to be treated as fully approved. It is recommended that bulk field samples be taken for typifying predons of unapproved soils in the course of field description for possible future processing and study. (This may require a minimum of effort.)

The Evaluation Team acknowledges that the volume of documentation and laboratory analyses required by USDA Soil Management Support Services for approval of new taxonomic classes to Soils Taxonomy is prohibitive under present work

pressures. It is recommended that lines of communication between the Consultant and USDA/SMSS be kept open.

By the intervention of the Evaluation Report, it is recommended that the Consultant proceed with field decisions and await any actions, suggestions, or records of proposed changes on file USDA that can be developed by the Evaluation Team Pedalogue on U.S. return and as an adjunct to this project evaluation. Let the date of February 15, 1981, be set for the receipt in Bamako of this report.

The Consultant is commended for resourceful and innovative actions in the field survey of both soil and vegetation resources in Mali and for a willingness to make valuable additions and refinements to the existing USDA Soil Taxonomy.

b. Land Capability Classification. By contract provisions, the USDA system of capability classification is specified for use. From this study will evolve a Soil Potential Map in the form of an interpretive overlay to the Soil/Vegetation Map.

The project rationale firmly leans on this approach to provide in tabular data information about such matters as (1) the relative arability of lands; (2) the limited aptitude of certain lands suitable only for watershed protection, forests or wildlife reserve; (3) the relative input necessary for any particular use; and (4) the relative productivity of all lands in their respective uses.

Groundproofing and mapping is about 25% complete but is progressing very rapidly and should be completed by the end of June 1981, pending, of course, the arrival of missing LandSat images. The color mosaics correspond with the IGN topographic quads at the same scale (1:200,000).

c. Atlas Assemblage. The production of any resource map at scale 1:500,000, comprising an area of 575,000 sq. km., at best must be considered ambitious. The project's proposed inventory, using subgroup levels of soil classification and employing in excess of 100 soil taxonomic units and at least 50 plant taxonomic units, will require an estimated 160 map units--both single member units and complex units. This large number of cartographic units immediately imposes a problem in visual perception and ready comprehension of the whole.

Therefore, the design of map legends must be done through a process of progressive testing and some resultant comprises. If the total resource is presented on about 10 sheets to yield a complete set of one map presentation, no one sheet would present the total legend.

It is suggested that one important use that will be made of the assemblage--sometimes in a sweeping overview--is a statistical analysis of particular groups of ecological units: for example, areas of land having irrigation potential or areas of land suitable only for wildlife reserve. Such analyses require

hectagage notation, as well as percentage-composition of taxonomic units in complexes.

It is recommended that the documentation include a listing of map units, either as a display on one separate atlas sheet or as tabular data in the narrative, ordered by some systematic listing, including statistical occurrence, and rated according to the following:

(1) Table of Characteristics that Affect Land Use (classes of depth, slope, AWC, etc.)

(2) Table of Potential for the Major Uses (using adjective ratings)

The content of inclusions in map units can only be determined by testing. A foremost recommendation is that any map unit listing be accompanied at close proximity by a descriptive phrase in non-technical terms, emphasizing a notion of landform, where significant.

3. Vegetation Resources

Ecological Team Objectives, in order of priority, are as follows:

a. Vegetation Identification. Plant communities are identified by composition of relevance, where a particular plant specie is weighted by its importance in the community:

5 . . . . . always present, dominant
4 . . . . . always present
3 . . . . .
2 . . . . .
1 . . . . . rarely occurs in the community

Plant communities are identified from the 1:200,000 scale color mosaic imagery. Groundproofing of each community is described and given a number corresponding with the soil analysis. The typing is accomplished by comparing similar units already inventoried. If the unit has not been seen before, a new unit is formulated. If the ecosystem is more or less the same as previous sampled unit, then a complex of an existing type is formulated. The Vegetation Classification system is very well adapted to the scale of the imagery and is simple to use.

The relating of soil/vegetation units to image signatures has been determined after much discussion and by actually identifying units in the field. Units have to be of adequate largess at the 1:200,000 scale in order to incorporate soil/vegetation units.

The procedure adopted for recording ecosystem information gives adequate data on location of sampled area, unit characteristics, vegetation, and references for locating it on the images.

The project is adequately describing and mapping the natural vegetation of the project zone in Mali and is gaining broad understanding of the ecosystem. One must keep in mind, however, the limitations in detail at the huge scale of the imagery, especially the scale of the final map (1:500,000).

b. Collection of plant production data (biomass production). Biomass data is collected following peak plant growth, or just following the rainy season from October possibly through January in the 250 mm to 700 mm rainfall areas. Samples are randomly selected and collected with a $1m^2$ area. Production is recorded as actual weight and is later converted to air dry weight through systematically weighting and air drying similar vegetative samples. Ultimately, biomass is calculated and presented as kilograms/hectare. No data has been collected for the 1979-80 period because no technicians were in place in time to take samples. Because of the time-consuming nature of the process, and the team approach to collecting soil/vegetation data in the field for the preparation of the Soil/Vegetation Map, only spotted samples have been taken during this season. It is planned to collect biomass production weights for the Niger River Delta after flood waters descend sometime in January or February 1981. Possibly in October-December 1981, time permitting, some 60 scattered samples will be taken.

Under present project timeframe, the quantity of biomass samples for the whole project area will be lacking. Project field work and mapping is to be completed by December 1981 as dictated by the contract agreement. If, however, an extension is allowed the project, additional samples could be taken. The systematic, non-biased, complying procedure selected by the ecologists on the project appears sound and with adequate

sampling in various rainfall regions should provide valuable production data for that year's conditions.

RECOMMENDATIONS:

(1) Biomass production is related to rainfall/evaporation and varies from year to year, but because of the variation of rainfall/evaporation throughout the project area, it would be absolutely necessary to take the maximum number of samples, cover the entire project area, and collect weather rainfall/evaporation data from as many regional stations as possible.

(2) The biomass production information should be presented on an overlay map to the Soil/Vegetation Map and rainfall data should be recorded with it, or not far behind, and by region sampled.

(3) Additional time should be allowed for collection of biomass data within the contract. It is recommended that an additional six months be allowed to facilitate training Malian experts in collection techniques, computations, and recording.

(4) More detailed information concerning the plant community species composition should be given on the legend. At least three major species should be included on the legend to give a clearer picture of what the plant community is without having to go into another area of the Atlas or text of report to find out, thus making the map useable without the cumbersome text.

(5) A detailed Methodology/Procedural Manual, concerning mapping and formulation of vegetative units and complexes should be incorporated into the text of the final document for use by Malian technicians once expatriates leave.

4. Water Resources

Although extensive use is being made of LandSat imagery in the mapping of soil/vegetation parameters, the available imagery for the project is only marginally useful in the mapping of water resources parameters. Much surface water data and analysis is linear and time-dependent and thus not suitable for display on maps. The mapping of areal ground-water parameters depends on the collation of existing well and borehole data with available geologic and hydrogeologic maps.

The water data inventory and analysis has provided sufficient information, both on surface water and ground water, to construct both base and potential water resource maps at the 1:500,000 scale, as planned under the project. The base map for water will include mean annual recharge to ground water (shown by isolines) in $m^3/hr/km$; the locations of gaging stations; mean annual flows by sealed river width, and numbers; 10-year maximum and minimum flows by numbers; and mean monthly flows by small inset graphs placed near gaging stations; and isohyets of annual rainfall in mm. The potential map will show areas favorable for crop irrigation from ground water at various magnitudes and those favorable only for village and livestock water supply; the sustainable ground-water yield in $m^3/hr/km^3$; existing surface water irrigation projects and bas-fonds possibilities; and annual surface water runoff by isolines, in mm.

Basic well-inventory data, areal aquifer, depth-to-water and well-yield maps together with computer processed data on annual stream flows, floods of selected frequencies, low-water frequencies and monthly streamflows will be published in a technical report to accompany the map atlas. There will be fold-out maps (probable scale 1:2,500,000), tables and graphs to accompany a narrative text in the report.

Because the water resources component of the project does not depend, except marginally, on the field checking and interpretation of the LandSat imagery, the work has advanced more rapidly toward completion than that of the soil/vegetation components. The preliminary phase of the water resources component is now essentially complete.

There remain, however, two applications of LandSat data that should be investigated on a trial basis. Lineaments, which may indicate the presence of faults, fracture systems, and/or the traces of dikes, are apparent in many places in the crystalline and consolidated sedimentary rock terrains of the project and may be identified by appropriate study of the available LandSat imagery.

It is recommended that a field study be conducted in three or four randomly-selected areas of about 100 km^2 to determine if any correlation can be made between the relative yields of wells and the presence of lineaments. A preliminary analysis indicated little or no such correlation. Such a study might verify or disprove the conventional wisdom that lineaments mark the location

of important quantities of ground water.

A second experiment is recommended in the Bandiagara and/or Douentza 1:200,000 quandrangles using available CCTs to obtain computer print-outs of the geographic coordinates of areas, in hectares, of possible surface-water stock ponds followed by field checking to verify the validity of the technique. The maximum cost for print-outs is estimated at $20,000.

The development of the water information data base andpreparation of preliminary hydrologic maps assumed that only limited field checking of collected data would be needed to verify its validity. The evaluation team concludes that this assumption may not be wholly correct, particularly with respect to ground-water data. Consequently, it is recommended that the Malian hydrogeologist and geologist assigned to the project undertake spot field checks, where deemed necessary or critical, to insure, insofar as is feasible within project constraints, the validity of the ground-water data base. It would seem that at least two months of field work for each of the two men would be necessary for spot checking the existing data.

The following technical changes are also recommended:

(a) The thematic map on "tubewell yields" should be eliminated because available data are too spotty areally to draw "iso-yield" lines. The explanatory table entitled "Relation of tubewell yield to lithology" would be transferred to the "Lithology" thematic map.

(b) The proposed thematic map, "Lithology", including the transferred explanatory table from the above described thematic map would be re-titled "Aquifer lithology vs well yields", or something comparable, to reflect the inclusion of well yield data. The column entitled "Alteration" would be eliminated from the "Lithology" explanatory table, as insufficient data are available to portray this parameter areally.

(c) The proposed thematic map "Greatest and Least Recorded Depth to Water" should be modified as insufficient data are available to contour the least depths to water. The published map would show only one set of greatest isolines with a symbol showing greatest and least depth to water, in meteres, and the number of wells in the sample. Such a symbol would be shown in each on-half degree square on the 1:2,500,000 scale.

(d) The data on the thematic map, "Possibilities for Ground Water Usage", should be split in two parts and shown on the 1:500,000 water maps of the atlas. One part, the recharge, in $m^3/h/km^2$ with numbers and related isolines, would be shown on the water base map. The other part, the sustainable ground water yield, in $m^3/h/km^2$ with isolines would be shown on the water potential map.

Finally, there is a continuing need for hydrogeological expertise. The FAC hydrogeologist arrived in Mali 12 months before the initiation of the project and then left only 9 months after implementation began. The TAMS hydrogeologist assigned to the project will be

departing soon and the TAMS hydrologist a month later. The Malian geologist and hydrogeologist attached to the Water Section have not been fully trained. Additional guidance is also required in spot field checking of the basic ground water inventory which is now in hand andin the preparation of the final water base and potential maps. Therefore, it is recommended that the project enlist for a period of approximately one year a FAC hydrogeologist to assure continuity in map preparation, adequate field checking of data, and on-the-job training of Malian counterparts.

D. TRAINING AND INSTITUTION-BUILDING

Training is an extremely important element of this project. The present project calls for the building of a cadre of Malian personnel trained in the basic inventories of land and water resources data and the analyses of the data for their broad development possibilities. Most of the training received by this cadre during the term of the project will be directly transferrable to more detailed inventories and evaluations needed for future development projects. As presently foreseen, this trained cadre would have its permanent seat as a research and planning office in the National Directorate of Water and Forests with a close liaison to the Directorate General of Plan. If the training is not carried forward to the full development of a viable office of research and planning, the maps and reports generated by the project are not likely to be effectively utilized in the future by the GRM.

As was previously noted, the Project Paper design gave greater weight to the technical components, namely generation of data, compilations, maps and reports, than it did to the training and institution-building components of the project. The two-year timeframe makes it difficult to provide homologues with both practical project experience and formal training. Also, on-the-job training has tended to suffer as the contractor has needed to emphasize technical outputs because of the implementation time constraints.

1. Informal Training

In most cases, a Malian homologue has been assigned to work alongside each expatriate technician. It is the view of the

project Evaluation Team that Malian counterparts are generally receiving or will have received adequate training, either on-the-job or by in-house workshops, during the life of the project in data inventories and analyses. On-the-job training is being routinely given to Malian counterparts on the soils and vegetation staff in survey techniques, classification and map legend development both in the field and office. On-the-job training of the documentalist and the sociologist is well begun but may need to be continued for a longer period of time. As was previously recommended, additional training of the Malian project hydrogeologist and hydrologist is required in conjunction with an expatriate technician.

There remains, however, a need for additional training in the ways and means of utilizing the maps and related data analyses to development planning and detailed project design. The institutional capacity envisioned in the project design cannot be expected to emerge simply from on-the-job training.

2. Formal training

The project design specifies advanced U.S. training for certain Malian candidates. It was decided by the GRM that they should have work experience with the project before beginning advanced degree programs. Two scholarships for Master's level education have thus far been provided under the project--for a soil scientist and an economist/planner. They are scheduled to

depart in January or February 1981. Two other Master's candidates have been identified--a range ecologist and a landuse planner. If accepted into a U.S. program, they will depart in late 1981. However, none of these participants will return until after the project has ended.

No scholarship has thus far been programmed in the water resources sector. In view of the importance of this sector to overall project objectives and to give balance to the disciplines involved, it is recommended that a scholarship in water resources planning be set up under the project. The Malian hydrogeologist currently attached to the project would be the appropriate candidate for this scholarship.

3. Seminars

In addition to scholarships for selected individuals, there is a need for strong emphasis, during the later stages of the project, on seminars directed to utilization of the final products of the project in development planning and more detailed project design. This is also key to the institutionalization of land use analysis and planning.

Eight technical seminars have been mentioned in the documentation; however, only two--one on ecology and one on soils surveys--have been held. It is recommended that the project develop and implement regularly scheduled meetings, seminars,

and later workshops to:

(a) inform and train the project Malian staff in the uses of LandSat technology, its limitations, interpretations of the data collected, and the usefulness of the finished product as a planning tool. Timeframe: duration of Project.

(b) Establish contact with all national services and donors that may be interested in the finished product and inform them of what the product will consist and discuss ways in which they can use it for their particular purposes. There has not been enough said about what the inventory is doing. Timeframe: early in 1981 (Coordinate with Ministry of Plan).

(c) Educate identified Malian technicians interested in using the finished product on how to interpret the mapping and documentation, and how to use it in a planning operation. Be sure to discuss the limitations. Expectations toward the final document may be too high. The end product is not the final answer to problems but a key to identifying them. Timeframe: during 6-month extension January-June 1982 (Coordinate with Ministry of Plan).

It is also recommended that range ecology and soil science seminars, oriented toward inventories and data analysis, be expanded to include water resources, both ground-water and surface water.

E. FINANCIAL SOUNDNESS

1. Appropriateness of financial management approach in assuring expeditious transfer and utilization of funding involving participating insitutions --GRM, USAID and TAMS. The contract for execution of the project was negotiated between the GRM and TAMS, with USAID financing. The total estimated cost of the contract, including the consultants' fixed fee ($250,000) is $3,771,000, approximately. Originally, $500,000 was allocated to contractor for starting project; this amount was used up by May 1980.

Presently, the contractor is submitting monthly accumulated bills to the GRM for verification and approval. The bills are then sent on to USAID/Bamako for approval, and then on to AID/Washington for reimbursement. It takes about four months between the date funds are transferred to Bamako by TAMS headquarters and the date TAMS is reimbursed for project expenditures. As a result, the contracting company must carry operating costs (average about $150,000 per month) while awaiting reimbursement for each billing. Given the inflation factor and the lack of interest being paid on the funds during the delay, the contractor is losing money on these funds which it "floats" the project. The subcontractors are also using their own funds to finance project activities because they are not reimbursed until TAMS is paid by AID/Washington.

Efforts need to be made by GRM and USAID to speed up processing of contractor billings for payment in order to reduce the financial burdens and even losses of the contractor.

It is recommended that USAID explore the possibility of establishing an advance fund for TAMS (the contractor) to operate with, which would be drawn down by submission of expense vouchers and replenished based upon projected expenditures. Also, recommend that USAID Controller office attempt to review monthly submitted project bills when they are submitted by TAMS instead of waiting approval by GRM to start on review.

2. Appropriateness of Funding Level. Based on project experience to date, it is apparent that a serious deficiency in estimated fund requirements occurred in the Project Paper design, and subsequently in the Grant Agreement and GRM/TAMS contract. The late start-up of the project plus the lack of provision for an adequate contingency fund and inflation factor has led to a shortfall--estimated at $800,000--in the original PP budget. In addition, it is calculated that costs were underestimated by about $300,000 for such items as satellite imagery, aerial photography, furnishings and equipment, support personnel and short-term consultancies, vehicles and maintenance. Thus, it is recommended that AID consider increasing the Life of Project funding level to complete the project. It is estimated that $1.1 million supplemental funds are now needed to sustain the project to its planned conclusion.

Note: Between the writing and submission of this report, these funds have been received.

3. Financial Viability of a New Service for Resource Evaluation. Given the present financial situation in Mali, there is some serious doubt about the GRM's ability to finance, without external donor assistance, the maintenance of a new service for resource evaluation.

It is recommended that USAID explore the possibility to continue funding assistance to the newly created autonomous interpretation/planning inventory service to at least a point where its role is secure as a functioning service. The important role to play here is to assure that the finished product is understood and is well distributed within the technical services, and that a planning service is, or will be, developed.

F. CONCLUSION

It is felt by all evaluation team members, after meeting individually with their respective groups of experts, that there may be a tendency by the staff to be moving too fast in an effort to complete their contractual obligation of collecting data and mapping; that adequate time is not being allowed each expert to train his Malian counterpart in methodology and especially mapping techniques. The training aspect of the project is important to the success of an on-going Malian effort. This aspect concerns us because two of the project purposes are related to the training and the building of expertise among the Malian experts. The Evaluation Team recommends that the current project be allowed an extension of time of six months (to June 1982) to allow for:

(a) Adequate time to train Malian counterparts in methodology, procedures, mapping, and interpretation of LandSat technology (duration of project).

(b) Adequate time for the ecology section to collect production data (bio-mass). Timeframe: September - December 1981.

(c) Adequate time for each section to develop and print a procedural and methodology manual for various aspects of their work. Timeframe: January - June 1982.

(d) Allow adequate time to canvass potential users and develop seminars to prepare user agency technicians in using the inventory. Timeframe: early in 1981.

(e) Implement actual planning workshops within national services

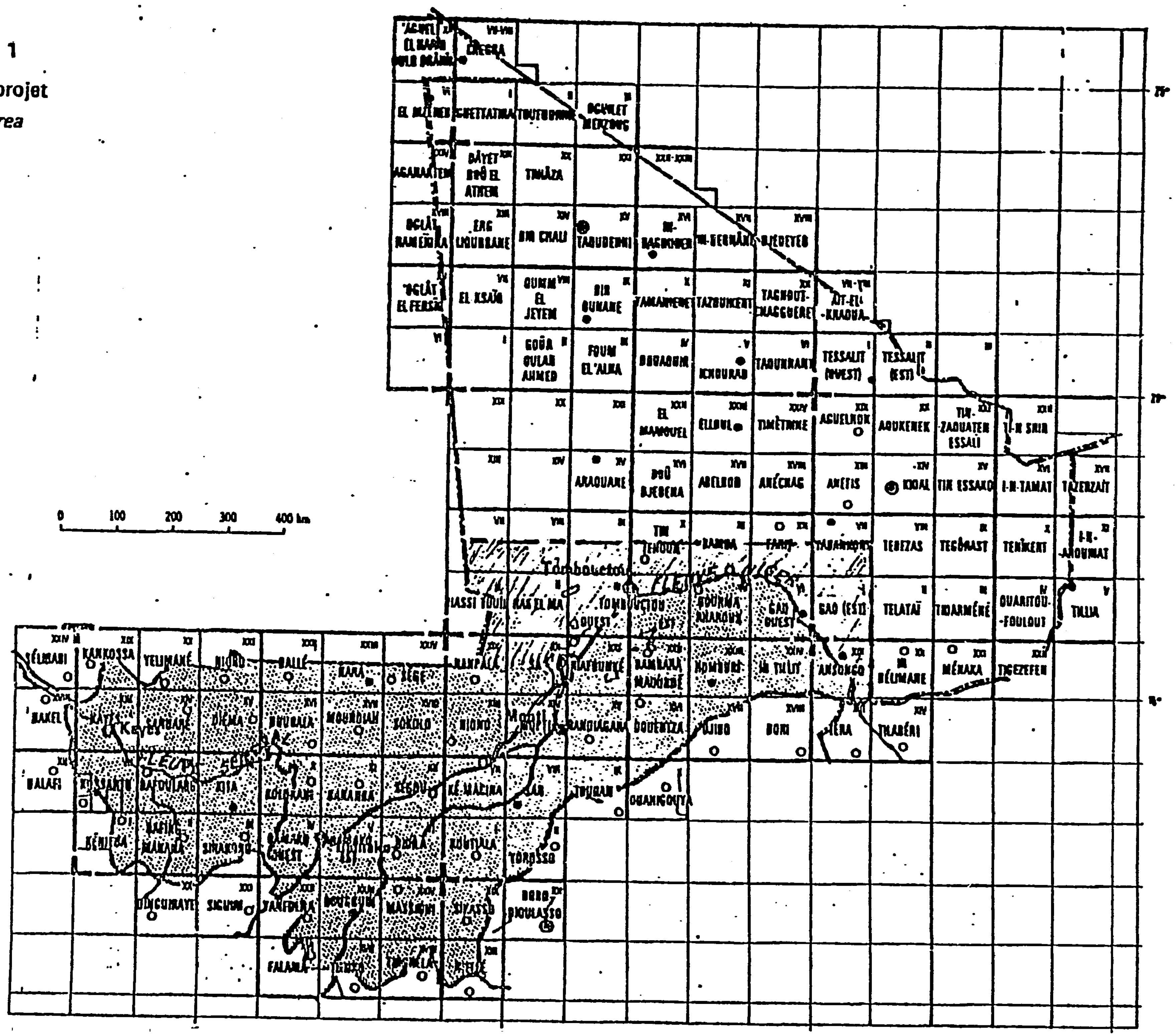
using the finished maps and documentation, and other pertinent information specific to that service's needs. Define what steps can be taken to meet the deficiency of available data in program planning. Follow-up to present project. Timeframe: December 1982, and January and February 1983.

Finally, the Evaluation Team RECOMMENDS that a follow-up project of two years' duration, which would include two expatriate advisors in land and water use planning for development and project design, be considered by GRM and USAID to insure the viability of an on-going Office of Resources Evaluation, Planning and Project Design in the National Directorate of Water and Forests.

FIGURE 1

Zone du projet

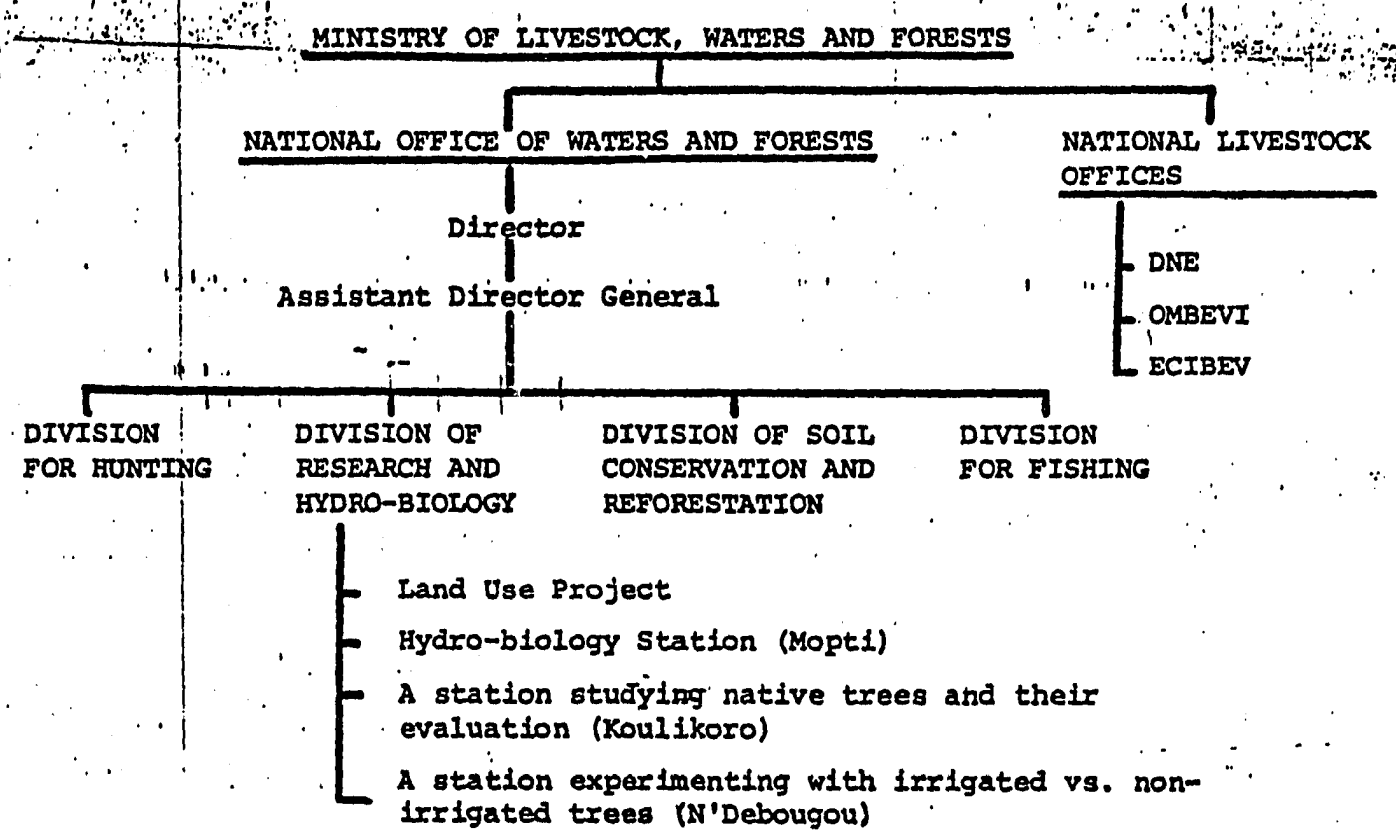
Project Area



APPENDIX I

APPENDIX II

ORGANIZATION CHART



APPENDIX III

Project Organization

December 1980

Direction

Dr. Gaoussou Traoré, Director
*Dr. John Buursink, Team Leader
*Mr. Kent Salter, Administrative Assistant

Technical Staff

Soils Section	Ecology Section	Water Section	Planning Section	Documentation Section
Chefs: *Dr. Raymond Laurin	*Mr. Niels LeRoy Martin	*Dr. Donald Gear	*Dr. James Albrecht	Mr. Ibrahima Djiré
Mr. Seydou Bouaré	*Dr. Steven Daus	*Mr. Jean Claude Henry	#Mr. Joel Thomas	*Ms Emily Candelmo
*Mr. Tom V. Dechert	Mr. Moussa Diallo	Mr. Ousmane Maïga	*Ms Charlotte Bingham	
Mr. Oumar Doumbia	Mr. Gaoussou Traoré	Mr. Madia Sidoro	Mr. Gaoussou Coulibaly	
*Mr. Geoffrey King	*Mr. Dean Treadwell§	#Dr. Jean David §	Mr. Alassane Kanouté	
Mr. Ibrahima Siby				
Mr. Abdoulaye Traoré				

* expatriate technicians provided under TAMS contract

* expatriate technicians provided by FAC

§ personnel who departed prior to 12/80

APPENDIX IV

Schedule of Evaluation Team

November 29 (Sat.)	Orientation in Washington
November 30 (Sun.)	Arrival in Bamako, via Paris
December 1 (Mon.)	Orientation at USAID Review of project documents Evaluation Team Mr. Lew Lucke, DEO, USAID/Bamako Mr. Moustapha Soumaré, Malian Service of Waters and Forests Mr. James Bower, Soil scientist Mr. George Taylor, Hydrogeologist Mr. Scotty Deffendol, Range ecologist (Ms. Gail Shands, USAID/Bamako, Project Coordinator - assisted)
December 2 (Tues.)	Introduction at TAMS and project office in Bamako, introduced to project staff and reviewed documents, quarterly reports, etc.
December 3-6 (Wed.-Sat.)	Evaluation team meeting each morning to discuss individual meetings held on preceding day. Interviewed project staff concerning project activities, problems and goals. Team members visited new office structure (old warehouse being renovated) at Sotuba A team member assisted at meeting between USAID and Director of Cabinet for the Minister of Livestock and Waters and Forests to discuss office structure at Sotuba.
December 7 (Sun.)	Reviewed project documents

December 8 (Mon.)	Team had meetings with: 1. Institut Economique Rurale Mr. Baka Traoré, Asst. Director General 2. Genie Rurale Mr. Cheick Bougadari Baithily 3. Eaux et Forêts Mr. Salif Kanouté (ex-Malian Project Director), Asst. Director of Service
December 9 (Tues.)	Evaluation team meeting at TAMS. Meeting at USAID with Lew Lucke to finalize format for final report.
December 10 (Wed.)	Evaluation team meeting at TAMS Discussions with: 1. Mr. John Buursink, TAMS Team Leader 2. Mr. Kent Salter, TAMS Administrative Assistant (Team)
12 noon	Departed by air from Bamako for a four-day field trip. Flew to Douenza and we were picked up by project vehicles and joined the field team working in the Douenza area. Overnight in area of Douenza.
December 11-13 (Thurs.-Sat.)	Spent with the project field team collecting data and ground proofing maps in the Douenza-Diougani-Koro area.
12 noon	Arrived in Mopti about noon on the 13th, but were unable to fly into Bamako because of harmattan conditions (thick dust). Overnight in the USAID guest house.
December 14 (Sun.)	Drove to Bamako, arrived about 6:30 pm.
December 15 (Mon.)	Started writing final report.
6 pm	Some team members met with a French engineer with Genie Rurale for informal talks Mr. Gadele, FAC
December 16 (Tues.)	Continued to compose our final report. Delivered a few pages for typing to Mrs. Martin.

December 17 (Wed.)	Final report. Meeting with FAC at 11 am Director, Mr. Patriat
	Meeting with Ministry of Plan at 1 pm. Mr. Ousman Diallo, Division of Planning assisted by two staff members.
December 18 (Thurs.)	Meeting with USAID Director Mr. David Wilson
	Meeting with OMBEVI (Malian Office of Livestock and Meat)
	Meetings with Lew Lucke and Gail Shands, USAID, concerning final draft report
December 19 (Fri.)	
1 pm	Departure of Taylor and Deffendol
December 22 (Mon.)	Departure of Bower

APPENDIX V

Scope of Work for the Land Use Inventory Project Evaluation

I. Review of relevant project documents:
- Current Project Paper
- Grant Agreement
- TAMS/GRM Contract
- TAMS reports

II. Review Project Setting - Identify and discuss major changes in the project setting which occurred following the design of the project which may have had an impact on implementation. That is, the economic, social, administrative, institutional or political conditions which existed or were assumed to exist at the time of the project design. You should also identify their impact on project implementation.

III. Assess the Project's Conceptual Feasibility. Based on project experience to date assess the conceptual framework on which the project was based in terms of:

A. The viability of the project objectives as presented in the project paper statement i.e., (a) to provide a technical basis for the allocation of resources to agricultural and range development; (b) to develop among Malians the capability of natural resource inventorying and planning; and (3) to compile the necessary information about Malian natural resources to make rational judgements on their optimal allocation.

B. The validity of project linkages. That is, was it reasonable to expect as is hypothesized in the conceptual framework, that if the inputs were provided as planned, the project outputs (results) would have been achieved, and further, if the outputs had been achieved, the project purpose (objectives) would have been realized.

C. The validity of the assumptions made at the project design stage. That is, do the assumptions as stated include all the major factors over which the project has no control but which if they are not valid are likely tohave a significant negative impact on the achievability of the project objective. Were major assumptions

left unstated and if so what are the implications with respect to the conceptual feasibility of the project.

IV. Feasibility of Implementation Strategy - Assess the feasibility of the implementation strategy as presented in the project paper. This assessment should include the following elements:

A. Technical Feasibility

1. Feasibility of approach identified in PP in providing a resource inventory and evaluation for Mali in terms of intended potential utilization for development planning by the GRM.

2. Feasibility of approach in identifying and compiling information on soils, vegetation, water resources and present land use. Appropriateness of utilized scales, imagery, color coding, etc.

B. Financial-Administrative Feasibility

1. Appropriateness of financial management approach in assuring expeditious transfer and utilization of funding involving participating institutions - GRM, USAID, and TAMS.

2. Appropriateness of financial and administrative structures for insuring the participation of Malians (GRM, etc.) in project activities and in their costs and benefits.

3. Appropriateness of administratives structures in terms of insuring support and eventual utilization of land use information for development planning purpose by the GRM.

4. Appropriateness of administrative structure to insure singularity of purpose by USAID and French technical assistance.

C. Institutional Feasibility

1. Appropriateness of program for assuring improvement of GRM planning, support and technical capacities.

V. Assessment of Implementation Performance

A. Identify the major responsibilities, especially implementation responsibilities, or authorities of the following institutions:

1. TAMS/Mali
2. Eaux et Forets (GRM)
3. FAC
4. USAID

B. Assess the performance of each in terms of:

1. Their understanding of project objectives and implementation strategies;

2. Their understanding of their responsibilities and authorities;

3. The results of their actions or non-actions.

C. Assess the effectiveness of information flows in the decision-making process.

VI. Lessons Learned

A. Identify and elaborate on the major lessons learned from the point of view of:

1. Design
   - flexibility
   - specificity
   - participation
   - analysis (technical-economic-administrative/financial)
   - innovation
   - information system
   - other

2. Implementation
   - strategy
   - clarity of roles and responsibilities
   - understanding of roles and responsibilities
   - type of contract
   - USAID monitoring role
   - importance of information in meeting stated goals
   - magnitude and scale of field work undertaken; summary of results
   - progress in identifying and resolving technical issues arising during project work to date
   - other

Profil de Travail pour l'Evaluation du Projet Inventaire des Ressources Terrestres

I. Examiner les documents en cause du projet
- Document Actuel du Projet
- Accord de Subention
- Contract de TAMS/GRM
- Rapports de TAMS

II. Examiner l'ensemble du projet - Identifier et étudier les principaux changements dans l'ensemble du projet qui ont eu lieu après la conception du projet et qui auraient pu avoir des effets sur l'exécution, c'est à dire sur les conditions économiques administratives, institutionnelles ou politiques qui existaient déjà a devaient exister ou moment de la conception du projet. Identifier aussi l'impacte de ces conditions sur l'exécution du projet.

III. Estimer la Praticabilité Conceptuelle du Projet
Estimer le cadre conceptuel qui aurait servi à fonder le projet, en se basant sur l'experience de projet en fonction de:

A: l'aptitude des objectifs du projet tels qu'ils sont présentés dans les énoncés du document du projet par exemple,
But du Projet

a. Fournir une base technologique pour la répartition des ressources pour le développement de l'agriculture et des pâturages

b. Développer chez les Maliens la faculté de planifier et d'inventorier les ressources naturelles

c. Recueillir les renseignements nécessaires sure les ressources terrestres maliennes pour pouvoir donner des opinions rationnelles sur leurs répartitions optimales.

B: La validité des liens du projet. Est ce qu'il était raisonnable par exemple de penses comme on l'avait supposé dans le cadre conceptuel, que si les intrants avaient été fournis comme prévu, on auroit pu obtenir les extrants (résultats) du projet et en plus, si on avait pu obtenir les extrants on aurait pu réaliser les buts (objectifs) du projet.

C: La validité des suppositions faites au moment de la conception du projet. Est ce que les suppositions par exemple telles qu'elles ont été citées, insèrent tous les facteurs principaux indépendants du projet. Cependant, si elles ne sont pas valables, elles auront certainement un effet significatif et négatif sur la réalisation de l'objectif du projet. Est ce qu'il existait des suppositions non mentionnées et si, oui, quelles en seraient les conséquences sur la praticabilité conceptuelle du projet.

IV. Praticabilité de la stratégie de l'exécution - Estimer la praticabilité de la stratégie de l'exécution telle qu'elle est présentée dans le document du projet. Cette évaluation devrait comprendre les facteurs suivants:

A. Praticabilité technique.

1) Praticabilité d'une approche qui serait identifiée dans le document du projet, pour fournir un inventaire de ressources et une évaluation pour le Mali, et qui serait utilisée de façon potentielle par le GRM pour la planification du développement.

2) Praticabilité d'une approche pour identifier et recueillir des renseignements sur les sols, la végétation, les ressources d'eau et les ressources terrestres actuelles, applicabilité des balances utilisées, la reconnaissance par satellite et du code en couleur.

B. Praticabilité financière-administrative.

1) Applicabilité d'une approche de gestion financière pour assurer un procédé de transfer rapide et efficace, et l'utilisation de fonds par les institutions particpantes - GRM, USAID et TAMS.

2) Applicabilité des structures financières et administratives pour assurer la participation des Maliens (GRM, etc.) aux activités des projets, ainsi qu'à leurs coûts et allocations.

3) Applicabilité des structures administratives pour s'assurer que le GRM puisse utiliser le support et l'utilisation éventuelle de renseignements des ressources terrestres pour la planification du développement.

4) Applicabilité d'une structure administrative pour que l'USAID et l'assistance technique française se dirigent vers un même but.

C. Praticabilité institutionnelle.

1) Applicabilité du programme pour assurer l'amélioration de la planification du GRM, des capacités de support et des capacités techniques.

V. Evaluation de la façon par laquelle l'exécution a été accomplie.

A. Identifier les responsabilités principales, et surtout les responsabilités d'exécution ou les responsabilités des institutions suivantes:

1) TAMS/MALI

2) Eaux et Forêts (GRM)

3) FAC

4) USAID

B. Estimer l'accomplissement de chacune d'elle en fonction de:

1) leurs compréhensions des objectifs du projet et des stratégies d'exécution;

2) leurs compréhensions de leurs responsabilités et directions;

3) les résultats de leurs participations ou non-participations.

C. Estimer l'efficacité des courants des renseignements au niveau du procédé de décision.

VI. Leçons qu'on a pu tirer de ce projet:

A. Identifier les principales leçons qu'on a pu tirer et les élaborer selon:

1) La Conception:
- fléxibilité
- spécificité
- participation
- analyse (technique - économique - administrative/financière)
- innovation
- système de renseignements
- d'autres.

2) L'Exécution:
- stratégie
- clarté des roles et responsabilités
- compréhension des rôles et responsabilités
- sorte de contrat
- rôle de contrôle de l'USAID
- importance des renseignements pour établir et réaliser les buts
- importance et échelle du travail entrepris sur les lieux; résumé des résultats
- amélioration de l'identification et de la résolution des questions techniques soulevées au cours du travail jusqu'à présent.
- d'autres.