PD-AAQ-050 HLM

IN-DEPTH EVALUATION

OF

NATIONAL PLAN FOR LAND USE AND DEVELOPMENT

EXECUTIVE SUMMARY

TRANSFER OF TECHNOLOGY

PROJECT USAID N°. 685-0233

1. This project attempts to relieve the information constraint concerning Senegal's soils, vegetation and other natural resources and thus allow GOS to prepare its national plan for land-use and development on the basis of adequate resource information. The project also attempts to provide GOS with people trained in the remote sensing and resource analysis technology used to prepare these maps and incorporate the information into the national plan.

2. This project focussed on using remote sensing technology to provide the most update data base on Senegal's natural resources. The project used Landsat imagery covering the entire country for different seasons and different years.

3. Natural resource information in Senegal on Senegal prior to this project has been obtained with the use of aerial photography and fieldwork.

   Satellite imagery is beginning to replace the use of aerial photography in regional or country-wide surveys, and for observing changes that occur throughout a country over time. One Landsat image covers 34,225 Km2, whereas one aerial photo of a standard scale here in Africa (1:50,000 to 1:100,000) covers about 132 Km2 to 528 Km2. Formerly, in order to survey extensive areas, it was either necessary to make large and costly photo mosaics, or break the area into more "pieces" which made it more difficult to see certain region-wide environmental patterns. In addition, aerial photo missions are costly to fly, so they are flown less often than a satellite passes over a region. Hence, satellites are more easily used to view changes over years or within seasonal cycles in one or more years. The end result is more area surveyed in less time and at less cost.

Aerial photos, however, reveal significantly more detail and are used for specific site planning and in supporting interpretations made from satellite information. We emphasize that each system is used to its best advantages, and often in conjunction with each other.

4. The direct beneficiary, the Direction d'Aménagement du Territoire, wishes to use this new technology to more efficienty survey Senegal and to better assess such rapidly developing land changes as desertification, erosion and deforestation.

Some of the intented beneficiaries (University of Dakar) ha d people already trained in remote sensing, realized its value and were interested in further developing its use in Senegal.

5. DAT is mandated to have a staff of planners, resource technicians and cartographers who can use the multi-resource information acquired in the project. To our knowledge, the DAT's director has had remote sensing training and has visited RSI's Remote Sensing Center in the U.S. Two DAT employees have been to CRTO-Ouagadougou, and one of those is now in Toulouse, France for further training, and one DAT employee is currently at RSI.

Other staffmembers of the Direction d'Aménagement du Territoire, have sufficient formal or technical training in their respective disciplines and in assessing the country's natural resources, and in resource management in general, but may not yet fully appreciate the potential of multitemporal and multiseasonal remote sensing data.

6. The adoption rate in the past two-years of the project has been relatively low due to the very limited member of qualified counterparts. Although the awareness of remote sensing techniques was increased through a number of seminars and through formal training (in progress) of Senegalese officials in the US and at CFTO-Ouagadougou.

7. The project has, until now, not been able to set forces in motion to induce accelerated acceptance and use of remote sensing techniques in land resource planning at the Direction d'Aménagement du Territoire no at University of Dakar.

8. US private input suppliers have an incentive to examine the resource information constraint addressed by the project. Currently Earth-Satellite Corp of Washington, D.C. produces the necessary landsat imagery. Mark Hurd Aerial Sruveys of Minneapolis, Mn,, will provide aerial photography.

   No known local enterprises can currently produce this physical portion of the new technology.

9. The project uses three delivery systems to transfer technology to beneficiaries:

   1. Formal training at Universities in the US, and at the Remote Sensing Center in Ouagadougou.

   2. On-the-job training of Senegal staff as far as available.

   3. Dissemination of an awareness of remote sensing techniques to Senegalese user agencies by means of seminars.

10. The use of these delivery systems requires specialized US personnel and Senegalese counterpart staff with a basic training in natural resource inventory assessments (soils, vegetation, land-use, geology, etc...). Few trainees are available that possess these characteristics.

11. The effect of the remote sensing technology, in as far as it was transferred by this and other projects using similar techniques is:

    1. The University of Dakar Geography Department strongly desires to expand its staff and facilities to be able to use remote sensing techniques in its research and training programs for Senegalese students.

    2. The Direction d'Aménagement du Territoire wishes to use remotely sensed data as a tool in further land-use planning and mapping of Senegal.

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PROJECT USAID N°. 685-0233

SENEGAL, DECEMBER 1983

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APPENDIX A

Schedule of Evaluation Team in Dakar

The development of DAT and the preparation of a national plan for optimal management and utilization of Senegal's natural and human resources (PNAT) is a multi-donor financed program supported principally by the United Nations and USAID. The preparation of the Plan requires resource maps, technology exchange and institution building.

The two U.N. projects involved are the United Nations Development Program (UNDP) Land-Use Planning Project and the United Nations Fund for Population Activity (UNFPA) Population Planning Project. The UNDP Land-Use Planning Project, begun in June 1979 for a five year period, is providing long-term specialists in planning, geography, economics, and information systems; and additional assistance in agronomy, statistics, hydrology, computer science and transportation planning. The UNFPA Population Planning Project is providing demographic information needed by PNAT.

The remaining inputs needed for PNAT are the baseline maps and interpretations and the technology transfer and training to be provided by the USAID project. The project uses multi-stage, integrated survey techniques including satellite remote sensing, ground survey and air photo interpretation to provide the baseline maps needed by PNAT. The Project is to strengthen Government of Senegal institutions by personnel training in appropriate techniques of resources monitoring and assessment.

1.2. Basic Project Data

Country	:	SENEGAL
Project Title	:	National Plan for Land-Use and Development
Project Number	:	685-0233
Cooperating Agency	:	Direction de l'Aménagement du Territoire (DAT)
Technical Assistance	:	Remote Sensing Institute (RSI) South Dakota State University (SDSU
Life of Project Funding	:	$2,000,000
Project Authorization Date	:	18 May 1981
Project Agreement Date	:	24 August 1981
Date Conditions Precedent Met	:	7 December 1981
TA Contract Effective Date	:	15 Jan. 1982
Joint Project Review	:	7 July 1982
First Project Evaluation	:	18 July 1983
In-Depth Evaluation	:	15 November to 14 December 1983
Project Assistance Completion Date	:	31 December 1984
TA Contract Termination Date	:	15 January 1985

1.3. Project Goal

The overall goal to which this project is to contribute in the preparation of a national plan for management and optimal utilization of Senegal's natural and human resources. This plan (Le Plan d'Aménagement du Territoire - PNAT) is being prepared by the Government of Senegal with multi-donor assistance (USAID Project Paper, Grant Agreement, RSI contract).

1.4. Project Purpose

The project has three purposes:

(a) to provide baseline resource maps and interpretations for development potential that are required by the GOS to prepare a coherent and balanced development plan for optimal utilization of available resources;

(b) to transfer technology and develop an appreciation and operational capability by GOS resource scientists and managers for the use and application of remote sensing as a tool for resource assessment and management; and

(c) to initiate a pilot institution-building effort to identify and assess long-term institutional needs for Senegal for remote sensing and photo interpretation capabilities.

2. REVIEW OF PROJECT INPUTS

The project inputs provided by USAID are Technical Assistance, Training, Commodities, and Operating Support for DAT.

The project inputs provided by GOS include Personnel, Office Space and Other Support.

Each of the inputs is reviewed below in terms of timeliness, appropriateness and adequacy.

2.1. USAID Inputs

2.1.1. Technical Assistance

The technical assistance input of the project is provided by the Remote Sensing Institute (RSI) of South Dakota State University under the terms of a cost-reimbursement type contract with USAID. This contract went into effect on January 15, 1981.

Long Term Technicians. In accordance with the project paper, RSI assigned two long-term technicians to the project. Each for 36 person months (pm):

(1) Soil Scientist/Teamleader - Dr. F. K. Hilwig, February 20, 1981 to present.

(2) Ecologist/Environmentalist - Mr. G. Tappan, March 2, 1982 to present.

The assignment of this staff was timely, their qualifications are adequate, and GOS and USAID approval was obtained prior to their assignment. RSI assigned a third long-term (19 pm) technician to the project in June 1983:

(3) Geomorphologist/Teamleader - Mr. A. Stancioff.

At the same time, Mr. Hilwig's assignment was limited to soil scientist, and the duration of his assignment was reduced from 36 to 24 pm. The level of effort of long-term technicians was thus increased from 72 to 79 pm. This change in long-term technical assistance was agreed upon by RSI and USAID in Contract Amendment N°. 3, effective May 18, 1983. The evaluation team found no written agreement between USAID and GOS concerning this change, as required by Grant Agreement Article 2.1.

On July 23, 1983 RSI requested USAID to again change the assignment of long-term technicians as follows:

(1) Soil Scientist, F. Hilwig, reduced from 24 to 22 pm.

(2) Soil Scientist, K. Dalsted, added for 9 pm, 5 pm on site, 4 pm at RSI.

At this time the RSI request has not been approved by GOS or USAID.

Consultants. According to the Project Paper (PP) RSI was to provide 12 person-months of consultants services in agronomy/land-use, hydrology, geology, engineering, forestry, ecology, etc. In the RSI contract some other disciplines are also mentioned such as hydrogeology, remote sensing, range management. A specific scope of work for each consultant was to

be defined by RSI. Three technical consultants have been assigned to the project by RSI as follows:

Mr. G.K. Eulert, Ecologist, from Sept. 20 to Oct. 12, 1982

Dr. F. Westin, Soil Scientist, from July 13 to 31, 1983.
Ms. M. De Vries, Information Specialist, from July 13 to 31, 1983.
The assignment of this staff was reasonably in time, their qualifications are adequate and the necessary approvals were obtained from GOS and USAID prior to their assignment. Dr. Westin devoted 2 weeks of his time to a Project Seminar. Per Contract Amendment N°. 3, effective May 8, 1983, RSI and USAID agreed to reduce the number of person-months for short term consultants from 10 to 2 (presumably meant was from 12 to 2). This, in effect, means that no further short term consultants will be assigned to the project. The evaluation team found no written agreement between USAID and GOS concerning this change.

RSI Home-Office Support. According to the PP, RSI was to provide 30 pm (p. 14), or 27 pm (Logical Framework) of home office support, as follows:

(1)	principal investigator	9 pm
(2)	technical assistant	12 pm
(3)	secretary	6 pm

The RSI Contract gives an estimated level of effort in the home office of 38 pm professional and 40 pm non-professional.

Per October 31, 1983, RSI has provided a total of:

17 pm professional time, about 20 pm remaining,
37 pm non-professional time, about 3 pm remaining.

Practically all planned non-professional time has thus been used.

Equipment. Materials purchased and shipped by RSI are primarily remote sensing products.

Planned Remote Sensing Inputs for the project include Landsat Multispectral Scanner (MSS) Imagery, both standard and digitally processed, Landsat Return Beam Vidicon (RBV) Imagery, and the aerial photography used to cover the semi-detailed sites.

As stated in the contract, Landsat (MSS) imagery, (standard or bulk process) covering the entire country has been obtained for different seasons and different years.

The Contract also specifies ordering one set of digitally enhanced geometrically corrected, color images at a scale of 1:500,000. This is were ordered from Earth Satellite Corporation in Washington, D.C., and arrived December 6, 1983. These are to be the base images for the 1:500,000 maps.

The bulk imagery began arriving in February 1982. The MSS imagery acquired to date is in both false color renditions and in the individual black and white "bands" representing the green, red and near infrared wavelengthes that are combined to form the color image. These images have been produced by the EROS Data Center in what is generally known as a standard false color process, and in an improved process know as EDIPS that began in February 1979. Image scales are at 1:1,000,000; 1:500,000; and 1:250,000 in color and black and white.

The 1:250,000 imagery, used as the initial mapping base, has the most seasonal and yearly copies of each image.

The 1:500,000 digitally processed images are quite costly, but they can be interpreted more easily, and because of their corrected image geometry, they can be better fit to existing stable-base map projections. It would have been useful to have had this imagery at an earlier date.

The RBV images covering the project area are at a scale of 1:250,000. The RBV system consists of television-like cameras that produce images of higher resolution (30 meters) than the MSS system's 80 meter resolution. This imagery is often used to supplement the MSS interpretation, and both the RBV and MSS at a scale of 1:250,000 were used for the resource interpretation and mapping.

Aerial Photography. Aerial photography at a scale of 1:50,000 was to be obtained locally for the sites to be mapped in detail. Recently flown aerial photography of the Senegal and Gambia River Basins is located at Organization de Mise en Valeur du Fleuve Senegal (OMVS), but it has not been released to RSI. The evaluation team understands that the photography can be used only at the OMVS office. This photography can also be ordered through Service Topographique.

Since October 1, 1983 aerial photos for 13 of 28 areas (selected by RSI) is available. Further acquisitions were awaiting replenishment of funds at that time.

Maps. The RSI staff has collected and used the IGN and Joint Operation Topographic Maps, plus a wide range of soils

vegetation, geological, geomorphological, and land use maps at different scales and printed by different agencies - including the map series prepared by the United Nations project for DAT. They are continuing to build a reference library at the RSI office.

RSI In-Country Support consists of such varied inputs to the project as: housing, support staff, local maps and data, library materials, vehicle support, soil testing, aircraft charter, translation and in-country travel.

RSI has provided housing for its field staff. RSI did not provide adequate administrative support staff to the project at an early stage, this was corrected to some extent after one year. Drivers were hired as planned, local maps and documentation was procured as needed. Plans for soil testing and aircraft charter are currently being finalized. Translation services have been arranged for with Mrs. E. Hulten.

The revolving fund maintained by RSI in Dakar to fund the above services proved to be inadequate on two occasions in 1983. This caused some delay in project work. This local fund appears to continue to be inadequate. (See Progress Report, Sept. 1983). The lack of an administrative assistant in the RSI support staff resulted in unnecessary loss of technical time for the two technicians, estimated from 2 - 4 months.

2.1.2. Training

The training input of the project requires US training (for two persons) and training of four Senegalese staff, provided by USAID at the Centre Regional de Teledetection (CRTO), Ouagadougou, to be provided by USAID. On-the-job training of 15 persons and training seminars for 80 persons were to be provided by RSI. RSI was to assist the GOS in defining the type of training needed.

USAID arranged for training in the US of Mr. A.K. Cisse, Remote Sensing Specialist. Mr. Cisse is scheduled to received 6 months of training.

Arrangements are being made for US training of a second Senegalese technician.

The USAID arranged training at CRTO-Ouagadougou was for two DAT staff members, Mr. K. Diatta and Mr. L. Ndiaye. This basic training course in remote sensing took place from March 20 to June 18, 1982. Similar training of two other candidates was delayed (Annual Report, 1982, p. 41).

In view of the fact that only a very limited member of Senegalese counterpart staff (3 out of 15) is involved in project work (See 3.2.1.) the on-the-job training component is very limited.

RSI has offered one training seminar. Twenty three students, in two groups, received one week of introductory remote sensing training in mid 1983. A second seminar started December 12, 1983.

2.1.3. Commodities

Commodities such as vehicles, remote sensing equipment, drafting equipment, office and household furniture have mostly been acquired by USAID, partly based on advice provided by RSI. Some delays were encountered. These seem to be normal and have not impacted project progress in any major way.

2.1.4. Operating Support for DAT

USAID provides direct support to DAT to finance such expenditures as per diem, labor, training and currently the leasing of office space. No particular problems have been encountered. Support is adequate.

2.2. GOS Inputs

2.2.1. Personnel

Figure 1 gives an overview of GOS personnel inputs as indicated in the Project Paper, as actually provided by GOS, and as engaged in project operations.

DAT personnel were assigned to the project in sufficient number, but somewhat late. Not all available DAT staff was engaged in the project operations. In fact, RSI hired a draftsman to help in map production.

Personnel of user agencies can be assigned to the project at the specific request by DAT to the user agencies. Two staffmembers have so far been assigned. A pedologist, Ms. Ba was just assigned. RSI has recently submitted requests to GOS for assignment of an agronomist, hydrologist/hydrogeologist, soft rock/hard rock geologist, and a forester.

National Remote Sensing Center (NRSC) was to provide the project with 5 staffmembers for a total of 12 months each during the 3 year period. Apparently this staff was nominated by the University of Dakar (NRSC does not exist), but their services have hardly been used because of organizational and contractual problems.

2.2.2. Office Space

Substantial office space is required to house the project. The project involves the inputs of up to 17 Senegalese technicians, 2 long-term and 12 short-term RSI technicians, support staff, and visitors from user agencies. And like all mapping project it requires extensive space for the production and use of maps.

Such working space was never available at DAT. The space was not available at DAT during the design phase of this project when it was concluded that the GOS would make 5 offices and 2 labs available to the project (quantities not specified in the Grant Agreement).

Because of lack of adequate space, the project moved offices twice in its first 1 1/2 years of existence. After an initial

FIGURE 1: GOS PERSONNEL INPUTS IN 1982 AND 1983

PERSONNEL STIPULATED IN PROJECT PAPER				PERSONNEL PROVIDED BY GOS			PERSONNEL ENGAGED IN 2 YEAR PROJECT OPERATION	
GOS ORGANIZATION	KIND OF STAFF	NUMBER OF STAFF	PERSON MONTHS	KIND OF STAFF	NAME	DATE AVAILABLE	PERIOD	PERSON MONTHS
Direction d'Aménagement du Territoire	Director	1	9	Director	M. Thiam	Nov. 81	Nov. 81-present	6
	Adm. Ass.	1	9	Adm. Ass.	A. Cissé/B. Traoré		June 82- "	6
				Adm. Ass	A. N'Dir			0
	Cartogr.	1	9	Cartogr.	L. N'Diaye		1982/1983	1
							(training 82)	3
	"	1	9	"	M. Thiam			0
	F. Surveyor	1	24	Geogr.	K. Diatta	Early 1982	Sep. 82-Dec.83	6
							(training 82)	3
	F. "	1	24	Amenag.	L. Diouf		March 1983	1
	F. "	1	24	"	O. Diouf		-	0
				"	A. N'Diaye		May 82/83	1
GOS USER AGENCIES	Technical Specialists	5	36	Botanist	A. Bodian	Dec. 82	Dec82-present	6
				Forester	A. Gaye	Sept 82	Sept. 82	1/2
				R.S. Spec.	A.K. Cissé	Dec. 82	Dec 82-Sep. 83	10
							(train. Sep.83 present)	4
NRSC	Staff Members	5	12	Geogr.	M.M. Sall	Nominated	Apr/May 82	1/2
			12	Trg. Sp.	A.T. Diaw		-	0
			12	Geom.	E.S. Diop	in 1982	-	0
			12	Cart.	A.P. N'Diaye		-	0
			12	Biog.	P. N'Diaye		Apr/May 82	1/2
TOTAL	3 yrs	17	204					

period at the DAT office, the University of Dakar provided space. Finally, in May 1983 the project moved to a villa rented for this purpose and had adequate office space.

The parallel UN projects which contribute to DAT are also housed in a villa and could have provided the design team with the obvious solution to the lack of office space. An estimated 4-6 person-months of RSI technical time was probably lost due to this situation.

2.3. Summary

INPUTS PROVIDED AS PLANNED AS OF THIS EVALUATION ARE:

1. Assignment of two long-term RSI staff.
2. Assignment of RSI Technical Consultants for three out of 12 months.
3. RSI home office acquisition of Landsat imagery (in part, quite late) and maps.
4. US and CRT-Ouagadougou training.
5. On-the-job training, in part only.
6. Most field and office equipment.
7. Assignment of GOS personnel, to some extent only.
8. Training Seminars.

INPUTS THAT WERE NOT OR WILL NOT BE PROVIDED AS PLANNED:

1. Continuous RSI field management was not provided but long-term staff will be increased.
2. Nine out of twelve person month of RSI Technical Consultants will no longer be provided.
3. Adequate local administrative and financial support to RSI fieldstaff.
4. On-the-job training of counterpart staff.
5. Number of counterpart staff.
6. Adequate working space for the first half of the project's duration was not provided.

Even though many inputs have been provided in a timely fashion (i.e. immediate assignment of RSI staff after contract signature) other factors have caused a general delay in project operations such as a 6 month delay in authorization of USAID/RSI contract.

3. REVIEW OF PROJECT ACTIVITIES AND PROGRESS

The project has two major outputs:

1. the production of maps for PNAT,

2. the training of GOS personnel.

Project activities were designed to emphasize technology transfer, training and institution building. Below, project activities and progress toward objectives are reviewed for each of these two major outputs.

RSI was responsible for the preparation of an Operational Plan in cooperation with DAT by late June 1982. This plan was to specify the major[1/] for implementing the activities under the RSI contract. (RSI Contract, Clause E). Since no such plan was found to exist the evaluation team has reviewed project progress in light of the project activities and the implementation plan outlined in the Project Paper (pages 11 and 52, respectively) and in the Log Framework in Annex A of the Project Paper, taking into account the RSI Scope of Work (RSI Contract, Clause C) and project progress reports, and annual plans and prepared by RSI.

3.1. Map Production for PNAT

The kind and number of maps to be prepared by the project for PNAT according to the PP Log framework and the Grant Agreement are:

1/ Word Missing in Text.

- 6 general photomaps prepared from Landsat and other remotely sensed data at a scale of 1:500,000 or larger; ("... or smaller", in Grant Agreement).
- 15 thematic photomaps at a scale of 1:500,000 concerning soils, vegetation, land capability and use, topographical and geological structures;
- improved specific area maps prepared using the general and thematic maps (approximately 5 per year).

The kind of final thematic maps at 1:500,000 as specified in the RSI contract (Clause E) differs to some extent from those listed in the project paper. A comparison is made in Figure 2. The number of maps is more specifically defined in RSI progress reports.

Map production was to be carried out in three steps:

- a) preliminary maps, at 1:500,000
- b) sample areas, at 1:50,000
- c) final maps, at 1:500,000

Sub. a) because of the urgent need of the PNAT for information on Senegal's natural resources, <u>preliminary maps</u> were to be prepared as a first estimate of the soil and land potentials, these maps were to be essentially based on temporal analysis of Landsat images at a scale of 1:500,000, existing reference maps, aerial reconnaissance flights and very limited ground truthing. The initial map submission was to occur 12 months after the start of project.

FIGURE 2: FINAL MAPS AT 1:500,000

PROJECT PAPER		RSI
P. 10	P. 13	CONTRACT CLAUSE H
Soils Vegetation Land-Use	Physiogr/Soils Vegetation/Land-Use	Soils Vegetation Land-Use
Land Capability	Land Potential Suitability, etc.	Land Capability Suitability
Topographical		Surface Hydrological Structures
Geological Structures		Surface Geological Structures

The evaluation team assumes that these preliminary maps are the same as the 6 general photomaps mentioned above.

In a joint AID/GOS/RSI meeting of November 24, 1982, the GOS project director stated that in view of the delays of the present project, PNAT had already made its own preliminary maps but that the project should go ahead and make preliminary maps as planned.

We quote from the minutes of this meeting: "Abordant le problème des cartes préliminaires et répondant en même temps à une question de Monsieur Harms, Monsieur Thiam a indiqué que, compte tenu du retard apporté à l'élaboration de ces cartes, le Plan National d'Aménagement du Territoire a fait ses propres cartes préliminaires, car a-t-il dit, au mois de décembre 1982, les premiers résultats provisoires doivent être présentés au Gouvernement, le rapport final du P.N.A.T. étant prévu pour juin 1985. Mais cela ne doit pas empêcher le Projet de faire les cartes préliminaires telles que prévues".

So far, no preliminary map at 1:500,000 was made by the project.

Sub. b) After this, approximately 12 blocks of aerial photographs covering selected sample areas at scale 1:50,000 were to be analyzed for preparation of the final maps at 1:500,000.

An approximate indication of the location of these sample areas was indicated in the RSI contract

(Clause C4). The field work in the sample areas was to include soil, vegetation and land-use observations and sampling.

Sample area mapping was done to some extent. It is our understanding that RSI is currently concentrating efforts on as many as 28 study areas selected for geological mapping, hydrological mapping, soils mapping or vegetation/land-use mapping. This is a considerable deviation from the integrated soils, vegetation and land-use work planned for the 12 sample areas.

Sub. c) The preparation of the final physiographic-soil and vegetation/land-use maps at 1:500,000 (presumbly the 15 thematic photomaps) was to be done by means of extrapolation of the field and aerial photograph observations and laboratory results. Additional aircraft observations were to be conducted to assure map accuracy. Land potential evaluations and suitability ratings for specific uses were than to be executed and interpretive maps were to be made (Project Paper is essentially in line with RSI Scope of Work on this).

No final maps at 1:500,000 have been produced so far, nor is this called for. The kind of maps to be produced are listed in Figure 2.

Instead of using this three step approach (preliminary maps at 500,000; key areas at 50,000; extrapolation and preparation of final maps at 500,000) RSI chose to map Senegal's resources at a scale of 1:250,000, based on Landsat imagery of that scale. Country-wide fieldwork was done based on an intensity relation to that scale and supported by selected, somewhat more intensive mapping of up to 28 sample areas, using aerial photography.

This change in mapping procedures does not necessarily result in more reliable maps and takes more time to accomplish because of the extensive travel required. The resource mapping has thus been done at much larger scale than stipulated in the contract and inferred in project paper. The maps produced by the vegetation, soils and geology team members are valuable to Senegal's planning efforts, but we feel that ensuing image production, field work and map production exceeds and differs greatly from the efforts called for in the contract.

There has been some question by RSI staff regarding the validity of doing the initial mapping at a scale of 1:500,000. A resource image interpreter can state the limits and accuracy of the legend or mapping units he wants to map at any scale. As long as his mapping rationale can be followed and the degree of specificity - or generality of his mapping - is accepted among the project scientists and the planning agency, then he has fulfilled mapping requirements. What has apparently happened is that the concepts of the original design team were not followed because none of the original design team members participated at length on site in Senegal. It appears that a number of ideas expressed in the

narrative of the project paper, that may have implied more detailed mapping (but not required by the contract), were carried over into the project work by the current staff.

Basic map scales in francophone West Africa are 1:200,000 and 1:500,000 for topographic maps (IGN) and for many pedologic, ecologic, geologic and other such maps. Although we realize the rationale for the selection of the 250,000 scales for imagery and working maps, (largest scale imagery cost-effectively produced at EROS - Defense Mapping Agency Maps available at same scale in Washington), it is still an unfortunate choice. It was not called for and it does not help users of these map products. For production of final project maps the 1:250,000 maps will be reduced to the final scale of 1:500,000.

Mapping results at the scale of 1:250,000 are as follows:

Soils. By the end of 1983, fieldwork at 1:250,000 is expected to be completed for about one third of the country: 74,000 Km2 in NW Senegal, covering Landsat scenes Dakar, Diourbel, Thies, and St. Louis. Based on this work a tentative legend was developed. Soil samples were collected from sites for laboratory analysis.

Landsat scenes covering the remaining two thirds of the country were sent to RSI home office for soils interpretation by an RSI soil scientist for subsequent (1984) verification in Senegal. No sample areas were mapped.

Vegetation. The vegetation maps are prepared by interpreting Landsat imagery, collecting field data and incorporating information from the literature and existing maps. The method used to describe the vegetation in each of the mapped units, the Braun-Blanquet System, estimates the relative abundance of plant species and those plants that are dominant, co-dominant and of varying degrees of lower abundance. The importance of this is that Africans use virtually every plant for purposes ranging from firewood and construction, to human and livestock food, to medicines and knowing these approximate plant distributions and densities will give the resource planner an idea of what potential resources exist in each unit. The condition of the environment, its state of degradation and such is also noted at each site. This, combined with the vegetation descriptions will eventually give the planner an idea of what conservation or resource management measures might have to be taken for purposes such as soils conservation, watershed management and the like. The vegetation mapping being done by RSI also combines plant species, both woody and herbaceous, that are now often described on different sets of existing maps.

Combining woody and herbaceous plants in one map ujit fulfills one of the objectives of resource planning, to integrate information in order to make it more easily useable by the planners.

The minimum mapping unit size of about 3 or 4 square kilometers often leads to mapping a large number of small mapping units that may incorporate too much mapping detail resulting in additional map production costs. The information on the maps can be generalized and future field work can proceed on a more general level.

The evaluation team understands that one half of the project region has been mapped at a scale of 1:250,000. The final legend for the vegetation maps has not been produced, but is being created as the mapping progresses.

Eight of the detailed areas have been mapped for vegetation by interpreting them from landsat imagery and making more detailed map units and field checks within the boundaries of the specified areas. Aerial photography had not yet arrived while these sites were being mapped.

Surface Hydrological Structures and Surface Geological Structures. The contract stipulates making surface hydrologica structure and surface geological structure maps. The maps that are now being made include a series of geology maps showing geologic structures and mineral occurrences, and a second series of maps showing such information as existing surface water, fossil channels, near surface water and other indicators of surface or ground water. At present the interpreter, who arrived in June and is serving as project manager as well, has collected a substantial amount of existing geologic and hydrologic information from the various research and service agencies, and has begun to interpret the area shown on a landsat image for the water resources topics. The maps in these series are to be printed in black and white. We assume these maps will be produced in four sheets like the vegetation maps.

Land Capability - Land Suitability Maps

No other mapping efforts were made.

3.2. Training of GOS Personnel

The training of Senegalese staff called for in the project paper is as follows:

- 4 mid-level officials trained at CRT-Ouagadougou in remote sensing interpretative procedures.

- 2 senior officials trained in U.S. in recent remote sensing technology developments.

- 7 mappers trained in all phases of remote sensing application including field survey and resource interpretation.

- 15 officials trained on the job in map interpretation, evaluation of data and appropriate use in their agencies' on-going programs.

- Approximately 80 officials informed of remote sensing techniques and applications in seminars at the National Remote Sensing Center (NRSC).

The evaluation team understands that since 17 Senegalese counterpart staff were to be assigned to the project, no more than that number could be trained. By not considering the project director and his administrative assistant 15 GOS technical officials remain for training. All 15 persons were to receive part-time on-the-job training, 7 of whom would get full time on-the-job training, and 4, respectively 2, out of 15 would get formal training. In addition, seminars were to reach out to about 80 officials. This inter-

pretation seems to be in line with the RSI contract (Clause E) which specifies on-the-job training responsibilities in map interpretation for 15.

At this time, 2 mid-level officials, have been trained in Ouagadougou. These are cartographer L. N'Diaye and geographer K. Diatta. After completion of his training Mr. L. N'Diaye has not been involved in project work. Mr. Diatta, after completing his training program, worked with both RSI staffmembers on soils and vegetation aspect of project work. Mr. Diatta departed for long-term training to France in December 1983.

Mr. Diatta was valuable to the project as an integrator of information because his background in physical and human geography, his training in remote sensing and his personal knowledge of Senegal's total resource needs. Mr. Diatta, however has gone to Toulouse for at least ten months leaving a gap in the integration capability when it is beginning to be most needed.

Mr. Diatta's going to Toulouse raises a another problem. Counterparts in Senegal benefit more, in pay and position, from French training than from U.S., short-term training. This causes them to seek training in France rather than the U.S. In addition, counterparts are almost all trained in technology then return to management positions because they are the few who are supposed to be able to do it, and because it is where they advance most in their society. But few key counterparts are given training in how a project, with all of its fiscal, logistical, administrative and leadership problems, is managed. And often expatriates will not spend

time going over the managerial aspects of projects because they don't have the time or have concentrated on technology transfer.

One senior-official, Mr. A. K. Cissé, in currently receiving training in the US, at RSI in Brookings. Mr. Cissé's training focusses on data processing and geographic information systems.

On-the-job training, whether part-time or long-term, has not been as effective as planned for a number of reasons.

Counterparts were "squeezed" into the expatriates program of trying to get the project management, mapping, training, and institution building done in developing country work circumstances. Not all the counterparts provided had the specific training, for example in geology, pedology, to receive direct counterpart instruction from the project pedologist and geologist. Pressed for time these people believed that they should work together with the counterpart as well as possible, but they are hindered by the realization that the counterparts would not remain in the capacity of geologists or pedologists per se.

Two GOS staffmembers received on-the-job training, Mr. K. Diatta (see above) and Mr. Bodian.

A. Bodian, GOS (Eaux et Forêts) botanist has worked with RSI's Gray Tappan on the vegetation mapping. He has provided valuable information used in the mapping, and he is being trained in image and photo interpretation as well as field methods used in this type of mapping.

At the same time the requirement for RSI to train 15 Senegalese staff included training of the 5 University staff members. However in the agreement between DAT and the University, the University staff is to give training to DAT staff. University staff was not supposed to receive it. This misunderstanding affected the on-the-job training program.

One seminar has thus far contributed to inform 23 officials of remote sensing techniques, a second seminar started December 12, 1983.

3.3. Summary

The map production for PNAT is behind schedule due to many different reasons such as lack of workspace, logistic and administrative problems and inadequate staffing. Most work done has been on soils and vegetation mapping, all other mapping efforts are in a very early stage or have not begun (land-use, land capability, geology).

Formal training was done for half (3 out of 6) the GOS personnel planned. This training has benefitted project work to only a very limited extent.

On-the-job training has been limited, essentially involving 2 persons (Diatta, Bodian), one of whom has now left the project.

In addition to this, communications among AID, GOS, and RSI project staff appear to be less than adequate. Personal communications in a project are not normally considered in project input/output relationships and are taken for granted,

but integrated resource inventories of the type with which this project is concerned require integrated thinking and thus optimal communications.

4. REVIEW OF PROJECT OBJECTIVES

The project objectives, goal and purposes, as defined in the project paper, are stated above in section 1.3. and 1.4.

In assessing these objectives for continued appropriateness, feasibility and relative priority for accomplishment, a more fundamental question needs to be answered first. Were the goal and purposes and the means for the accomplishment of this project ever appropriate and feasible?

4.1. Project Purposes

The three project purposes essentially try to focus on the needs of two different GOS organizations: the National Remote Sensing Center, presumably at the University of Dakar, and the Direction d'Aménagement du Territoire (DAT).

This notion is reflected in many statements throughout the project paper and culminates in the requirement for a service agreement between DAT and the University of Dakar. This is a condition precedent to disbursement of USAID funds.

However, in doing so, two substantially different issues were confused in project design:

1. Technical assistance directed toward institutional development of a (national) remote sensing center at the University of Dakar.

2. Technical assistance directed toward the development of a national land-use plan (with strict time schedules) and simultaneous institutional development of the GOS agency concerned with this - the Direction de l'Aménagement du Territoire.

Each of these two objectives are very valid objectives to pursue, but each of the two requires a totally different approach. For the development of a Remote Sensing Center the requirements in terms of personnel, equipment, time limits etcetera, are totally different from those for the development of the national land-use plan. Again both issues are well worth being considered in USAID project programming for Senegal, but a very different approach is needed in each case.

A dual or triple project purpose is difficult to deal with under the best of circumstances, but if the two purposes are only vaguely related than the task becomes practically impossible. It is certainly unrealistic to expect that it can be accomplished by a 2 million dollar project which allows for only two long-term expatriate staff. In addition, a mid 1983 deadline set for completion of project work sets the stage for unsurmountable problems and pressures.

In other words, the projects purposes, as states are appropriate for two projects to aim for. The project evaluation team believes that it is not feasible for one project to do both.

4.2. Project Goal

If the purpose of a project cannot be met, then obviously no contribution can be made to the project goal.

Interestingly, though, in this project the project goal - the preparation of a national plan for Senegal - has already supposedly been met independant of the project.

The following baseline resource maps were provided to DAT by the parallel UN projects:

1. Ecologic - Geographic Environments;

2. Land-Use;

3. Infrastructure;

4. Population;

5. Development Zoning;

Plus some 15 additional draft maps.

A preliminary land-use plan is now completed by DAT for submission to the respective Senegalese government agencies concerned. It is expected that this plan in its final form will be ready by June 1985 to serve as a basis for the 7th 4-year plan for Senegal. (1986-1990). Strictly speaking therefore: if the goal was reached by GOS even without this project's outputs then there is no reason to make any more efforts.

The above analysis of project objectives shows that the project goal and purposes are ill-defined and may help explain some of the confusion found to exist among expatriate and local project staff. The real needs of Senegal in remote sensing and land planning techniques still exist and have hardly been addressed.

Numerous discussions with GOS officials lead the evaluation team to believe that US technical assistance could play a major role in further development (strengthening) of:

1. a GOS remote sensing facility, and

2. a GOS land-use planning capability.

4.3. GOS Remote Sensing Facility

Overall coordination of Senegal's remote sensing activities is handled by the Ministère de la Recherche Scientifique et Technique (Dir. de l'Innovation et du Progrès Technologique). Remote Sensing techniques are currently used and/or developed in scientific and applied research at the University of Dakar, in oceanographic and meteorological institutions and as part of this AID project. No final decisions have been taken by GOS with regard to the question as to how all the various activities can best be coordinated or how a central remote sensing facility could stimulate the use of remote sensing techniques. Different possibilities are being considered, such as:

a. a new national remote sensing center,

b. a new remote sensing institute at the University of Dakar,

c. enlarging the remote sensing unit at the Geography Department of the University of Dakar

d. enlarging air photography facilities at Service Géographique National.

An effective remote sensing center can be established with a minimum of equipment if it is correctly organized and staffed. Many scientists and planners who seek remote sensing information already know a great deal about their own subjects, and how to use maps aerial photos and field methods. What they basically need is some understanding of what can be seen on landsat, how often their area has been covered by Landsat, and what they can expect from future remote sensing systems. A well organized center will have landsat imagery, aerial photos and maps indexed so that people can quickly find an image, locate their area of interest on it, locate different scales of aerial photographs and different scales and types of maps of that same location, and find literature describing that area or that will help them find solutions to their problems. RSI's office is beginning to develop this system as their project progresses. As knowledge of the work is disseminated among various agencies and other projects, more people visit their project providing more ideas or feedback on what their needs might require in further organization of the center. Eventually, what information has been produced can be phased back into

another organization, such as DAT or the University. The University might maintain responsibility for the purely academic end of remote sensing. The service orientation of such a center should also be taken into consideration.

It is expected that the facilities of such a center are open for use by all other GOS agencies. The evaluation team feels that development of a new institute for this purpose is not appropriate. The existing GOS structure will easily allow for expansion of an existing organization to handle the national remote sensing training and research needs.

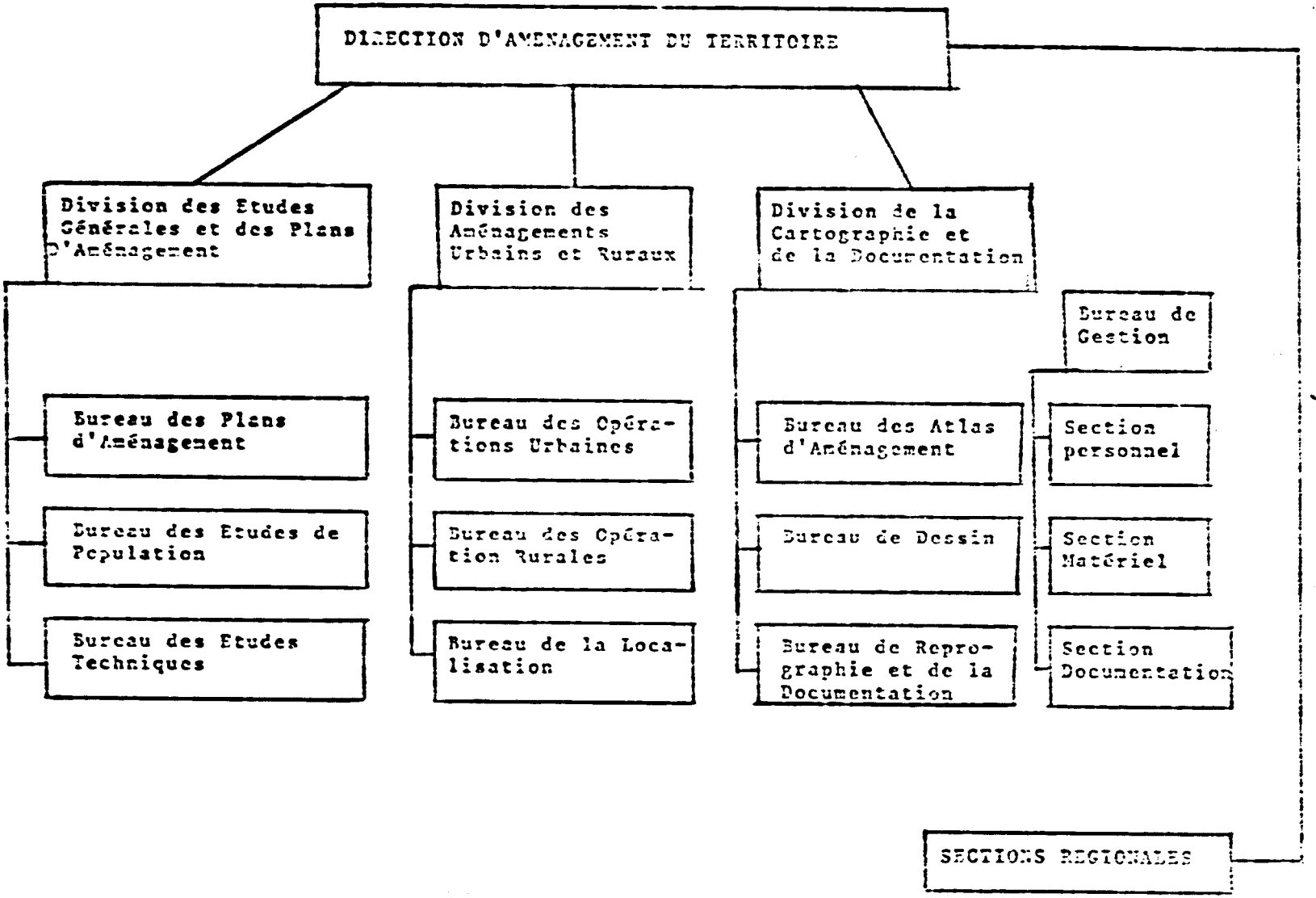
The project has begun to establish linkages with other remote sensing centers by sending counterparts to CRTO-Ouagadougou, Toulouse, and RSI South Dakota.

4.4. A GOS Land-Use Planning Capability

The GOS agency charged with land-use planning is the Direction d'Aménagement du Territoire. Its mandate and work program are briefly outlined in Section 1.1 of this report. The organizational structure of DAT is shown in Figure 3. This existing organization is essentially production oriented: plans, maps and reports need to be produced within a given timeframe.

The immediate objective of DAT is the development of a national land-use plan. In the years to come this initial first plan must be updated, amended, approved and checked for continued validity. DAT further wishes to provide much stronger plan-

FIGURE 3


DIRECTION D'AMENAGEMENT DU TERRITOIRE
Division des Etudes Générales et des Plans D'Aménagement
Division des Aménagements Urbains et Ruraux
Division de la Cartographie et de la Documentation
Bureau de Gestion
Bureau des Plans d'Aménagement
Bureau des Etudes de Population
Bureau des Etudes Techniques
Bureau des Opérations Urbaines
Bureau des Opération Rurales
Bureau de la Localisation
Bureau des Atlas d'Aménagement
Bureau de Dessin
Bureau de Reprographie et de la Documentation
Section personnel
Section Matériel
Section Documentation
SECTIONS REGIONALES

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ning inputs to such international organizations as OMVS and OMVG which primarily deal with land-use planning and implementation on a rive basin basis.

In the years to come DAT will develop larger scale maps for use in more detailed land-use planning of sub-regions of Senegal.

DAT therefore has a key function in Senegal's development and its importance cannot be over emphasized. At this time DAT lacks sufficient technically competent resource managers, land-use planners and similar staff, and it lacks the tools and equipment to effectively carry out its functions in the long-term. DAT wishes to strengthen its planning capabilities.

4.5. Appropriateness of Using a Computer Programmed Geographic Information System (GIS) for Land-Use Planning in Senegal.

A GIS uses computer technology to:

1. Enter into a computer the spatial information shown on maps or seen on images and aerial photographs so that this information can be "stored" or referred to by its geographic coordinates.

2. Assign values, called "attributes", to map information that is contained in a unit, such as the area of a mapped unit, the length of a road, type of village, etc.

3. "Merge" information shown on different maps, for example merging a soils map with a forest type map to derive a map showing forest types associated with soil types.

4. Change existing information to more usuable forms, for example, changing topographic contours into specific slope classes so that planners can decide what type land use or protective measures might be appropriate for various regions with different degrees of slope classes.

5. Looking at relationships between different types of information, such as physical and infrastructural information. For instance, finding the distance from a village to the nearest unexploited soils unit with a certain level of agricultural potential.

6. Comparing information gathered at different times (tempora sequence), such as comparing the change in area of forest units mapped between 1950 and 1980.

The GIS can also enter information from graphs, statistics and other sources in order to use it with information taken from maps and images. GIS information can be produced in the form of maps, charts, written on paper, shown on a cathode ray tube (CRT).

Thus, a GIS allows resource scientists to more effectively display and analyze resource information that might often be quite abstract and would be difficult to do using convential "manual" methods. These systems are obviously of significant value to developing country resource planners where the information entered is usually shown as land capability

potential for agriculture, forestry, rangeland, water resources, and the location of these resources in relation to cities, villages, roads and other infrastructural or economic elements in the country.

Geographic information systems require a substantial amount of computer and other data processing equipment, and considerable "data entry capability" in the personnel who operate them. The purpose for which a GIS is to be used needs to be carefully determined and has to be planned in terms of a long-term investment. The information entered into the system has to be carefully formatted and edited. In general, however, it is believed that the initial time, equipment and manpower costs are made up as the system becomes operational.

Inputs to a GIS already exist in Senegal through RSI and GOS scientist and technicians trained in remote sensing, vegetation, analysis, land-use, soil science, and geology and cartography, and other disciplines.

One Senegalese counterpart with computer science skills is at RSI for 6 months training in GIS. Direct hire Senegalese provide capabilities in pedology and cartography, but they will probably leave at the end of the project. University of Dakar counterparts with abilities in remote sensing and other disciplines have been nominated or assigned to the project, but haven't worked with it very much. DAT has personnel who could provide input and analysis for a GIS.

RSI has staff in South Dakota who can operate their Area

Resource Analysis System (AREAS), and the equipment with which to enter information.

The project has base maps, literature and other inputs that can be used as input to a GIS. They also have interpretation and mapping equipment, and vehicules and field equipment for any field verification that may be necessary. The University of Dakar has map and equipment resources, that can be used if the proper liaison can be established between DAT and University of Dakar. Other agencies and United Nations projects have maps and literature and their own information systems that could be incorporated into a GIS.

The evaluators believe that a GIS would be a valuable resource assessment tool to have in Senegal. They are, however, concerned about two things. 1) They are not sure yet of what the final products are going to be and what the capability or suitability maps will be in terms of what DAT wants or Senegal needs as related to agriculture, rangeland and forestry development.1/ 2) They are not sure the counterparts RSI staff can really be produced and commited to the project, given the experience of the first phase of the RSI project.

It will be difficult to phase in a GIS system until specific resource analysis and institution building goals are determined, counterpart availa ility staff operational questions are answered, and space allocation is assured.

1/ RSI has proposed a pilot GIS project for the Peanut Basin.

5. RECOMMENDATIONS

In view of the current state of project affairs as discussed in the previous sections of this report, and in view of GOS expectations raised by this project, a number of recommendations are made.

These recommendations concern first of all actions to be taken vis-a-vis GOS's remote sensing and land-use planning needs. Secondly, recommendations deal with modifications in project activities. These proposed modifications are intended to ensure that project results will meet some of the needs of GOS.

5.1. Remote Sensing

The University of Dakar's Geography Department had expected to bolster its Remote Sensing capabilities through the project. In view of the high priority mapping requirements of DAT, and due to the current contractual obligations between USAID and DAT, the Geography Department understands that RSI staff will have little or no time to work with Dakar University.

It is our opinion that the Geography Department could greatly benefit from technical and material support provided by an American University, especially in such a field as Remote Sensing in which several U.S. Universities have extensive experience. The Geography Department has again expressed this desire for close collaboration with a U.S. University,

and in particular with RSI. The experience of the current project shows that this cannot be accomplished through complicated contractual arrangements with another GOS government agency.

We recommend that USAID consider the possibility to have RSI provide services directly to the Geography Department to enhance its Remote Sensing capabilities. In institutional terms this could mean that first the Remote Sensing laboratory at the University be developed into an effective training and research unit using RSI experience in this field. This development could lead to the establishment of a Remote Sensing Institute or Center at the University of Dakar, with full image processing and sales facilities for local needs.

In view of the fact that CRTO-Ouagadougou is currently continuing to develop image processing facilities, a careful analysis would be needed to determine the cost of developing a similar facility in Senegal versus the expected demand.

If the GOS so wishes, this University Center could in the longer term be developed into a National Remote Sensing Center.

The direct collaboration between RSI and the University provides the best means for effective transfer of Remote Sensing technology and at the same it would provide ideal means to transfer RSI managerial and organizational capabilities in operating a Remote Sensing Center to an African University.

RECOMMENDATION 1

It is therefore recommended that USAID investigate the possibility to fund direct collaboration between the University of Dakar and RSI.

RECOMMENDATION 2

It is further recommended that RSI field or home office staff, or an outside advisory team, determine together with the University of Dakar, the needs of the University in its Remote Sensing research and training activities in terms of manpower and equipment.

5.2. Land-Use Planning

The needs of DAT (Direction d'Aménagement du Territoire) go well beyond the preparation of a set of natural resource maps at scale 1:500,000. As perceived by DAT these needs include substantial institutional development which would allow for effective planning, once a set of basic maps is prepared.

Map production and planning efforts now require the inputs of other GOS agencies and/or of technical assistance from outside. For DAT to be able to establish its resource information base, carry out mapping and planning tasks, it needs a multidisciplinary staff of human and natural resource specialists that are able to focus on integrated resource

planning. Such a staff requires adequate work space and the facilities to carry out their task. Essential facilities would be a resource information data base, map production facilities (Cartography Department), report production facilities, and possibly a GIS to process and access a wide range of data necessary for Senegal's land-use planning.

As regards Land-Use Planning maps, the review team is not sure whether, at this stage of the project, there is an agreement between RSI - DAT people as to what the maps and information are to be prepared in relation to each others' goals. That is, we perceive substantial emphasis by RSI on producing agricultural capabilities maps of several types, but only lip service, for example, toward forestry and rangeland capability assessment in the overall country context, and in the context of the maps already produced for DAT by the UN.

RECOMMENDATION 3

It is therefore recommended that USAID determines the feasibility of providing long-term institutional support to DAT in order to assist the GOS in allocating its natural resources judiciously among various agricultural options and set priorities for attaining proposed development objectives.

RECOMMENDATION 4

It is further recommended that RSI field or home office staff, or an outside advisory team, determine together with DAT the

needs of GOS in land/water resource planning for national and regional development in terms of manpower and equipment.

5.3. On-Going Project Activities

Specific recommendations to re-orient on-going project activities depend to a large extent on USAID's long-term policy with regard to remote sensing and land-use planning in Senegal. The recommendations for adjustment in project activities presented here should therefore be considered as interim solutions.

RECOMMENDATION 5

It is recommended that the RSI staffing arrangements currently in effect (no further short time consultants) and those proposed be clarified to DAT, and that DAT clarify GOS' position regarding counterpart staff.

RECOMMENDATION 6

It is recommended that map outputs of the project be curtailed in view of the limitations of funds/time and of Senegalese counterpart staff to about four sets of 4 maps at scale 1:500,000. A soils map, a vegetation map and land capability map should be produced as a minimum in view of the work done already. In view of the 1:250,000 country-wide mapping approach used by RSI, the need for sample area detailed surveys is reduced. Consideration should be given to eliminate further work on sample areas if the 250,000 mapping program were to proceed.

RECOMMENDATION 7

It is recommended that the kind of final maps with French/English legends and accompanying bilingual report be decided upon in a meeting between DAT and RSI, subject to approval of USAID. It is recommended that final maps be in black and white, if possible on mylar overlays to be used in conjunction with the IGN topomaps at 1:500,000, or to be used in conjunction with landsat imagery (or image maps) at that scale.

RECOMMENDATION 8

It is recommended that similarly a workschedule be agreed upon between DAT and RSI. The workschedule will specify how the workload will be divided among present or new project personnel, and it will schedule the delivery of final map and report products to DAT. In order to ensure consistency in mapping, changes in personnel should be kept to a minimum.

RECOMMENDATION 9

It is recommended that all counterpart staff put at the projects disposal indeed be trained on-the-job.

5.4. Communications and Administration

One of the most pressing and delicate problems on this or any other project, is communications. This situation is

complicated on this project by the project manager having substantial technical responsibilities without adequate administrative assistance.

It appears that projects such as this one are perceived by AID as relatively small - dollar wise - so certain administrative amenities perceived to be necessary on large projects are not necessary for there smaller ones. Often the contractors will erroneously agree with this themselves. Remote sensing, integrated resource projects are very complicated to manage, and unfortunately it is always assumed that to cut costs, the technical people can provide both technical and managerial help with little administrative assistance.

The technical manager needs more than secretarial help. He needs someone who knows administration and can get things done in a developing country. (Apparently an administrative position was budgeted, but then cut). The alternative is to have an experienced resource scientist totally devoted to the details of project management and who's previous technical experience allows him to guide several key scientists toward producing an excellent set of maps and reports. And often, he needs a decent administrator.

Project managers working against deadlines and budget constraints will typically try and produce a tangible product - a product by which his or the project's financial or technical success or failure is determined. In general, most U.S. managers working on multi purpose projects will opt for map and report preparation (tangible products) and meeting

deadlines at the expense, perhaps, of training and administrative procedures. If there are the beginnings of personality or communications problems, in such situations, they are increased by: 1) the effect produced by the African manager becoming overwhelmed by requests for people and assistance. This frustrates him because it makes him appear to be inefficient to his superior, when he may in fact simply not know how to handle this situation, in addition to being responsible for a certain amount of other work. 2) the rebound effect is the U.S. manager not getting what he needs, (and by agreements, should get), which of course adversely effects his progress. Requests for aid and assistance eventually transition to memos oriented toward each person protecting his position as regard not being able to accomplish tasks.

Part of the solution to this problem is an informal system of communication where each party supports the other through informal communications and by really trying to understand each others' problems.

The first project manager, a competent soil scientist had the extremely difficult task of starting a project in a developing country. He became concerned with the details of coordination, finding work space and other such activities at the expense of making maps, collecting information and advising project scientists and counterparts. Any communication problems that exist are only amplified in these situations.

He also did not have the right kind of support from his home office. We mean, at some risk of talking out of turn, support

by staff who at one time had to continously face, on a personal basis, the problems of having to start a project in a developing country.

The new project manager is himself behind in his technical responsibilities, and understandably so for many of the reasons stated above. He has taken a direct approach to collecting information, producing maps and coordinating activities, at the expense of certain formal procedures which are considered bureaucratic necessities but hinderances to us. This has led to a measure of progress in data collection and mapping activities, but it hasn't improved communications between RSI and DAT.

RECOMMENDATION 10

It is therefore recommended that the communications and operational problems between RSI and DAT should be confronted to establish whether there two organizations indeed still have an understanding of what each wants and how the products RSI produces will assist DAT; and if indeed the RSI manager and the director of DAT can work together. Although it is each supervisors' responsibility to promote workable relations between organizations, we recommend that, in addition to providing more timely support, AID become the mediator in this matter.

APPENDIX A

Schedule of Evaluation Team in Dakar

Tuesday, November 15, 1983	Arrival in Dakar Orientation meeting at USAID with Larry Harms, Project Manager, and at DAT with Mamadou Thiam, Director.
Wednesday, November 16, 1983	Introduction at Project Office, met with Project Teamleader and his staff. Reviewed project documents.
Thursday, November 17, 1983	Discussion with M. Thiam, DAT Discussion with L. Dubois. UNDP Project supporting DAT
Friday, November 18, 1983	Discussion with L. N'Diaye, DAT. Interviewed project staff concerning project activities, problems and goals.
Saturday, November 19, 1983	Reviewed project documents
Saturday, November 19, 1983	Reviewed project documents
Monday, November 21, 1983	Interviewed project staff concerning project activities, problems and goals.

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Tuesday, November 22, 1983	Meeting at Ministère de la Recherche Scientifique et Technique Discussion with project staff, discussion with M. Thima Meeting at Direction de l'Elevag
Wednesday, November 23, 1983	Meeting at Geographic Department Meeting with Larry Harms, USAID, Meeting, Director Eaux et Forêts
Thursday, November 24, 1983	Reviewed GIS possibilities
Friday, November 25, 1983	Meeting with Thiam and Director of Decentralization at Office of Decentralization Review Documents - do report
Saturday, November 26, 1983	Work, do report
Monday, November 28, 1983	Brief meeting with Thiam Meeting with Larry Harms, AID Set up typing schedule Meeting with Thiam
Tuesday, November 29, 1983	Meeting with Gray Tappan and A. Bodian at RSI Office Prepare report

Wednesday, November 30, 1983	Prepare report Meeting RSI - Dorigan - Brief period with Hilwig - Afternoon meeting with Stancioff Buursink - Long meeting with Hilwig, brief meeting with Stancioff Meeting with Thiam - Dinner
Thursday, December 1, 1983	Meeting with Diatta - RSI Work on report
Friday, December 2, 1983	Report
Saturday, December 3, 1983	Report
Sunday, December 4, 1983	Report
Monday, December 5, 1983	Meeting - Larry Harms Meeting - University of Dakar
Tuesday, December 6, 1983	Met Vic Meyers, Directeur RSI Worked on report
Wednesday, December 7, 1983	Worked on report
Thursday, December 8, 1983	Turned in draft report to Harms. Met briefly with Stancioff.
Friday, December 9, 1983	Presentation of draft report to AID staff and Director of RSI.

Saturday, December 10, 1983	Finalize draft report
Sunday, December 11, 1983	Prepare exec. summary report technology transfer report.
Monday, December 12, 1983	As above
Tuesday, December 13, 1983	Meeting with Mr. Thiam, Director DAT
Wednesday, December 14, 1983	Meeting project staff.