Evaluation of the South Coast Agricultural Development Project in Guinea-Bissau

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EXECUTIVE SUMMARY

The South Coast Agricultural Development (SCAD) Project was authorized in July 1983 for $5.5 million. It was an attempt to increase rice production in Guinea-Bissau. The country has gone from being a net exporter of rice before the war of independence to becoming an importer of about 25,000 tons per year. Since Bissauans are the second largest per-capita consumers of rice in the world, the project was of great importance. It was implemented through the Department of Agricultural Hydraulics and Soils (DHAS). The funding provided by the U.S. Agency for International Development was only for infrastructural development, commodity procurement, training, and eventual technical assistance and water management studies.

In addition to AID, several other donors participate in the project. The International Fund for Agricultural Development (IFAD) and the African Development Bank (ADB) jointly fund part of the project (time frame: 1986-1991, budget: $16 million). Major components of their program include rehabilitating 3,400 ha of *bolanha* on the Isle of Como-Caiar, resettling farming families on 1,800 of the 3,400 ha, implementing an agricultural credit system to finance inputs, and strengthening extension services on the Isle of Como-Caiar and on 14,400 ha of *bolanhas* in the adjacent area. A soil study has been completed to target areas for rehabilitation. Topographical studies are ongoing, and dike construction is scheduled to begin next year.

The Kuwait Fund is financing another part of the project (time frame: 1986-1991, budget: $4.47 million), which will construct approximately 16 dikes and ancillary structures to improve 9,300 ha of rice fields. The project will provide technical assistance and training, purchase construction materials, and build and equip a vehicle and machine maintenance garage. In 1987 the project completed four large dikes, each protecting 300-500 ha of rice fields.

The following sections deal only with the AID-financed portion of the project. However, the team evaluated the entire project, as reflected in the section on "Recommendations for Future Course of Action." But since the AID-financed component of the project is almost completed, AID might want to use the information to assist the other donors.

ACHIEVEMENT OF OUTPUTS

The project paper outlines eight project outputs:

- Construct a regional center in Catio;
- Establish a regional maintenance capacity;
- Develop locally adapted water management technology;
- Transfer adapted water management technology;

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- Establish capacity for socioeconomic data collection and analysis on water management;
- Design and test water control structures;
- Improve the construction of water control structures; and
- Enhance the competency of the hydrology staff.

These outputs appear reasonable and achievable, although a longer time frame than originally anticipated will be required. At this point, only the first output--the construction of a regional center in Catio -- has been achieved. The other outputs will have to await the arrival of the technical assistance team and the implementation of the augmented participant training program.

INFRASTRUCTURE INPUTS

- The construction of the Catio regional center is 95 percent completed. It should be operational by the end of March 1988. The cost of the construction component should total $2.442 million.

- Three long-term participants in the project's training component were sent to the United States in February 1985 for B.S. degrees. One is enrolled at the University of Arizona, where he has an "A" average. The two others did not perform as well.

  Among the short-term participants, two individuals were trained in Portugal in greenhouse management and soil science-related photo-interpretation. They have returned and are working at the DHAS in occupations appropriate to their training. Two others, who are in Portugal studying accounting and administration, are making good academic progress and are expected back in Guinea-Bissau in May 1988. One individual completed a one-year training program in Senegal and France in managing irrigated perimeters in Africa, and returned to Guinea-Bissau in May 1987.

  The project also sponsored an observation/study trip to the United States for three weeks in 1986 for the project director.

- Spare parts for Land-Rover and DAF trucks were ordered and delivered in November 1983 at a cost of $25,000. Additional spare parts for DAF trucks costing $27,000 were ordered in November 1985 and delivered in February 1986. Waivers were issued for two Toyota Land Cruisers for $45,000 and three DAF dump trucks for $275,000. The Toyota Land Cruisers are in Bissau. They will be transferred to Catio after the arrival of the two technical assistance experts. Office furniture and equipment were ordered in April 1987 for $25,000, and are expected to arrive in Bissau no later than January 31, 1988. Appliances for the amount of $40,000 were ordered and delivered in July 1987.

- AID purchased $24,049 worth of tools and $20,879 worth of vegetable seeds in 1984. They were distributed. At the same time, 16 caterpillar tires and tubes were purchased for $15,304, and buckets and watering cans were purchased for $2,361.

ECONOMIC VIABILITY

The project has undergone several changes since the project paper was written in 1983. It has experienced substantial delays, and its chief component, the regional center in Catio, is not yet operational. Questions regarding recurrent costs in maintaining the center after the project assistance completion date (PACD) were barely touched on in the project paper. These estimates are now dated. Modalities for financing these costs were not addressed at all. A review of project files reveals that no updated analysis has been done since 1983. It is not possible to estimate recurrent costs until the technical assistance team defines the extent of its activities, in conjunction with the other donors and the DHAS.

The project calls for government financial support and provides no method for generating funds to support anticipated project activities. If SCAD is to contribute to area development after PACD, provisions must be made to minimize operational costs and generate funding, possibly through the creation of a user-fee system. Fees should be assessed based on cost calculations for maintenance activities and paid for in rice through the water management committees established on area *bolanhas*. Unless questions pertaining to recurrent costs are addressed by the donors and the Government of Guinea-Bissau (GOGB) at the outset of the center's operation, prospects for the project to make a long-term contribution to increased rice production in the South Coast area are poor.

RECOMMENDATIONS FOR FUTURE ACTION

Implementing the AID-Financed Agreement

Subject to a positive environmental and social analysis, it is recommended that the SCAD project, as described and agreed upon in the project agreement, be continued to its full conclusion. No increase in project funds will be required as long as only two long-term technical assistance specialists are provided.

- AID should obligate the remainder of the funds ($147,851) for the project this fiscal year.

- If long-term technical assistance is provided, the PACD will have to be extended from September 30, 1989, to September 30, 1991.

- AID must pay greater attention to implementation matters, particularly when the technical assistance is obtained.

- AID should utilize the REDSO/WCA more effectively to support project implementation, especially by coordinating short-term consultancies activities in advance and by following up on REDSO recommendations.

- AID must re-establish a system of project implementation letters, update the Financial Plan, and straighten out the filing system.

- The Procurement Plan should be revised and updated, and the agricultural development officer should consult with REDSO's commodity procurement officer.

- AID should order the furniture as soon as possible to make the houses at Catio livable for the U.S. and counterpart technicians.

- Provision of heavy equipment by the United States is not appropriate, especially since such inputs are probably available from other donors. The same can be said for the provision of spare parts for non-U.S. equipment.

- Greater coordination is indispensable for the appropriate management of the project both between donors and with the GOGB. Formal and informal contacts should be established and maintained.

Improved Coordination Among Donors

The major donors in the project area and the GOGB should develop a document that clarifies the respective roles of the individual donors in the project area and establishes an integrated implementation plan for the region. Regularly scheduled meetings should be held to review progress of the various activities in the South Coast region.

An effort should be made to coordinate the procurement of commodities by the donors to avoid non-compatibility and redundancy. This could be accomplished by circulating procurement lists before the commodities have been ordered.

Once the regional center at Catio is operational and implementation plans have been solidified, a detailed study of the recurrent costs of the center should be made and a plan outlining ways in which the GOGB will finance the recurrent costs must be developed. The feasibility of charging user fees for DHAS services should be investigated.

Natural Resource Management

Rice-land Management and Planning

DHAS recognizes that rice cultivation has occupied the best intertidal soils and can expand only into marginally productive areas. Emphasis on increased rice production should 1) focus on highly productive intertidal soils that have been in

continuous production for long periods, and 2) encourage the expansion of rice cultivation on upland soils that are suitable for fresh-water flooding and have proved response to fertilizer and an intensified level of management.

A land use capability survey (scale 1:50,000) based on recent aerial photographs and ground reconnaissance is recommended to provide the information required for dike location, potential rice land expansion, and monitoring of land use and rice production. An unknown area of cultivated rice land is abandoned each year while new marginal areas are being drained and diked. Land use inventories would assist in identifying those lands in continuous rice production where improved levels of technology and water management have proved to be cost effective. Reliable estimates of land use, including new land undergoing ripening, rice production land, and abandoned land unsuitable because of acidification or salinization, would guide DHAS planning for projected expansion as well as maintenance of exiting protected areas. DHAS, which has requested this survey, would need technical assistance for implementation and training.

DHAS should develop a systematic measurement of rice yields on acid mangrove soils and upland soils. This measurement would serve as an indicator of project progress and attaining rice self-sufficiency.

DHAS should continue support of the tidal rice farmers by constructing large barrier dikes and providing improved water management technology. Barrier dikes, effective barriers to salt-water intrusion and fresh-water seepage, have brought more new land under cultivation, but this has led to the abandonment of established paddies elsewhere. Barrier dikes yield a net gain of 25-percent rice land whereas traditional lower contour dikes yield less than 10-percent cultivable rice land. Additional advantages to large barrier dikes are the protection of a much larger area per-unit length and improved resistance to deterioration. In addition, as a result of their short length, barrier dikes require less maintenance and less fill.

However, the lack of up-stream water control reduces the capability to provide optimal flooding depth and water-level control for paddy rice production since the dikes function only in one direction. Future design of barrier dikes should consider additional canals and drains to facilitate individual farmer control, and to provide two-way flow for periodic salt-water flooding and seasonal fresh-water control.

Technical assistance and DHAS implementation should be phased so that two-way flows of water controlled by dual-action gates are fully implemented prior to any improved water management on individual subunits. Key water management issues that require technical assistance include:

- Water release and gate operation to maintain fresh- and salt-water flows required by downstream estuarine fisheries;

- Redesign of sluice gates to permit two-way flows and allow farmers at higher elevations to rejuvenate their lands periodically by sea-water flooding;

- Hydrological studies to permit the adequate sizing of dikes and gates to handle peak runoff flows and tides;

- Improved low-cost gate design should replace the traditional canoa pipe outlets for small dikes; and

- Improved coordination with other departments to develop the up-stream structures and operating procedures for efficient water-level control for rice production.

DHAS is capable of water control management and barrier dike construction, but unable to offer extension services to farmers or assist in community development. DHAS should explore establishing a co-pilot program with local groups and other donors in providing extension services. Similar coordination and planning is required in maintaining and repairing old water structures to recuperate abandoned rice lands that could return to prior levels of production.

Estuarine Resource Management

Assess the impacts of converting mangroves to rice land by selecting specific watershed units in the intertidal zone that represent: 1) areas that have experienced extensive conversion, 2) an undisturbed mangrove area, and 3) an area in the process of conversion. If these representative areas could be established for base-line data collection, a minimum of two years' preconversion and two years' post-conversion monitoring might be required for reliable results. Additional sample units can be added to account for the large diversity of estuarine habitats found along the South Coast. The purpose of this base-line study is to define the biological, hydrological, and ecological relationships between upland fresh-water runoff and the down-stream estuarine mixing, and the resultant productivity of fish and associated species.

A sampling program should be established to collect fish and macroinvertebrates from as many different habitats as possible. Collections during both the wet and the dry season should assist in identifying the major species present, general habitat preferences, and seasonal abundances. A reference collection will be maintained for training and use by local scientists as well as other experts. Information on the ecological relationships of the collected species will be developed.

The populations of important estuarine species should be documented as well as their life histories and reproduction cycles. Target species and sampling locations should be guided by the fish and invertebrate survey suggested previously. Quantitative sampling at selected locations will be designed to monitor changes in population size, migratory movements, and seasonal use of specific habitats.

The hydrology of the estuarine system will be quantified by periodic monitoring of selected sites in major estuaries to characterize seasonal changes in water flows and water quality. Parameters to be measured should not require elaborate equipment or highly trained personnel; they should include such measurements as salinity, temperature, dissolved oxygen, essential nutrients, and water velocities. Sampling design should take into account tidal cycles as well as seasonal variation of runoff. More sophisticated equipment is required to monitor pesticide contamination and nutrient content of the water, but is useful in determining estuarine productivity.

More direct measurements to help estimate the loss of estuarine productivity as a result of mangrove conversion involve the uninterrupted overland fresh-water flows, leaf litter or detritus input, and tidal mixing. Field sampling should be established to monitor aquatic and terrestrial primary productivity and the production and transport of mangrove leaf litter. All of these base-line measurements will help determine the impacts of the barrier dike construction in reducing fresh-water flows, estuarine mixing, and changing water quality on estuarine productivity.

The monitoring activities will require considerable technical assistance since locally trained human resources and facilities are limited. Pesticide analysis and some water quality analysis will have to be acquired outside the country.

Although subsistence fishing has been sustained for a long time, controls will be necessary to avoid overfishing and stock depletion that could result from successful commercialization. It is unlikely that unmanaged reservoir fisheries will ever equal or exceed the productivity of the estuarine areas they replace. Large pond-rearing fisheries require large initial investment and a sustained high level of management. Considering the difficulties now experienced with water management for rice alone, it appears impractical to consider imposing yet another set of conflicting management criteria requiring cooperative planning. Fish culture within the rice polders holds by far the greater potential because of the relative large areas available, but needs further investigation before proven recommendations can be offered.

Removing Social Constraints

Coordination Among Donors

It is imperative that there should be communication and coordination among the three international donors participating on this project -- AID, the Food and Agriculture Organization (FAO), and IFAD. Although FAO is financing the socioeconomic studies, DHAS will use the findings to implement phases of projects funded by both AID and IFAD. The objectives and methodology, and terms of references of these socioeconomic studies and their results, should be made available to all parties concerned. The former should be made available immediately and the latter as they become available.

AID, with the assistance of an agricultural social scientist, should determine if these studies adequately assess the social constraints that might impinge on site selection and subsequent water management programs. This social science analysis should take place at the initial stage, as soon as studies have been formulated. They should be followed up with one or more evaluations since it will take time to implement the studies and to analyze and use the resulting data to implement the project's various phases.

Because of the lack of coordination among the international donors, it is incumbent upon AID to seek out and establish lines of communication and coordination. It also behooves AID to be in direct contact with the National Institute of Study and Research (INEP) since communication and coordination among donors and host government agencies are not always satisfactory.

Socioeconomic Studies

One segment of the socioeconomic studies to be undertaken by INEP will address the question of available labor for the increased areas of rice cultivation created by the dams. Preliminary interviews with staff of INEP suggest that its objectives, methodology, and terms of reference are appropriate for a survey of the labor situation. However, since these studies are at early design phases, they should also be assessed and monitored by an agricultural social scientist.

Intra- and Inter-Tabanca Conflict

Intra- and inter-*tabanca* conflict has resulted from dam construction and the subsequent development of more serious and complex land distribution and water management problems. In some instances, for example, at Nhala in the Quinara region, these problems have led to serious inter-ethnic conflict. Some method of resolving these land tenure and water management problems must be developed. Efforts have been made to create a superstructure that encompasses all *tabancas* (of same or different ethnic affiliations) in a new dam site, but to date have been unsuccessful. It is possible that once DHAS is on site at Catio, these inter-*tabanca* and inter-ethnic problems can be solved. However, it is more reasonable to expect, given the social customs involved, that conflict resolutions will have to be accomplished slowly through experimentation since none of the groups possesses the social structure to do so. An attempt to impose a foreign social structure is not likely to succeed. Water management programs should give individual farmers as much water control as possible and water reserves to those farthest from the dam, for example, pits, trenches, etc. This may entail a subdivision of water basins and limiting sizes of basin and areas created by dams, allowing for autonomous *tabanca*-controlled areas.

Farmer Participation in Dam Construction and Maintenance

Farmer participation in dam construction and maintenance has been problematic in the past. It is vital that farmers perceive these structures as their own and feel compelled to participate. It is important that all farmers, regardless of their field position in the *bolanha* (near or far from dam, dikes, and sluice gates) participate in constructing and maintaining ancillary soil and water management structures. Aside from the dam itself, other structures should be constructed as much as possible of locally available materials and as technically similar to traditional methods as possible. Working together (members of the same *tabanca*, different *tabancas*, different ethnic groups) at these early phases of dam construction will encourage and facilitate later cooperation and coordination in maintenance activities and water management programs -- especially as it relates to control of sluice gates. The solution will develop from the attempt itself as it adapts to the farmers' needs and social customs.

Role of Women and Women's Needs

The project will inevitably increase the workload of women rice producers. It is imperative for the health and welfare of the women and their families that

consideration be given to their circumstances. If the health of this critical segment of the rice-producing labor force is impaired, it will affect rice production and thus the success of the project itself. From the preliminary interviews with INEP, it is not evident that these concerns will be addressed by the socioeconomic studies. An assessment of the women's workload, both agricultural and domestic, and a judgment about the necessity of including technical assistance to women in the project should be made. This technical assistance, in the form of mechanical hulling machines, improved stoves, etc., could be implemented through the Department of Agricultural Research and Experimentation (DEPA), which already has the local infrastructure and ability to do so. AID would simply have to provide funding.

FUTURE INVESTMENTS IN SUPPORT OF RICE PRODUCTION

For the GOGB to make significant strides toward its goal of rice self-sufficiency, improved monitoring and marketing of South Coast rice production must be addressed.

The GOGB has embarked on a fundamental change in policy with respect to pricing and marketing decisions. It has, however, inadequate financial and human resource capacities to evaluate the effects of this shift in policy direction on South Coast rice producers. AID should therefore consider:

- Financing technical assistance to bolster the GOGB's capacity to evaluate production trends in the project area. This assistance could include hiring an agricultural statistician to develop a low-cost methodology for evaluating yields and production in the South Coast area and training and equipping GOGB technicians to monitor the effects of the changing policy framework on regional production. At present, the GOGB has almost no ability to evaluate the impact of its new policies on South Coast rice producers. This capacity must be bolstered to adapt policies to changing conditions;

- Hiring a marketing specialist to study costs associated with the commercialization of South Coast rice, develop least cost scenarios, monitor marketing trends, and advise private sector traders on alternative marketing strategies; and

- Targeting the vegetable oil currently being imported under the PL 480 program to the South Coast area by requiring that the GOGB sell the oil to wholesalers operating in the project area. Counterpart funds generated by the sale of the vegetable oil could be earmarked for supporting operating expenses at the Catio regional center.

To improve marketing channels, AID should consider:

- Improving the road between Bambadinca and Xitole. Enlarging and grating this one-lane track would facilitate road transport between Bissau and the project area, decrease marketing costs, and encourage private traders to take a more active interest in possible economic opportunities in the South Coast area;

- Improving the area river transport capacity by purchasing small barges to deliver consumer goods and inputs and take out rice to those areas inaccessible by road. If producers in isolated areas are to respond to the favorable pricing policies enacted by the GOGB, they must be able to exchange their crop for desired consumer goods. Although three new barges have been recently purchased by the Dutch, barge capacity remains woefully inadequate. Area port facilities have been rehabilitated by several donors, but the GOGB must expand its river-carrying capacity if large-scale marketing increases are to be expected from the region; and

- Financing silo construction. Grain storage capacity is inadequate in the region. The paucity of storage silos increases on-farm post-harvest rice losses because the GOGB and private traders are unable to purchase rice from farmers in a timely manner for lack of storage space. Next year, the Dutch will undertake a study pinpointing regional storage needs, but will finance only a portion of the actual silo construction. AID should evaluate the possibility of financing silo construction in the project area.

CHAPTER ONE

SCOPE OF EVALUATION

The purpose of the South Coast Agricultural Development (SCAD) Project, as stated in the approved project paper, is to strengthen the institutional capacity of the Department of Agricultural Hydraulics and Soils (DHAS) to expand rice production areas on the South Coast of Guinea-Bissau through improved water control structures and soil and water management practices.

The evaluation team was to assess the validity of the approved project purpose; its relationship to the problem statement contained in the project paper; and the agricultural, engineering, social, economic, and other assumptions on which the project is based. The team was also to evaluate the relationship of the approved purpose to these assumptions and to the program objectives of the U.S. Agency for International Development in Guinea-Bissau.

The team was to assess the project's performance to date in terms of achieving specified project outputs or other benchmarks that have been formally established between the Government of Guinea-Bissau (GOGB) and AID. The team was expected to comment on the adequacy and continued validity of the set of specified outputs in relationship to achieving the project purpose or goal statement. The team also was to assess the performance of the project implementation entities in terms of providing planned project resources, including commodities, technical services, construction, training, and host country staff. Input delivery performance had to be assessed in terms of quality, quantity, timeliness, and reasonable cost. In general, the team was expected to determine whether the types and amounts of inputs agreed upon were being delivered, whether they were being used as intended, and whether they could reasonably be expected to produce the desired outputs.

Furthermore, the team was to analyze the performance of the project's management structure. This assessment had to include a brief description of the major roles and responsibilities of the entities involved in the project's management and implementation. The management system had to be defined to cover other donor participation and coordination.

The team was to examine the performance of the management information and monitoring systems of the project and their impact on its management and implementation. Project information systems were to include use of financial management reports, input delivery schedules, monitoring progress indicators, periodic implementation reviews, evaluations, and credits.

The recurrent cost aspect of the project was to be assessed in terms of both the financial and the human resources requirements. This aspect of the evaluation had to note the commitment exhibited by the GOGB to date and the priority that it accords this project in allocating its resources as well as those of its donor partners.

Based on these analyses, the team was to make conclusions, suggestions, and recommendations regarding the above-noted aspects of the evaluation. In essence, the team was asked to assess whether the project's design is valid, reasonable, and technically sound. The team was expected to document its assessment and to recommend what changes in project design or implementation appear necessary to achieve the project's objectives.

CHAPTER TWO

EVALUATION METHODOLOGY

The evaluation team consisted of a project management specialist/evaluation specialist who was also the team leader (DAI), an agricultural development officer (AID/Bissau), a project development officer (REDSO/WCA), an agricultural economist (DAI), a soil reclamation engineer (DAI), an applied estuarie ecologist (DAI), and a social anthropologist (DAI). The entire seven-member team met for the first time in Bissau on November 23, 1987.

SCHEDULING

Week One (November 23-29, 1987)

The team met daily to discuss the evaluation methodology and schedule, and to assign individual responsibilities. The team met with the staff of the DHAS to determine the evaluation schedule. Then individual meetings were held with DHAS staff, representatives of the other donors in Bissau, and other GOGB personnel. At the end of the week, the team leader, accompanied by the agricultural development officer visited the project site at Catio and made working and living arrangements to prepare for the visit of the other team members.

Week Two (November 30-December 6, 1987)

The evaluation team spent most of the week in Catio. All the GOGB local counterparts as well as the director of DHAS were present during the team visit. Interviews were conducted with the local representatives of the other project sponsors and with numerous farmers. The team members visited the project's site and all of the dams, including those built by the project.

Week Three (December 7-13, 1987)

The team spent the week writing the first draft of the report while meeting with GOGB personnel and some donors to obtain additional information. The project development officer from REDSO/WCA completed his section of the report and returned to Abidjan at the end of the week.

Week Four (December 14-20, 1987)

Most of the week was spent discussing findings and recommendations and revising the first draft. The social anthropologist and the ecologist went to Tite for two days. The soil reclamation engineer returned to Catio for three days with the civil engineer from REDSO, who was going there to inspect the project site.

The team leader presented a draft report to the AID representative and noted his informal preliminary comments. Formal comments from AID/Bissau were telexed to DAI later. The team left Bissau on December 21. The team leader reviewed the report's findings and the recommendations with AID's Africa Bureau in Washington.

APPROACH

The team used three elements to carry out its evaluation: documentation, site visits, and interviews. The AID project paper and project papers prepared by the two other donors were reviewed. All other project documentation available at AID/Bissau and at DHAS was reviewed. The team also was able to obtain a large number of additional documents from other donors and other GOGB's agencies. The site visit allowed team members to interview local representatives of the GOGB and donors. A series of other interviews initiated in Bissau during week one continued during week three. A list of persons contacted can be found in Annex B and a bibliography makes up Annex A.

CHAPTER THREE

CONCEPTUAL FRAMEWORK OF PROJECT: INPUTS AND IMPLEMENTATION

HISTORY OF THE PROJECT

Project Antecedents

The design and implementation of the SCAD project has benefited from the experience and data gathered in two prior projects. These were the Agricultural Production Project (657-0002) and the Rice Production Project (657-0009).

The Agricultural Production Project was authorized in September 1977 with a life-of-project funding of $2.35 million. The project's purpose was to provide the GOGB with supplemental assistance to increase agricultural production, including seed improvement, identification and control of plant diseases, and land reclamation. The first project in the Guinea-Bissau bilateral portfolio, it lasted over eight years to December 31, 1985.

An evaluation was carried out in February 1985 by a team from REDSO/WCA. The team concluded that, apart from the success of land reclamation and a significant number of degree participants trained in soils, seed technology, and other technical agricultural fields, the accomplishments of the project were "meager." The team noted that, as a result of unclear management and the protracted nature of the implementation schedule, several items of unfinished business remained on the agenda. The team recommended that the project be brought to a "rapid and meaningful closure." Remaining funds would be spent on commodity support to the National Seed Laboratory and the provision of spare parts for the heavy equipment used in land reclamation efforts by the Department of Agricultural Research and Experimentation (DEPA), the research and extension service of the Ministry of Rural Development. Many findings and conclusions of the evaluation of this earlier project are similar to the ones that will be made for the SCAD project, particularly in the area of AID management.

The Rice Production Project was authorized in August 1980 for $4.5 million. Its purpose was to increase food production and farm income of at least 1,200 farm families in Guinea-Bissau's Geba River basin through developing land in the northern Zone II for rice production and creating an institutional capacity at DEPA. That project was evaluated three times. An informal evaluation in January 1983 recommended reorienting the project from an irrigated effort using pumps to rain-fed rice production. In November 1984, a REDSO evaluation recommended redirection and redesign of the project to follow more closely the original intent of DEPA--that is, to attend to the needs of the farmers with technology they could implement themselves and to provide institutional support to DEPA's Center at Contuboel. The final evaluation was carried out in June 1987. It recommended increased policy dialogue with the GOGB on agricultural policies having impact on AID projects, an extension of the project, and a new farming systems research and extension project in the Contuboel area.

The South Coast Agricultural Development Project

The SCAD project was authorized in July 1983 for $5.5 million. A full project description will be found in the next two sections of this evaluation. A major problem exists in the conceptualization of the project as viewed by AID and by the GOGB. AID's impression about the nature of the project is based on the project paper. Unfortunately, in the weeks following the completion of the design of the project and its approval, AID discovered that the GOGB had serious reservations concerning the project's design, particularly the technical assistance component. A project agreement was negotiated containing compromises. Each party now uses its respective document to defend its position, and each is often unaware of what is contained in the document the other is using. This situation has affected the project's implementation. Moreover, both parties realized that the participant training component was inadequate project and a large training activity was subsequently added. Another exogenous factor having impact on the project was Guinea-Bissau's deteriorating financial situation. Frequent devaluations and shortages of foreign exchange have meant that the government often has been unable to make its agreed-upon contribution to the project.

THE LOGICAL FRAMEWORK

Goal

According to the logical framework in the project paper, the project is to increase rice production in Guinea-Bissau. This goal is consistent with the project goals in two other agricultural projects in the AID's portfolio (Rice Production and Food Crop Protection projects). It is also consistent with the last Country Development Strategy Statement for Guinea Bissau, prepared in 1985, and with the U.S. Assistance Strategy for Africa, 1987-1990, prepared in June 1986. That document states that AID programs will be directed at three priorities as part of the pro-growth strategy:

- Economic restructuring;
- Agricultural development; and
- Human resources development.

Guinea-Bissau is undergoing major economic restructuring, which is taking it from a socialist, centrally directed and planned economy to one based on the private sector. Economic activities have been deregulated, prices have been allowed to increase, private production incentives are appearing, and the economy is opening to the outside world. As a result, the pre-conditions for increased rice production are now evident -- that is, the elimination of restrictive regulations in the marketing of rice, higher producer prices, and the availability of consumer goods in rural markets.

Project Purpose

The stated purpose of the project is to strengthen the institutional capacity of DHAS to promote and facilitate the extension of south coastal rice production areas through improved water control structures and water management practices. This purpose would appear reasonable and consistent with the project goal and the AID strategy. However, institutional development in countries with limited human resources capacity, such as in Guinea-Bissau, is well known. The project had a time-frame of six years, which is probably not enough to achieve its ambitious

purpose. Although over four years have passed, the project has not yet brought in any technical assistance in support of institutional development.

The project will either have to extend its time frame or face the prospect of not fully achieving the project purpose. Given the changing economic and political climate in Guinea-Bissau, the resources invested, and the progress already made, the evaluation team counsels patience and understanding on the part of AID and recommends a renewed effort to accomplish the project's institutional objectives. It should also be noted that AID's efforts in Guinea Bissau may have left something to be desired in the area of project implementation.

Project Outputs

The project paper outlines eight outputs that should be achieved by the end of the project:

- Construct a regional center in Catio;
- Establish a regional maintenance capacity;
- Develop a locally adapted water management technology;
- Transfer adapted water management technology;
- Establish a capacity for socioeconomic data collection and analysis on water management;
- Design and test water control structures;
- Improve the construction of water control structures; and
- Enhance the competency of the hydrology staff.

These outputs appear reasonable and achievable, although a longer time frame than originally anticipated will be required. At this point, only the first output--construction of a regional center in Catio -- has been achieved. The other outputs will have to await the arrival of the technical assistance team and the implementation of the augmented participant training program.

INPUTS

Construction

The construction aspect of the project was characterized by inadequate planning when the project paper was prepared. The project's designers were obviously unaware of the procedures required for a construction activity. They apparently also were unaware that there was no final agreement on which buildings were to be constructed and by what donors.

The designers did not know that plans, specifications, or architectural drawings were not available for the construction, and that an architectural and engineering (A&E) firm would have to be engaged to do the planning and design work, including the architectural drawings and specifications. Nor did they know that a firm would have to be engaged to supervise construction, that competitive procedures would have to be followed to engage the firm to do the design and supervisory work, and that competitive procedures supervised by the A&E firm would have to be followed before the construction contract could be signed. And they did not know that all of these requirements are very time consuming in an developing country where coordination among Bissau, Abidjan, Dakar, and Washington was also required.

Moreover, as a direct result of this lack of understanding of what was involved in a construction project, the funds necessary to finance the A&E contract were significantly underestimated. This meant that the original PIO/T had to be amended in December 1984 to increase the funding from $204,000 to $425,000 (a 100-percent increase). Since the project paper and project agreement did not envision funding the construction design and supervisory activities, the project was already considerably over budget before it began. To make matters worse, other facilities (two office buildings, two junior officer residences, electrical and telephone service lines, and a shallow aquifer test well) were to have been financed by another donor, the International Fund for Agricultural Development/African Development Bank (IFAD/ADB). Unfortunately, the IFAD/ADB schedule did not accord with that of AID. So to have all the facilities at the Catio center available when the U.S. technicians and their counterparts were to have arrived, the United States decided in

June 1985 to finance not only an increased scope of work for the A&E firm to design the additional facilities but also their construction costs as well.

Schedule from Annex 9 of PP Compared to Actual

Action	Date Scheduled	Actual
A&E consultant selected	May/June 83	Dec. 84
ADO/Bissau requests RCO write standard contract for design and construction supervision	July 83	Jan. 85
A&E firm completes construction documents for bid	Sept./Oct. 83	July 85
Review of construction contract	Nov./Dec. 83	Sep. 85
Pre-bid conference	Dec. 83	N/A
Bid opening	Feb. 84	Feb. 86
ADO/Bissau requests RCO to execute construction contract	Mar. 84	Mar. 86
A&E firm provides day-to-day construction supervision	Apr. 84/Oct. 85	Mar. 86-present
A&E firm notifies that construction is substantially complete	Oct. 85	Mar. 88

Once AID revised its understanding of what would be required to begin construction and elaborate a new set of procedures, a contract was signed with the A&E firm (Louis Berger International [LBI]) in January 1985, approximately 18 months after the project's start. Preliminary design for all of the facilities, including those of IFAD/ADB, was approved by the AID/Bissau and REDSO on July 29, 1985, and by the GOGB on September 6, 1985. Following this approval, a prequalification notice was sent out by the A&E contractor, and potential contractors were then prequalified on October 4, 1985.

Engineering plans, designs, and specifications were eventually completed in January 1986. By that time, LBI had already pre-selected the construction firms that had expressed an interest in being considered for the construction contract. Tender

documents were prepared by LBI and submitted to these firms. The bid opening was scheduled for January 14, 1986, at the AID office in Dakar. Bids from four prospective firms were received. At the last minute, however, the bids were not opened at the request of the REDSO/WCA. The office felt that an amendment to the administrative conditions should be submitted with the tender documents. As a result, the bid opening was rescheduled for February 14.

Following the opening, an analysis of the bids was made, and the Sociedade Metropolitana de Construcoes SARL (SOMEC) was selected as the construction firm with which the AID direct fixed-price contract would be signed. The construction contract was signed on March 7, 1986, and the order to proceed was given on March 19, with actual construction work to begin within 10 days later. On March 18, LBI assigned its resident engineer, Roland Henderyckx, to Catio for the duration of the construction. Construction began on April 3 with site preparation, which included earth moving and removal of trees and roots. However, the annual rains began in late May; thus, the land-clearing activities had to be stopped until the end of the rainy season. SOMEC then requested to extend its contract by three and one-half months to June 1987. This request was approved by the REDSO contract officer (RCO). Work was therefore scheduled to be completed by that date. However, delays that have been entirely attributed to the construction contractor have postponed completion to the end of March 1988. Penalty clauses are being applied against SOMEC.

Final cost for the construction component should amount to:

A&E contractor	$ 622,000
Construction contract	$1,800,000
Total	$2,422,000

The original amount prescribed for construction was $1.33 million plus $565,000 from the GOGB for the cost of plans, the construction of six technicians' houses, and the renovation and construction of workers' housing. Although six technicians' houses are still planned (to be funded by the ADB), the other elements of the GOGB contribution were assumed by AID under this project.

The implementation plans, schedules, and cost estimates included in the project paper were realistic, when one considers past implementation problems encountered in Guinea-Bissau, past experience in general with project implementation anywhere, and the remoteness of the project site. The ultimate responsibility for this situation must rest with REDSO.

The project was designed in the field under Delegation of Authority 140, in which authorization is exercised by the AID representative with the concurrence of the REDSO director. This concurrence is obtained with the support and assurances from the REDSO staff that all of the requirements in the law and internal AID regulations have been met, including Section 611 (a, b, and e). There is no project development officer, engineer, procurement specialist, contract officer, or legal advisor at AID/Bissau. It depends on the reliability, effectiveness, and efficiency of REDSO employees to provided those services. When, as in this case, REDSO does not carefully and prudently exercise its responsibilities, no one should be surprised that a project does not achieve all of its objectives in a timely and effective manner.

Technical Assistance

The technical assistance has not yet begun on the project. It was originally anticipated that assistance would start November 1985. However, the project paper and all subsequent documents made clear that the long-term technical assistance would not be provided until appropriate housing and other facilities were available at the project site in Catio. As the site is now substantially complete, AID should finalize the PIO/T as soon as possible to obtain the required technical assistance.

Some disagreement with the GOGB remains, however, about what should make up the technical assistance. Originally, the project paper anticipated that there would be four specialists for a total of 144 person-months, that is, three years each. These specialists were to be a civil engineer, a hydrologist, a mechanic, and a sociologist.

In the discussions that followed the project's approval by AID, it was concluded

in the project agreement that only two individuals would be furnished by AID, the mechanic and a water management specialist. The engineer and sociologist were to be provided by other donors. The project agreement also included a clause that, if the GOGB were unable to obtain the services of these individuals from other donors or their own resources, AID would provide the services.

AID must begin negotiations to develop a final agreement with the GOGB concerning the specific nature of the technical assistance. This will require closely coordinating with the other donors (including FAO, IFAD, and the Dutch) who also provide technical assistance to the overall program in the South Coast. If the technical assistance is still anticipated to require three years, the project assistance completion date (PACD) must be extended from the current September 30, 1989, to at least September 30, 1991.

Training

The project's training component consisted originally of $58,000. This would finance two long-term participants to attend a two-year hydrology course in Ouagadougou and one short-term participant, a soils scientist, to attend a six-month program in mangrove acid sulfate soils sponsored by the International Rice Research Institute in the Philippines. It was felt at the time that the DHAS had already received extensive technical training under a prior project and that additional training was unnecessary. The Agricultural Production Project (657-0002) was providing or had provided training to one B.S.-level student in soils and soil fertility, two laboratory technicians for soils, one B.S.-level student in hydrology and water science, one M.S.-level student in hydrology, and one A.A.-level student in mechanization and management. Also, the chief of the National Soils Laboratory (a section of DHAS), a chemist, had received nine months non-degree training in soils.

Subsequently, it was decided that additional long- and short-term training would be desirable. An additional $300,000 was reallocated within the Financial Plan in December 1984 to cover the costs of an expanded program of training. The Project Agreement's Amplified Project Description was not modified, however, to account for this seven-fold increase. Nor was a project implementation letter (PIL) issued requesting GOGB concurrence in this change.

Three long-term participants went to the United States in February 1985 for B.S.-level training. Only one of the three is making good academic progress. That person has, in fact, done extremely well, and is enrolled at the University of Arizona where he has an "A" average. One other failed after two years and may have returned to Guinea-Bissau, while the other, because of his poor academic work, has been transferred to an associate degree program, in which he is unlikely to succeed.

The AID mission was fully aware (see Bissau 150, January 22, 1985) that the last two individuals had very low scholastic records at secondary school in Bissau and that their English language proficiency was limited, if not nil. They probably should never have been sent to the United States for long-term training. Nevertheless, AID persisted in encouraging a university enrollment for these two marginal participants rather than finding suitable replacements. The cost to the project and the U.S. government for the two failed participants will be nearly $200,000.

The short-term participants have fared better. Two individuals were trained in Portugal in greenhouse management and soil science-related photo-interpretation. They now work at DHAS in occupations appropriate to their training. Two others are in Portugal studying accounting and administration. They are making good academic progress and are expected back in Guinea-Bissau in May 1988. One individual went to Senegal and France for a one-year training program in managing irrigated perimeters in Africa. He has completed his program and returned to Guinea-Bissau in May 1987. The project also sponsored an observation/study trip to the United States for three weeks in 1986 for the project director. These short-term activities cost the project $65,000.

Commodity Procurement

Original Procurement Plan

1. Spare parts for existing heavy equipment and trucks: $125,000

2. Project vehicles including one DAF truck and vehicles for technical assistance team members: number and cost not specified

3. Office furniture and equipment for the offices at the regional center to be constructed at Catio: $37,500

4. Furniture and appliances for the technical assistance team's housing: $128,500

5. Two generators for the center and one generator for the technical assistance houses: $30,000

6. Soils laboratory equipment, supplies, and books: $135,000

7. Garage tools and equipment for the center: $159,700

8. Spare parts for vehicles, equipment, and machinery provided to the project: cost not specified.

9. Cement and reinforcing steel for sluices to be built, four each year for three years: $150,000

The project originally anticipated purchasing $1.032 million of commodities. An additional $40,000 was added in September 1984 to purchase small tools. The project paper contained a relatively complete and detailed list of the commodities and equipment to be purchased. Some modification of that list has occurred since, which, if all of the items were to be purchased, would exceed the original budget by a substantial amount ($1,411,700).

It is evident from a review of AID/Bissau's records that the project was often unable to define its requirements and thus to complete many of its procurement actions within a reasonable period of time. Rather than attempting to document the seemingly endless changes over the past four years, this section will describe what has already been purchased and suggest that AID work closely with the DHAS to develop a well-defined revised procurement plan for the remainder of the project. The mission should then request the assistance of the regional commodity procurement officer in Abidjan in implementing the procurements.

Each category of commodity procurement is reviewed below to determine what has transpired and to provide a basis for future actions.

1. **Spare parts for heavy equipment and trucks:** In November 1983, spare parts for Land Rover and DAF trucks were ordered and delivered at a cost of $25,000 under PIO/C 657-0010-4-30001. In November 1985, spare parts for DAF trucks were again ordered from the same supplier (Truck and Car of Belgium) under PIO/C 657-0010-3-30002 for a cost of $27,000. AID reported that only a partial shipment was received in February 1986 with approximately $10,000 worth of parts missing. The supplier stated that it would ship the remainder within three weeks. However, there is no evidence that the remainder of the shipment was ever shipped or received, and the missing parts may have been stolen. In addition, it appears that AID did not pay for any of the spare parts, even those already delivered to the project. The evaluation team does not have sufficient information to evaluate this situation fully. AID should follow up with outside assistance if necessary.

2. **Vehicle procurement:** All vehicles and spare parts purchased by the project require source/origin waivers including Caterpillar equipment, which, although often U.S.-made, will usually require proprietary (name brand) procurement waivers or single source waivers. These waivers must be obtained prior to the issuing of PIO/Cs. Obtaining the waivers is a time-consuming and often delicate matter. Most important, it requires that AID have a clear idea of exactly what it wants and why. After considerable debate and discussion lasting several years, waivers were issued first for two Toyota Landcruisers and subsequently for two Toyota pick-ups ($45,000) and three DAF dump trucks ($275,000). The project has ordered and received the two Toyota Landcruisers for the technical assistance team to use but purchase of the remaining vehicles is being postponed pending results of this evaluation. It should be noted that, as in the case with the Caterpillar equipment, the DAF trucks would normally be considered heavy equipment and, thus, a part of the GOGB's contribution as agreed upon in the project agreement.

   AID has purchased the two Toyota Landcruisers through the Bonn RPSO without issuing a PIO/C. Since these vehicles have now been delivered and are being used, AID should issue a PIO/C to regularize this situation. The PIO/C number should be 657-0010-4-50319, and it should be for $45,000, the cost of the two vehicles including delivery.

3. **Office furniture and equipment:** PIO/C 657-0010-4-50317 for $26,000 was prepared and submitted in April 1987. AID was advised that Franklin Export will be the firm doing the procurement and that a bank letter of commitment was being opened. Procurement was not suspended, and the commodities were expected to arrive in Bissau no later than January 31, 1988.

4. **Furniture and appliances for technical assistance team:** PIO/C 657-0100-4-30306 for $90,000 was issued in March 1987 for five sets of household furniture from Ethan Allen, Inc. The PSA, Franklin Export, was informed that procurement was being suspended pending the completion of this evaluation. Given the lead times necessary to deliver furniture and that GOGB counterparts are prepared to move to Catio whenever the

housing is ready, it is recommended that the procurement under this PIO/C proceed irrespective of the scheduling of U.S. technical assistance.

Appliances (including stoves, refrigerators, air conditioners, and water heaters) were ordered under PIO/C 657-0010-4-30307 for $40,000. These appliances were procured through RPSO in Bonn and delivered in July 1987. However, the 15 air conditioners received are redundant, because air conditioners for houses of the technical assistance personnel were provided under the SOMEC construction contract. They are being stored in the AID warehouse. AID should discuss with DHAS an alternative use for the air conditioners such as in the project offices in Catio or in the DHAS offices in Bissau.

The regional commodity procurement officer has recommended that AID develop a system to track procurements and establish procedures for receipt, inventory, and warehousing well before the commodities arrive. This evaluation strongly supports that recommendation.

5. **Generators:** All generator procurement for the Catio regional center is being undertaken as part of the overall construction program by SOMEC. No action is necessary.

6. **Soils laboratory equipment:** AID has taken no action concerning this possible procurement. Since the U.S. technical assistance will not be involved in ordering, installing, or utilizing this equipment, it is recommended that AID coordinate any procurement of such equipment with all of the other donors before proceeding to avoid duplication or the ordering of inappropriate equipment.

7. **Garage tools and equipment:** AID has taken no action on this procurement. Before AID engages a mechanic to work at Catio, AID should determine whether it will inherit the garage equipment and tools from the Dutch mechanic working in the project. If not, a set of basic tools will have to be ordered and delivered prior to the arrival of the mechanic. The list included in Appendix 3 of Annex 10 of the project paper should be updated, perhaps by the REDSO Engineering Office, before ordering.

8. **Spare parts for vehicles and heavy equipment:** In 1985, under the Agricultural Production Project (657-0002), AID ordered spare parts for Caterpillar equipment from a dealer in Portugal (STET) for the benefit of DHAS. Approximately $12,000 of these parts were reported missing upon receipt in Guinea-Bissau. Since the files on the Agricultural Production Project have been retired, the evaluation team was unable to determine the outcome of this situation, but it appears that it has not yet been resolved. In any case, AID planned to again purchase Caterpillar parts from Portugal and received a fund cite for $75,000 and a PIO/C number 657-0010-4-50314. AID was preparing the required documentation, but it was never completed. In a letter to DHAS of March 11, 1987, the AID agricultural development officer (ADO) noted that the quantities of spare parts requested appeared to be in excess of immediate or near-term needs.

It is recommended that no further spare parts for vehicles and heavy equipment be purchased until (a) the arrival of the U.S. technical assistance mechanic and (b) the situations discussed above and in #1 above are resolved to AID's satisfaction. Parts for Caterpillar equipment should be purchased from the United States using an IQC PSA, and a warehouse control and management system should be established at the DHAS warehouse for any U.S.-financed equipment stored there.

9. **Cement and re-bar:** The project has not yet financed any purchases of these commodities which are used for the construction of sluice gates and other small works. Procurement should await the arrival of the technical assistance before determining final requirements.

10. **Additional unanticipated procurement:**

    a. Caterpillar equipment: PIO/Cs 657-0010-4-30304 and 40319 totaling $206,000 were issued in September 1986 and April 1987 to finance the purchase of two bulldozers, a D4 and D6 from Portugal. As a result of the urging of REDSO's Procurement Office, and over DHAS's objections, AID decided to procure these items from the United States rather than from Portugal. It is not clear from project files why AID agreed to this procurement in the first place. According to the project agreement, this type of heavy equipment should be purchased by the GOGB as a part of its contribution to the project. Although the GOGB may not be able financially to afford the purchase of expensive heavy equipment, such assistance is available from other donors under the larger program for the South Coast. The evaluation team, finding no justification for such purchases under this project, supports AID's decision to cancel the procurement of heavy equipment.

    b. Topographic equipment: PIO/C 657-0010-4-30305 was issued in December 1986 to purchase of $18,000 of topographic equipment. A pro-forma from a local supplier was received in 1986. No further action has been taken on this procurement. As this material is available relatively quickly from local sources, procurement should await the arrival of U.S. technical assistance.

    c. Camping equipment: A draft PIO/C was prepared in 1986 for $55,000 to purchase a large supply of camping equipment for DHAS. Pro-formas have been received from Dakar suppliers. This equipment can be put to immediate good use in the field by DHAS. A fund cite should be obtained from REDSO so that the PIO/C can be finalized and DHAS formal approval obtained.

    d. In 1984, AID obtained an additional $40,000, which it obligated for the purchase of small garden tools for the DHAS. No PIO/C was ever prepared. AID then purchased $24,049 worth of tools and distributed them, leaving $15,951 to be spent. Separately, AID purchased vegetable seeds for $20,879, 16 Caterpillar tires and tubes for $15,304, and buckets

and watering cans for $2,361. No PIO/Cs were prepared for them either. It is recommended that AID prepare a PIO/C for these four sets of commodities and obtain DHAS's formal approval for the expenditure of approximately $62,600 in project funds.

e. Additional procurement has been suggested to finance the purchase of 125cc motorcycles, several small generators, a concrete mixer, and concrete vibrator. The ADO should pursue discussions with the DHAS to determine the need and justification for this and any other desired procurement when preparing a revised procurement plan for the project.

Inputs of the Government of Guinea-Bissau

According to the project paper and the subsequent project agreement, the GOGB committed itself to support the project with inputs valued at $3,640 million. The breakdown of this contribution is as follows:

Technical assistance	-
Training	3.0
Operating costs	1,458.0
Land contribution	345.0
Construction	565.0
Commodities	100.0
Equipment	875.0
Depreciation	292.0
Evaluation	2.0
Total	3,640.0 (in thousands of U.S. dollars)

Operating costs include salaries, utilities, and supplies necessary to day-to-day office operations. Land was to be provided at Catio to construct the regional center. The GOGB would finance the costs of preparing plans and specifications for the construction component, as well as constructing six technicians' houses and renovating and constructing workers' housing in Catio. The GOGB was to have provided all heavy equipment such as bulldozers, trucks, backhoes, and front-end loaders. The costs of depreciation of the equipment and machinery were also attributed to the project as a GOGB contribution. Much of the heavy equipment is actually provided by other donors. Because this property belongs to the GOGB,

however, it was felt that the equipment could be fairly considered as a legitimate contribution.

It should also be noted that as a "least developed country" Guinea-Bissau is not obligated under U.S. law to make the 25-percent contribution required of many other recipients. Moreover, the DHAS has not received any local currency support from the P.L. 480 program. However, AID has received several requests from the DHAS to support its activities with the provision of heavy equipment including bulldozers, trucks and vehicles, and spare parts. These requests have been considered, in spite of the GOGB support commitment, because of the extreme shortage of foreign exchange prevailing in Guinea-Bissau. The other commitments (land, operating costs, etc.) are generally being adhered to.

IMPLEMENTATION

Financial Plan and Budgeting

The project has obligated nearly all of the funds authorized:

	Amount Oblig.	Amount Oblig.	Date of Oblig.	Plan
1. Original Pro-Ag	$ 1,730,000	$ 1,730,000	Aug 29, 1983	FP
2. Amendment No. 1	450,000	2,180,000	Feb 22, 1984	No FP
3. Amendment No. 2	40,000	2,220,000	Sep 20, 1984	FP
4. Amendment No. 3	1,000,000	3,220,000	Jan 25, 1985	FP
5. Amendment No. 4	500,000	3,720,000	Aug 30, 1985	No FP
6. Amendment No. 5	500,000	4,220,000	Apr 10, 1986	No FP
7. Amendment No. 6	1,132,149	5,352,149	Aug 29, 1986	No FP

$147,851 remains to be obligated of the total $5.5 million authorized.

Financial plans are attached to each project agreement and amendment showing how the obligated funds are being budgeted and are to be used. The Financial Plan for Amendment No. 2 was incorrectly done. This was corrected in the subsequent plan attached to Amendment No. 3. No further financial plans have been prepared. This means that AID has had no means of cross-checking and verification against the financial plan and budget being used by the REDSO/WAAC (accounting station) in REDSO/Abidjan. As a result, the two budgets vary widely, and there are differing

impressions of accruals and expenditures in Bissau, Abidjan, and Washington. It is recommended that AID update its financial plan for the project and obtain REDSO/WAAC understanding and concurrence in a PIL reflecting the agreed-upon budget.

According to REDSO's Accounting Center, only $3,280,759 had been earmarked in various PIOs and other sub-obligating documents signed by the GOGB as of October 31, 1987. Of this, only $2,824,845 has been committed in specific contracts, purchase orders, etc., and $1,656,046 actually disbursed. These break down into the project elements (components) as follows:

	Element	Earmarked	Committed	Disbursed
1.	Construction	2,110,407	2,034,493	1,073,515
2.	Commodities	514,306	134,306	88,832
3.	Tech. assist.	311,626	311,626	298,325
4.	Training	340,770	340,770	194,352
5.	Evaluation	-	-	-
6.	Contingency	3,650	3,650	1,022
7.	Inflation		-	-
	Total	3,280,759	2,824,845	1,656,046

However, if the original project budget is compared with the amount that is estimated necessary to complete the project, there will be a shortfall of approximately $544,000.

		Original Budget	Current Budget
1.	Construction	1,330,000	2,422,000
2.	Commodities	1,032,000	1,411,700
3.	Tech. assist.	2,227,000	1,380,000*
4.	Training	58,000	350,000
5.	Evaluation	80,000	100,000
	Audit	-	20,000
6.	Contingency	300,000	240,300**
7.	Inflation	473,000	120,150***
	Total	5,500,000	6,044,150

* 72 pm x $15,000 + $300,000 for short-term technical assistance

** 10% of $5,683,700 (subtotal) - $3,280,800 (amount already earmarked)

*** 5% of unearmarked total

AID should review the budget with the GOGB and make the necessary adjustments. If certain marginal commodity procurements are eliminated and the project reduces its requirements for short-term technical assistance support, it should be able to stay within the $5.5 million budget. Nevertheless, if three years of long-term technical assistance are required to accomplish the project's objectives, the PACD will have to be extended to at least September 1991.

Project Implementation Letters

There have only been three PILs issued by AID/Bissau since the project was authorized in August 1983:

- PIL #1 of September 9, 1983. This PIL set out the administrative procedures to be followed in implementing the project. It has apparently been accepted by the GOGB, although no record of this acceptance can be found in the files.

- PIL #2 of October 4, 1983. This PIL, which notified the GOGB that some of the conditions precedent to first disbursement had been met and that there were still others with which it had yet to comply, was misnumbered. There

is no record that the GOGB accepted this PIL by signing and returning a copy to AID.

- PIL #3 of August 19, 1985, informs the GOGB of an additional $40,000 that had been made available to the project for purposes that had not been foreseen in the project agreement. This PIL was signed by the GOGB, and a copy of the acceptance exists in the files.

- PIL #4 of November 1986 was a draft concerning a revision of the project's financial plan and budget in which the REDSO did not concur. The letter was, therefore, never sent to the GOGB.

It is recommended that AID begin again the process of issuing PILs. This might begin with a PIL with the latest updated budgetary information. AID may also wish to reissue PIL No. 1 with the procedures updated.

Project Implementation Reports

The USAID has a full set of project implementation reports (PIR) in its files. The reports began in November 1983 and run through September 30, 1987. These reports are used primarily by project reviewers in Washington to understand the project's status and problems. After a thorough search of the AID files, the only written or cabled reaction to the PIR's from Washington that could be found was one cable to AID/Bissau in September 1987. It cannot be determined if this means that PIR meetings in Washington were not held, whether they were not reported upon, or that the reporting cables were misfiled or lost in Bissau.

Project Files

The project files in the AID offices are in a deplorable state. Rather than being filed by subject, documents are often filed chronologically in folders marked as follows: Cables in, Cables out, Correspondence in, Correspondence out, etc. Moreover, documents in these files are often not even in chronological order. Cables, letters, and memoranda referring to a particular contract or procurement action often will not be found in the appropriate PIO/T or PIO/T folder. Receiving reports, for example, where they exist, will be found in a correspondence file rather than in the relevant PIO/C file folder. In addition, some documents in the SCAD project files belong in the files of some other project or activity. This misfiling

means that it is likely that SCAD project materials are in files other than for this project. The organization of the files and the filing have been left to a partially trained file clerk, who is inadequately supervised. The situation concerning files has been raised repeatedly by visitors, particularly from REDSO, as well as by the audit team that visited the mission over a year ago. It is recommended that the AID project officer over the next several months take the time and responsibility to get these files into a state where they can be used efficiently.

Management Style and AID Relations with the DHAS

The working relations between AID and the DHAS during much of the project's implementation can only be characterized as poor. A series of disputes arose, particularly during 1985 and 1986, that brought effective cooperation to a standstill. This section will describe only one set of these disputes, the one that is best documented in the files. The new AID management team should keep this history in mind when dealing with the DHAS and make every effort to avoid any repetition.

On October 7, 1985, the AID representative wrote to the director of DHAS stating his concern with the neglect and underutilization of the greenhouse furnished to the Ministry of Rural Development under the SCAD project. On December 6, 1985, the AID representative informed DHAS that no further equipment and supplies purchased would be released until the greenhouse was repaired and functioning. On December 19, the AID representative informed DHAS that the ADO's secretary was being put on the project payroll. On December 20, the AID representative and ADO met with the director of DHAS and the secretary general of the ministry. The greenhouse issue, the secretary situation, technical assistance issues were discussed, and the AID representative repeated his refusal to release project supplies.

The ministry officials objected to the ultimatum in the representative's letters. Following another meeting at the ministry on December 23 (there is no record of this meeting in the AID's files), the AID representative wrote to DHAS again informing it that project materials would not be released. But on January 24, 1986, the AID representative again met with the director of DHAS to inform him that equipment and spare parts would be released after all because the ministry had complied with the AID's requests concerning the greenhouse. Without even

considering the technical merits of a glass greenhouse in the tropics, the necessity for an enlarged program of technical assistance, or the advisability of putting the ADO's secretary on a project payroll, AID's approach was heavy handed and needlessly coercive.

CHAPTER FOUR

ECONOMIC CONSTRAINTS TO INCREASED RICE PRODUCTION AND POLICY RESPONSES BY THE GOVERNMENT OF GUINEA-BISSAU

AN OVERVIEW OF THE NATIONAL RICE ECONOMY

Rice is the staple cereal of the national diet. It accounts for approximately 76 percent of total cereal consumption.[1] Prior to the War of Liberation (1963-1975), Guinea-Bissau was a net exporter of rice. The southern part of the country, which historically was the major rice-producing area, was severely affected by the war. Massive bombardments by the Portuguese air force destroyed the system of earthen dikes, which permitted rice cultivation on reclaimed mangrove swamps. The hostilities provoked a substantial exodus, as rice farmers fled to safety in the interior. The road and bridge network that linked the south to Bissau was extensively damaged. Total rice production dropped from a high of 175,000 metric tons in 1961 to 85,000 metric tons following the end of hostilities in 1975. The surface area in rice has sharply decreased since pre-war days. The country has not yet recovered.

Rice producers in Guinea-Bissau employ few purchased inputs. The government has recently begun to produce improved seed for sale to farmers, but production is, to date, insignificant. The importation and sale of fertilizers, pesticides, and insecticide are essentially confined to donor-financed and -implemented projects. Animal traction is little used in rice cultivation as a result of cultural considerations.

Rice cultivation is characterized by three distinct rainfed farming systems: production on converted coastal mangrove swamp (*bolanha salgada*), production on inland depressions (*bolanha doce*), and upland rice cultivation. Yields vary greatly according to the type of cultivation. According to the Ministry of Rural

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[1] Statistics cited in this report must be considered as approximate orders of magnitude. The lack of historic base-line data, the paucity of capital and human resources, the non-monetized nature of large sections of the economy, and the extent of parallel market activities preclude a high level of confidence in government statistics.

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Development and Fisheries 1985 Statistical Yearbook, 135,000 ha were devoted to rice cultivation, of which 67,500 ha were in converted mangrove swamp, 41,000 in lowland production, and 27,000 in upland rice farming. Yields varied from 1,000 to 1,500 kg per ha in *bolanha salgada* to 800 kg per ha in lowlands and 400 kg per ha in upland areas. The average yield for 1985 was 807 kg per ha. This yield compares unfavorably with those in neighboring countries (Gambia 1,200 kg per ha, Senegal 1,300 kg per ha, and Guinea 1,100 kg per ha). However, production costs are far higher in these countries.

Following the conclusion of the war in 1975, rice production substantially decreased as a result of dike destruction, population dislocation, and absence of production incentives, while the country became increasingly dependent of food aid.

TABLE 1

PRODUCTION AND IMPORT TRENDS
(hulled rice, metric tons)

Year	Local Production	Food Aid	Imports	Total	Food Aid as % of Total
1977	37050	11559	4500	53109	21%
1978	60125	15010	----	75135	20%
1979	46150	16421	500	63071	26%
1980	21775	8634	5050	35459	24%
1981	52000	28000	5000	85000	33%
1982	72760	17640	5000	95400	18%
1983	51250	24156	678	76084	32%
1984	58000	23326	6000	87326	27%
1985	63860	12718	20000	96578	13%

The GOGB, as enunciated in its first Four Year Plan (1983-1986), has given highest priority to achieving food self-sufficiency. The FAO estimates that the average rice shortfall during the past five years is 26,000 metric tons. There is widespread consensus among the donor community that rice self-sufficiency can indeed be achieved before 1995. The GOGB's investment priorities, as illustrated in the Four Year Plan, place a heavy emphasis on increased expenditure in the South

Coast region (Zone III). The GOGB hopes to attain rice self-sufficiency by reclaiming 16,000 additional ha of mangrove swamp through constructing dikes and increasing the productivity of existing *bolanhas* by implementing effective water management systems. AID has been called on to play an important role in attaining the goal of rice self-sufficiency.

The following sections in this chapter will discuss the agricultural setting in the project area; examine the macroeconomic, marketing, and production constraints to increased production; describe the activities of other donors in the project area; and evaluate the impact of changing government policies on rice production in the South Coast area.

OVERVIEW OF THE PROJECT AREA

The southern regions of Tombali and Quinara will benefit directly from the activities of the SCAD project. These two regions represent 17 percent of the total area under cultivation but traditionally produce approximately 55 percent of the national rice production. Rice cultivation is the major productive activity in the area; other cereals account for only 8 percent of national production. The production of export crops in Tombali and Quinara (groundnuts, oil palm, and cashews) is insignificant. These two regions have historically produced a surplus of rice. Prior to the War of Liberation, the regions accounted for the totality of national rice exports. According to the National Plan for Food Security (FAO 1985), Tombali and Quinara produced an average surplus of 19,000 metric tons between 1983 and 1986.

The area is geographically isolated from the major urban centers in the north. The road network connecting Bissau to the project area is poor. A substantial part of the distance must be covered over a one-lane dirt track that is difficult to negotiate even in the dry season. During the rainy season, the road is often impassible. The local agricultural economy may be characterized as subsistent and almost completely non-monetized.

CONSTRAINTS TO INCREASED PRODUCTION

Lack of Producer Incentives

South Coast rice producers have little incentive to produce beyond their subsistence needs because the agricultural inputs and consumer goods they demand are almost always unavailable. An economic operator has no impetus to increase production unless that incremental production translates into increased purchasing power. If there is nothing to purchase or trade for, the operator's money has no value. It is therefore no surprise that such a small percentage of surplus rice was marketed through official channels in recent years, as illustrated in the following table:

TABLE 2

QUANTITY OF SURPLUS RICE MARKETED THROUGH OFFICIAL CHANNELS

Year	Surplus (metric tons)	Quantity Marketed	Percent Marketed
1983	15,433	2,191	14%
1984	19,644	1,105	6%
1985	23,395	1,000	4%

There is no correlation between estimated surplus and quantities marketed through official channels. During these years, farmers were known to leave paddy in the fields rather than harvesting their entire crop because the surplus could not be used to purchase additional goods. The army has intervened on more than one occasion to "encourage" farmers to market their crop. In the absence of tradeable goods, the farmers were paid in pesos, which could not be spent. The larger quantity that was marketed in 1983 was clearly not a function of available surplus but a direct response to an increase in available consumer goods as a result of liberalized government-marketing regulations. Despite producer prices being raised during the following two years, the quantity marketed decreased as a result of lower levels of imported goods. Discussions of pricing policy and improved water management have no meaning unless the economy, via government economic policies, can increase the availability of desired consumer goods.

Macroeconomic Policies and Unavailable Consumer Goods in Rice-Producing Regions

Guinea-Bissau's economic policies have, in large part, been dictated by the government's need to earn foreign exchange. Guinea-Bissau's monetary unit is the peso Guinean (pg). It is a non-convertible currency. For the government or private sector to import goods, it must acquire convertible foreign exchange through the export of locally produced products, notably, groundnuts, cashews, palm kernels, and wood products. To maximize its foreign exchange earnings through the promotion of export crops, the GOGB systematically targeted the distribution of imported consumer goods to those areas that produce export crops.

The Structure of Marketing Channels Prior to the Reforms of 1985

Prior to the reforms of 1985, two GOGB parastatal agencies, Armazens do Povo (ADP) and SOCOMIN, exercised a virtual monopoly over internal and external commerce, controlling the collection of cereals; the export of groundnuts, cashews, and oil palm; and the importation and distribution of all goods deemed of primary necessity. These two parastatal were under the direction of the Ministry of Commerce and Tourism (MCT). The parastatals possessed a fleet of trucks, regional warehouses, and a network of retail stores in both urban and rural areas. The MCT established producer and consumer prices and marketing margins for all of the cereals, export crops, and consumer goods they imported.

The role of the private sector was minimal. In the early 1980s, 91 import firms held government licenses, 85 of which were located in Bissau. These firms were permitted to purchase foreign exchange at the National Bank to buy non-vital imported goods that were not covered by government monopoly. The GOGB, as a result of the scarcity of foreign exchange, was never able to provide sufficient hard currency to facilitate a viable distribution of goods to the interior of the country. Smaller private traders, operating at the regional level, bought their goods wholesale from one government parastatal or licensed importers and sold or traded these goods to farmers. Private traders who sold export crops to the government, which held a monopoly on their export, were entitled to receive 30 percent of their earnings in hard currency.

The need for foreign exchange dictated the government's and the limited private sector's involvement in the distribution of imported foodstuffs, agricultural inputs, and consumer goods. The major export crop-producing regions are in the north and northeast, whereas the majority of rice is produced in the south. The GOGB used its commercial imports of rice to exchange for export crops in the north. Imported consumer goods were disproportionately targeted to the groundnut, oil palm, and cashew-producing regions to stimulate production of export crops and discourage illegal exports to neighboring Senegal, where producer prices were far higher. Similarly, the private sector was interested only in exchanging consumer goods for export crops as it was entitled to 30 percent of the value of those crops in hard currency. One need only look at the regional distribution of private traders and transport vehicles to see the difference in commercial activity between cash and food-crop producing regions.

TABLE 3

EXPORT CROP PRODUCTION AND PRIVATE COMMERCIAL ACTIVITY

1984* Year	Percent of Groundnut Production	Percent of Palm Oil Production	Number of Operators	Number of Trucks
Bafata	27%	8%	145	35
Gabu	25%	7%	104	36
Oio	22%	15%	90	8**
Cacheu	15%	49%	92	8**
Quinara	4%	3%	28	1
Tombali	2%	1%	37	1

* Figures for cashew production by region were unavailable.

** The low number of transport trucks in these regions is due to the proximity of Bissau. Goods are transported by truckers located in the capital.

There is a clear correlation between regional concentration of export crops, economic activity, and thus distribution of consumer goods. The South Coast regions of Tombali and Quinara produce only a small fraction of groundnuts and palm oil and consequently have the smallest number of private traders and transport vehicles of any of the six regions. The government, private traders, and rice producers do not want pesos. The government and private traders want hard currency to finance additional imports, and farmers have no desire to earn pesos if they cannot be used to purchase agricultural inputs and consumer goods.

Given that the driving force behind government and private commercial activity is the need to earn foreign exchange to finance imports, it is understandable that the major rice-producing region in the south, which has an extremely limited amount of export crop production, has remained as a subsistence and non-monetized economy. Until rice producers can buy the consumer goods that they demand, improvements in institutional infrastructure, water management, and changes in pricing policy cannot have the desired effect of increased rice production in the project area.

Marketing Constraints

Although the commercialization of rice cannot directly generate foreign exchange as the country does not officially export rice, it can be used to indirectly generate hard currency by exchanging rice for export crops in the rice-deficit regions, as illustrated in the following scheme:

Import Consumer Goods to Bissau

↓

Exchange Consumer Goods for Rice in the South

↓

Exchange Rice for Export Crops in the North

↓

Export Cash Crops to Gain Foreign Exchange

↓

Import Consumer Goods to Bissau

The areas that produce the majority of export crops are also those that do not produce sufficient rice to meet local demand. Rice must be brought in from outside. At present, commercial imports of rice by the government are used almost exclusively to trade for export crops. Only a small percentage of the available surplus in the major rice-producing regions of the south finds its way to rice-deficit regions because the farmers have no motivation to sell the rice as there is nothing to buy. Assuming that sufficient consumer goods were available in the south to permit the marketing circuit described above to function, several constraints exist that impede its functioning.

There is a lack of rice-milling capacity in the south. The government or private traders are thus obliged to ship the paddy back to the Bissau region to be hulled because the only large capacity rice mills in the country are located near the capital. The hulled rice must then be transported to the regions that produce export crops. This is inefficient and costly. The poor condition of the national road network, particularly that portion that links the capital to the South Coast area, raises transport costs because trucks require a high level of maintenance. There is a shortage of operational trucks and barges with which to transport the rice to the mill. In addition, the high cost and frequent unavailability of gasoline inhibit the timely transport of rice, thereby increasing post-harvest losses in the producing areas. Furthermore, past non-remunerative tariffs established by the government for private sector transporters have discouraged large-scale participation in the marketing scheme described above and have thus reinforced the economic isolation of the South Coast region.

DONOR ACTIVITIES IN THE PROJECT AREA

In addition to the SCAD project's activities of infrastructure development, commodity procurement, training, and eventual technical assistance and water management studies, several other donors are involved, directly or indirectly, in increasing rice production in the immediate project area.

IFAD and the ADB are jointly funding a project (time frame: 1986-1991, budget: $16 million) to increase rice production in the south. Major components of their program include the rehabilitation of 3,400 ha of *bolanha* on the Isle of

Como-Caiar, the resettlement of farming families on 1,800 of the 3,400 ha, the implementation of an agricultural credit system to finance inputs, and the strengthening of extension services on the Isle of Como-Caiar and on 14,400 ha of *bolanhas* in the adjacent area. A soil study has been completed to target areas for rehabilitation. Topographical studies are ongoing, and dike construction is scheduled to begin next year.

The Kuwait Fund is financing a project (time frame: 1986-1991, budget: $4.47 million) that will construct approximately 16 dikes and ancillary structures to improve 9,300 ha of rice fields. The project will provide technical assistance and training, purchase construction material, and build and equip a vehicle and machine maintenance garage. In 1987 the project completed four large dikes, each protecting 300-500 ha of rice fields.

Members of the evaluation team met with FAO experts who are implementing the Kuwaiti-funded project. They expressed substantial reservations concerning the wisdom of continuing dike construction before proper socioeconomic studies concerning land tenure and labor availability had been performed. The FAO experts also raised questions about the advisability of embarking on the implementation of large-scale water management systems without testing various systems during a pilot phase. In addition, they emphasized the need for far greater cooperation between AID, IFAD, Kuwait Fund/FAO, and the GOGB with respect to harmonizing activities and developing an overall coordinated program.

There has been a serious lack of planning and coordination by both the GOGB and the donors. To the knowledge of the evaluation team, no government document exists that outlines GOGB priorities concerning South Coast regional development, delimitating the respective roles of the donors and the GOGB, establishing an implementation schedule, or defining a coordination process to avoid procurement redundancies or significant gaps in a unifying implementation strategy. This has resulted in a piecemeal approach to regional development that has manifested itself in dike construction without a clear follow-up implementation plan that addresses instituting effective water management systems within rice fields rehabilitated under the program. There appears to have been a tendency, which is in large measure now being corrected, first to rehabilitate and expand cultivated area and only then to

address the land tenure, labor availability, and water management problems created by barrage construction. Coordination problems can be seen through redundant or non-compatible commodity purchases to equip the Catio regional center and a lack of knowledge on the part of individual donors with respect to complementary development activities in the project area.

Many implementation and coordination problems associated with the development of the South Coast are due to inadequacies on the part of the major donors. Base-line soil, hydrological, and socioeconomic studies performed during the project planning phase were seen by those responsible for project implementation as wholly inadequate. This has necessitated redoing the studies, despite the fact that one donor has already begun implementation. The FAO representative in Bissau stated that he had approached the former staff of AID to define ways to improve coordination among donors involved in rice production in the South Coast area, but AID was unresponsive to his overtures. If AID is to maximize the benefit of its investment in the project area, donor coordination must improve.

DONOR RESPONSES TO MARKETING CONSTRAINTS

In recent years there has been a substantial increase in investment in the South Coast area, reflecting the GOGB's priority in increasing rice production. During the 1984 through 1986, regional investment increased 12.1 percent, 17.4 percent, and 42.7 percent. Much of this donor-financed investment has been directed to improving the marketing channels in the project area. At present, port facilities in the South Coast are being rehabilitated, barges to transport locally produced rice to Bissau have been purchased, and construction of grain storage silos will soon begin. Reconstruction of bridges and improvement of the road network are being financed by the World Bank. Various donors are involved in increasing the milling capacity in the project area as an incentive for private traders to participate more fully in the marketing of locally produced rice. Several extension programs are planned to improve water management techniques within existing *bolanhas*. These activities should substantially improve the marketability of South Coast rice, providing that the fundamental constraint to increased production -- that is, the lack of available goods -- is addressed.

GOVERNMENT POLICY RESPONSES TO PRODUCTION CONSTRAINTS

Past Economic Situation

The GOGB is changing its role in the national economy. Previously, the GOGB held a virtual monopoly over internal and external trade. Economic policies favored the urban sector to the detriment of 80 percent of the country's population engaged in agricultural production or fishing. These policies were characterized by an overvalued exchange rate, which rendered imported goods artificially inexpensive. This situation favored the urban elite (the primary consumers of imported goods) while, in effect, taxing agricultural producers in rural areas. The overvalued exchange rate served as a stimulus to the expansion of parallel markets. Low producer prices for food crops (principally rice) subsidized urban consumers while acting as a disincentive to increased production in rural areas. Increasing debt repayment obligations by the GOGB forced a rationing of imported consumer goods thereby further discouraging increased agricultural production. The rapid increase in government expenditures financed by the Central Bank credit fueled inflation, decreasing the purchasing power of consumers.

In 1983 the government enacted a series of measures designed to decrease expenditures, limit non-productive imports, and stimulate agricultural productivity. These measures included devaluing the peso, increasing producer and consumer prices of agricultural goods, gradually transferring parastatal retail outlets to the private sector, and increasing government taxes. As a result of a continuing high rate of inflation and slow implementation of administrative reforms, these actions had an insignificant effect on the pressing economic problems that confronted the country.

Recent Developments

In 1987 the GOGB, in conjunction with the World Bank, enacted a series of reforms aimed at shifting the terms of trade from the urban to the rural sector. These reforms expanded upon the liberalization policy begun in 1983.

In terms of monetary and fiscal policies, the peso will continue to be devalued regularly to maintain the disparity between official and parallel market rates at approximately 10 percent. The effects of consequent higher prices of imported goods will be passed along to the consumer. Export taxes on all agricultural goods, with the exception of cashews, will be abolished, and exonerations of import duties will no longer be given. The percent of foreign exchange earnings permitted to be retained by private sector exporters has been raised 30-50 percent. These monetary and fiscal measures make private sector involvement in the marketing of export crops far more attractive. To increase their volume of exports, merchants will offer higher prices to export crop producers to serve as an incentive to increased production.

The government has enacted policies to encourage further private participation in the marketing of agricultural products. Import licenses are now far easier to obtain. The pricing structure of transport services per ton per kilometer has been increased, making involvement in the transport sector more financially attractive. Restrictions on private sector participation in direct marketing of export crops have been eliminated, and laws that previously placed the private sector at a competitive disadvantage with regard to the parastatal import and export firm have been changed. The GOGB has also relaxed control of illegal imports, reasoning that the forgone import duty revenue will be compensated for by increased production as a result of the greater availability of consumer goods.

Price controls have been lifted on all but four essential goods: rice oil, sugar, and cement. Both producer and consumer prices for rice have been raised.

TABLE 4

PRODUCER AND CONSUMER PRICES FOR RICE

Producer Price for Paddy pg/kg

1984	1985	1986	1987	1988
14.5	24	35	50	85

Consumer Price for Rice pg/kg*

1984	1985	1986	1987 Trimester		
			1st	2nd	3rd
30	50	65	120	200	250

* Government employees are entitled to buy rice at the subsidized price of 65 pg per kg.

These monetary, pricing, and marketing reforms constitute a change of the government's role in the national economy from one of central control to one of guidance, monitoring, and correction. These reforms, in conjunction with the projects to improve marketing channels in the south, will greatly increase the attractiveness of marketing locally produced rice. For these reforms to have the desired effect, however, essential consumer goods and agricultural inputs must be rapidly injected into the economy and targeted to rural areas.

The Structural Adjustment Program

To inject basic consumer goods and agricultural inputs into the economy so that the monetary, marketing, and price reforms might have a significant impact, the World Bank, the ADB, and several bilateral donors have agreed to lend the GOGB approximately $45 million, on extremely favorable terms, over the next two years, to finance the importation of vital consumer goods, vehicles, and agricultural inputs necessary to stimulate production and facilitate product marketing. The program contains three major components.

The first component targets the importation of basic foodstuffs, agricultural inputs, and vehicles. Under the auspices of the donors, the GOGB, through a European-based procurement firm, has solicited competitive bids covering the 10 items to be imported under this component (rice, sugar, vegetable oil, flour, fertilizers, pesticides, trucks, tractors, tillers, and roofing material). The most competitive bid for each item on this list will be retained, and the items will be purchased through the National Bank and imported to Bissau.

The GOGB has selected six import and export firms, chosen on the basis of their ability to market the imported goods effectively, that is, transport and storage capacity and financial strength, to participate in this aspect of the program. The National Bank will sell the imported goods to both the parastatal trading company (ADP) and the six selected private firms. The firms will then wholesale the goods regionally to smaller private traders.

The second component will focus on the importation of basic non-food consumer goods (soap, matches, batteries, bicycles, radios, and sewing machines). These articles will be apportioned to private traders and the ADP according to projected regional demand for these goods. These goods are scheduled to arrive in Bissau in February or March 1988. The third component will finance the importation of basic agricultural production inputs.

Effects of the Structural Adjustment Plan on South Coast Rice Producers

The policy reforms recently undertaken greatly increase the incentives of both the private and the public sectors in marketing locally produced rice. The two-year structural adjustment loan directly addresses the fundamental precondition to increasing production --- availability of imported consumer goods and agricultural inputs. The loan should prime the national economy and permit it to expand greatly the volume of exports, while channeling imported goods to areas that will directly stimulate increased production.

ADP has allocated sufficient consumer goods to the regions of Tombali and Quinara to purchase 5,000 tons of locally produced rice this year. This is more than double the amount purchased last year. According to the representatives of the

Ministry of Commerce, the major importers and exporters will focus their marketing activity in the South Coast region. Three of the six private firms selected by the Minister of Commerce have a large warehouse network in the region and thus are well placed to carry out distribution to smaller traders.

The GOGB has structured its policies to prevent needed rice imports from competing against locally produced rice in several ways. The GOGB maintains a monopoly on rice imports to permit it to regulate the quantities imported. These quantities will be kept at a minimal level to require importers and exporters to trade for locally produced rice to meet demand in deficit areas that produce export crops. In addition, although the consumer price of imported rice is controlled by the government, the producer price (above and beyond the floor price ensured by the government parastatal) and the consumer price of locally produced rice are subject to free market forces. Private sector firms stand to gain more money by exchanging locally produced rice from the South Coast area for export crops, rather than directly trading imported rice whose price is established by the government for those same export crops.

The increased availability of consumer goods and agricultural inputs and the pricing and marketing policies that govern the distribution of these goods make it financially attractive for marketing agents to ensure that demand in the South Coast area is met. South Coast rice producers should see far more consumer goods available in 1988 and will therefore finally have a reason to increase their productivity.

Negative Effects of the Structural Adjustment Program

The recent monetary, pricing, and marketing reforms adopted by the GOGB demonstrate a commitment by the government to create a favorable environment for increased rice production. These reforms have been undertaken at a certain risk. Urban dwellers will see their purchasing power decrease as a result of increased consumer prices for rice and imported goods (as a result of the devaluation of the peso). These negative effects should be partially mitigated by increased availability of consumer goods. A reduction in government expenditures will necessitate laying off a substantial number of lower level government workers. The World Food

Program has agreed to provide food for these workers until they can be reintegrated into the economy, and the GOGB will launch vocational programs to facilitate this reabsorption.

MEDIUM-TERM PROSPECTS FOR RICE PRODUCTION

Assuming that the GOGB supports the new reforms and extends credit to marketing agents and rice producers as planned, the prospects of greatly increased production and marketing of locally produced rice are positive. At present, average regional yields are less than one-half of what they could be with improvement in water management techniques. The Balanta ethnic group, which comprises 55 percent of rice farmers in the project area, is known for its sophisticated farming techniques and may well be receptive to adopting improved technologies if they were demonstrably beneficial, economically feasible, and culturally acceptable. The Kuwait Fund and IFAD mangrove rehabilitation projects will improve or bring into production an estimated 14,000 ha over the next five years. An additional 14,400 ha will benefit from donor-funded extension activities. Assuming a conservative estimate of 2 tons of paddy per ha on new or rehabilitated lands, this would result in a net production increase of 28 tons of paddy or 18.2 tons of rice, representing about 65 percent of current total commercial and food aid rice imports.

Increased producer incentives, even without additional technical assistance or production inputs, should increase production as farmers base planting decisions not only on considerations of rice self-sufficiency but also on the goal of producing a marketable surplus. Production increases will have an import substitution effect as commercial rice import needs decrease, conserving foreign exchange.

There exists a real medium- and long-term potential for Guinea-Bissau to once again export rice to neighboring countries (Senegal and Gambia) whose production is only on the order of 35 percent of national demand. Guinea-Bissau is the lowest cost producer of rice in West Africa, and major rice-growing areas are in proximity to navigatable waterways.

The future of rice production is, of course, inextricably linked to the economy as a whole. If the recent reforms are carried through and the structural adjustment

program provides a sustainable stimulus to the economy, the potential for greatly increased production of rice in the project area is good.

THE ECONOMIC VIABILITY OF THE PROJECT

The project has undergone several changes since the project paper was written in 1983. It has experienced substantial delays, and its chief component, the regional center in Catio, is not yet operational. Questions regarding recurrent costs entailed in maintaining the center after PACD were barely touched on in the project paper. In any case, these estimates are now far out of date. Modalities for financing these costs were not touched on at all. A review of pertinent project files reveals that no updated analysis has been done since 1983.

Although the project has undergone several alterations since its inception and other donors who will use the facility are revising their implementation plans, it is not possible to estimate recurrent costs until the technical assistance team who will implement the center's programs defines the extent of its activities, in conjunction with the other donors and the DHAS.

Clearly, the success or failure of the project will be determined only long after PACD when the GOGB will demonstrate its ability to repair vehicles and machinery promptly, develop and transfer appropriate water management systems, and continue to finance the center's operating budget.

The project, as designed, calls for an realistic level of government financial support and provides no method for generating funds to support anticipated project activities. If SCAD is to contribute to area development after PACD, provisions must be made to minimize operational costs and generate funding, possibly through the creation of a system of user fees. These should be assessed based on cost calculations for various maintenance activities and paid for in rice through the water management committees established on area *bolanhas*. Unless questions pertaining to recurrent costs are addressed by the donors and the GOGB at the outset of the center's operational phase, prospects for the project to make an enduring contribution to increased rice production in the South Coast area are poor.

CHAPTER FIVE

NATURAL RESOURCE MANAGEMENT

RICE-LAND MANAGEMENT AND PLANNING

Historical Background

Until the war for independence, Guinea-Bissau was an exporter of rice based on the established infrastructure of the South Coast region. Farmers had property and water rights that included the right to fresh water and the right to salt water to restore the soil's capacity to supply nutrients. Flood canals, overflow spillways, and drains were developed to remove excess fresh and salt water when needed to maintain proper water depths required by the rice crop.

The infrastructure was maintained by hand labor, primarily farm families working to build and maintain barrier and paddy dikes. Farmers ridged the soil to improve subsoil drainage and installed sluice gates made of hollow logs to control drainage of fresh or salt water. They knew how to ripen the potentially acid soils over a three-to-four-year period before planting rice for the first time. They also knew that after three-to-four years of continuous rice production the soil would have to be washed in salt water and leached to release nutrients and stimulate production again.

By 1965 many paddy fields and their dikes had been destroyed in the struggle for independence and nearly one-half of the fields were abandoned. After independence farmers were slow to return to the fields, SCAD was established to help farmers regain their former rice-producing status.

Post War of Independence

Rehabilitation was seen as a low-cost approach to recovering rice production. Using machinery to replace some of the large barrier dikes and improve existing dikes would quickly revitalize the paddies and fields damaged or destroyed during the

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war. Another approach was to expand the area planted with rice. This required building more traditional barrier dikes on uncultivated soils, and using machinery to build larger barrier dikes lower into the tidal zone than traditional dikes usually went, especially along the estuaries and the interfluvial and intertidal flats. In some cases, designs would call for the damming of the upper estuaries with large dikes capable of controlling the runoff from the upstream watershed. The large barrier dikes were favored since they would be more resistant to deterioration and require less maintenance. In addition, their span would be shorter, requiring less fill than the farmer-built, long contour dikes.

Paddy rice production in coastal swamps requires keeping the salt water out of the field. The hand-made dikes are small and weak and only satisfactory for land that lies 0.5-1.0 meter below the highest tides. Because the placement of these dikes is often established empirically, they frequently fail. More reliable methods would ensure the integrity of the dike. The placement of the dike on land 1-3 meters below the high tides requires more technology, but opens more land to cultivation.

The major focus of SCAD became building shorter and larger dikes across the upper portion of the estuaries. Equipment was available, and four sites were reconstructed. The project would eventually provide the engineering technology, such as foundation depth, size of structure, height, materials, and the placement and size of the sluice gate, needed to achieve successful water control for six specific purposes:

- Preventing salt-water intrusion;
- Containing fresh water;
- Draining fresh water;
- Regulating salt-water inundation;
- Draining salt water; and
- Controlling the level of the fresh water table behind the barrier dike.

Effective operation of dikes depends on the sluice gate or other gate and spillway combination to maintain the structural integrity of the dike. Breaking the dike or using a hollow log in a fragile structure for water control provides a pathway for salt water to seep into the fields and fresh water to seep out as the tides change. Water saturation weakens the dike. The sluice has to be sized to drain the fields for harvest and planting as well as control the water level in the paddy during the growing season. In the mangrove soils, the sluice has to be designed to flood the fields every three-to-four years with salt water from the spring tides. The volume of the salt water needed to flood the upper paddies during peak tides places stress on the dikes and gates. The small dikes can be leveled, in part, for the flooding and then reconstructed. Although this practice is dangerous for the integrity of the larger structures, it is difficult to tie the dike walls together and consolidate the reconstructed sections. However, SCAD developed an improved design for barrier dikes to incorporate dual action gates to control both salt- and fresh-water flows into mangrove rice-growing areas.

CURRENT SITUATION

Production and Yields

Two indicators can be used to measure increased rice output: 1) total rice production or rice consumption plus sales gives direct data; and 2) yield measurements combined with surface area estimates can be used to calculate production.

In 1978 gross production of flooded rice was estimated to be 85,000 metric tons per ha (SCET, 1978, Table 5, pp. 28). Estimated total consumption of rice is 105,000-120,000 metric tons (SCET, 1978, Table 8, pp. 40). Most of the rice is consumed by the extended family who produces it so this may be an underestimate since rice may be consumed on farm and not reported.

Estimating gross production by the average consumption per capita multiplied by the population in the region (SCET, 1978, Table 8, pp. 40), and adding the rice sold from the area is unreliable since rice consumption varies significantly by region and year. Gross production can be estimated using average yields multiplied by surface area harvested. Data on the area planted are known (SCET, 1978, Table 5), but the average yield per acre has not been reliably established.

Yield estimates are also difficult to establish. No record of systematic measurement of rice yields on acid mangrove soils, the dominant paddy type, was available. Under optimum growing conditions, a farmer can harvest about 1.5 metric tons per ha; however, with improved management and fertilizer, rice yields could reach 3 metric tons per ha. In the South Coast region, an average yield of 2-2.5 metric tons per ha is a realistic goal.

Actual average yields for 1978 (SCET, 1978, Table 5, pp. 28) for Tombali region were estimated at 1.3 metric tons per ha, the Buba area yields at 0.9 metric tons per ha, and the country-wide estimate for coastal-flooded rice was approximately 0.8 metric tons per ha. With good management practices, average national yields may double. Despite the average rainfall of 2,500 mm per year, only one rice crop can be grown each year under rainfed conditions because of the highly concentrated rainfall distribution from July-September.

Surface Areas

Examination of 1953 aerial photographs reveal that, barring salinization or acidification, the rice fields in the intertidal zone can remain productive for over 35 years. However, surface area actually cultivated in any given year is determined by paddy layout and soil quality. In the rice fields visited, the earthen barrier dike, internal dikes, canals, and drains occupied about 70 percent of the total area. The remaining 30 percent of the area was dedicated to rice cultivation, which is classified as new land undergoing ripening, rice production land, and abandoned land unsuitable because of acidification or salinization. Estimates of land area in each category and changes in land use over time were not available.

Seven large barrier dike sites built without engineering design are part of DHAS's effort to expand rice production in the region:

Site	Year Built	Area Protected
Eam	1981	1,200 ha
Um Comone	1982	325 ha
Kantone	1981	527 ha
Nhala	1982	300 ha
Biombno	1984	205 ha
Quinara	1985	180 ha
Cablol	1987	300 ha
TOTAL		3,037 ha

About 700 ha were brought into new production since traditional rice fields occupied about 60 percent of the protected areas.

DHAS also constructed smaller, more traditional, barrier dikes following the contours of the depositional terraces of the estuaries to protect rice lands from tides. The DHAS sites (including those built during this project) recuperated most of the war-damaged and abandoned paddies and fields on 2,352 ha of protected land.

Observations on Barrier Dikes

The evaluation team visited five of the large barrier dikes (*barrages*) constructed by DHAS. They are elevated 2-3 meters above soil level, and sited perpendicular to the water flow of the estuary to protect a much larger area per-unit length than the traditional low-contour dikes. They also control water flow through one outlet, rather than by overflow from a series of points along contour dikes into the estuary.

Four dikes had concrete sluice gates to prevent the intrusion of salt water, and one used culverts made of joined barrels for water control. The flap gates mounted on the sluice gates and culverts were in reasonable repair and working. However, there had been little maintenance on the dikes, and upkeep was needed around the wing walls of the sluice gates and the butt ends of some structures.

The sluice gates were able to hold and drain fresh water to the level of the sluices. The fresh water retained behind these barrier dikes supported fish. However, none of the dikes had upstream works to control the height of water in the basin. The lack of upstream water control reduces the capability to provide optimal depth of flooding for rice production, and prohibits farmers from flooding upstream paddies with salt water every four-to-five years, as is customary. Behind one large barrier dike visited, farmers on the higher estuary terraces were ready to flood their fields with salt water, but the down-slope farmers on newer land were not. Current dike and gate construction does not permit the individual control of land subunits within the protected zone. Survey, redesign, and addition of canals and drains are necessary to make this possible.

The upper reaches of these sites (about 60 percent of the area) contained rice fields with the traditional contour dikes preserved to act as a paddy dike. The approximate 30 percent of new protected land was either planted or being ripened. At all sites, some paddy land near the new barrier dike was abandoned because of salt-water intrusion.

Traditional and smaller new hand-made dikes were also visited, and, like the large dikes, they serve as transportation and communication routes through the swamps. Many were constructed recently closer to the estuaries, and some of these new dikes have more solid sluices and better-sealed gates. They also were actively maintained.

The cultivated area is expanding more rapidly behind the hand-made dikes than the major barrier dikes. This may be because of their higher position in the landscape or location on land, which is already ripened. Although the new hand-

made dikes were substantial and retained water on both sides, the older dikes had deteriorated and allowed both salt water and fresh water to seep through.

The new hand-built dikes confine tidal flows to the immediate estuary channel as they are built closer to the channel. The new rice fields lie in the intertidal zone that is above the mean tidal levels and thus the dikes are not challenged by the tidal waters. However, the new rice fields are located close to significant areas of mangrove vegetation; this will make paddy management more difficult as the mangrove soils must be maintained in a wet condition or they will acidify and sterilize. At the same time, salt water must be kept out to permit the rice crop to be planted.

Currently, there is more expansion of rice fields by traditional methods. All the fields visited were in some stage of reclamation. The expansion onto less desirable saline and acid-sulphate soils is without supportive research to guide site selection and development of soil and water management practices.

The areas behind the large barrier dikes are being evaluated for their potential to produce rice. One-half of these evaluated sites were found not suitable for sustained rice production.

The DHAS estimates that 16 suitable sites (about 400 ha each) for new development exist in the project area. If all sites are developed, the project can protect an additional 6,400 ha with large barrier dike construction. About 30 percent of these sites will be cultivable, adding 2,000 ha of rice production.

CLIMATE, TOPOGRAPHY, AND SOILS TAXONOMY

Climate

The climactic conditions of the South Coast region are favorable for rainfed flooded swamp rice production. The average rainfall in the Catio area is 2,500 mm with an estimated 75 percent concentrated during July-September, and August being the rainiest month with about 30 percent of the rainfall. As most swamp rice

varieties need more than three months to mature, planting must take place in June for a full crop to be harvested. Year-to-year variability in the beginning and end of the rainy season is high, causing substantial yield fluctuations. Heavy early rains severely reduce the growing season. And reduced rainfall early in the season does not allow desalting of the paddies, resulting in late crops. If drought occurs during the growing season and the paddies dry out, the entire crop is lost if acidification occurs at a critical growth stage.

The average annual relative humidity is 70 percent, and the annual evaporation rate is 1,837 mm per year. Despite the annual moisture surplus, there is a seasonal moisture deficit in December-February (SCET, 1978, Table 1, pp. 10).

The average annual temperature is 26.9 C. ranging from a minimum of 18.8 C. in January, to a maximum of 33.9 C. in March (SCET, 1978, Table 1, pp. 10). An average of 2,741 hours of sunshine has been recorded each year.

Topography

The topography of the rice-growing areas of the South Coast region is made up of nearly level intertidal flats with a weak berm along the estuaries. The land gently slopes to the upper tidal reaches and the upland, or it grades into nontidal lowlands frequently flooded. In addition to former beach terraces with ancient dunes, the tidal areas are flanked by well-dissected low rolling hills. The ridges between the river-estuaries are undulating plateaus that provide freshwater runoff, important for paddy rice production as well as for providing nutrient input to downstream estuaries.

In the uppers reaches of the old valleys, the clay deposits are now washed clean of the salts and acids and are planted to inundated rice. Down stream, the soils are usually vegetated with *Avicennia* mangroves. More fertile soils lie between the low berm of the estuary and the rising edge to the upland. Both of these areas tend to be more acidic than the central region. The interfluvial areas between the estuaries, which are influenced by the tides, are more complex and less predictable in the pattern of very saline or very acid soils mixed with the more desirable *Avicennia*

soils. The abundant organic matter and rich clays in the intertidal soils are replenished by erosion of the topsoil in the uplands. It is these preserved nutrients that allow the mangrove soils to produce for so long if the salinity and acidity are managed within tolerable limits. The South Coast farmers are taking advantage of the geologic process that has created the soil fertility needed for sustained rice production.

Rice fields occupy four different locations in the South Coast region: 1) those at the highest elevations are in valleys above the tidal influence; 2) those in the valleys of the upper reaches of the watershed are inundated by less than 1 meter of the highest tidal water; 3) those along the banks of the estuaries are below 1 meter of the highest tides; and 4) those on intertidal interfluves. These broad areas also are no lower than 1 meter or so below the highest tides since this is as high as hand-made dikes can be made comfortably. The SCAD project opted for opening new rice land by building higher barrier dikes in the lower-lying areas, a strategy most effective in the intertidal-interfluvial areas since they have more area extending seaward. An option of the project is to build a simple and larger barrier dike across an estuary to reduce the need and size of long barrier dikes at higher elevations.

This strategy would reduce considerably dike maintenance requirements over the lower contour dikes. In most of these areas, the resulting rice land would equal about one-fourth of the area controlled. The retention area created in the old estuary occupies about 10 percent of the controlled area. Potential retention areas over 1,000 ha are considered large by the DHAS, sites with 300-500 ha are considered intermediate, whereas those of 100-200 ha are considered small. Because of the cost and organizational requirements for the public works, most specialists opt for the intermediate sites if the soils are favorable and the people are willing. Each new barrier dike adds 75-125 ha of new rice land.

Soil Taxonomy

The lowland and intertidal soils are level, deep, clayey (rich in Smectite), rich in organic matter, saturated, saline, and prone to acidification on exposure. Soils with continuous rice production have a surface *Avicennia* horizon, which is low in

sulfur compounds for more than 30 cm. These soils must be "ripened" by protecting them from sea water, draining them, and exposing them to fresh water to leach out the salts. The process firms up the soft muds to withstand farmers traversing them and takes from three-to-four years, depending on the soil topographical position and its degree of ripening.

In the South Coast region, brown soils naturally inundated by seawater are classified as *Typic Tropaquepts* and are the most suitable for rice production. These soils require careful salinity management, but are structurally consolidated and pose fewer problems of acidification. Acid clayey mangrove soils, classified as *Typic Sulfaquepts*, require a long time period for ripening and have strong potential for acidification if dried. Higher on the landscape soils inundated with fresh water but with low or no sulfur accumulations are classified as *Typic Hydraquepts* and are also suitable for rice cultivation.

The best rice soils in the intertidal zone are in the *Avicennia* mangroves, with 30-50 cm soil horizons and infrequently subjected to the diurnal tides. These areas should be selected for potential rice soils and should have barrier dikes constructed. The soils should be drained. If after a few years salt grass invaded, indicating a good *Avicennia* horizon in the soil, good rice yields could be expected.

Land Use Capability

Besides the taxonomic classifications, soils also have been classified for their potential land use capability, based on limitations to agricultural production. On the 266,955 ha of rice planted in the country, 105,935 ha (40 percent) are planted on soils considered favorable for rice production. The remaining 161,200 ha of rice are planted on land subject to salinity, low acidity, and tidal inundation (SCET, 1978, Table 2, pp. 14).

TABLE 5

LAND USE CAPABILITY FOR SOUTH COAST RICE SOILS

Class	Total Area Planted to Rice	Limitations
Ia	68,530	Subject to flooding
III	4,925	Erosion
Va	4,340	Saturated subsoils and subject to flooding
Vb	28,140	Saturated subsoils and subject to flooding
Vd	75,250	Salinity, acidity
VII	36,370	Salinity, tidal inundation

Source: SCET, 1978.

Constraints to Rice Production

The most frequent constraints to rice production are:

- Fertility (usually lowland soils have accumulated through the deposition of fine erosional sediments);
- Weeds (controlled by flooding);
- Salinity (controlled by leaching with fresh water);
- Acidity (modified locally by occasional salt-water inundation and reducing aeriation by flooding); and
- Tides (controlled with dikes).

DHAS PROCEDURES

DHAS has constructed and trained people to build, higher, and stronger barrier dikes closer to the estuaries, which are more effective barriers to salt-water intrusion and fresh water seepage than the smaller contour dikes. This has brought more new land under cultivation but has led to the abandonment of established paddies elsewhere.

DHAS established a review process that includes the use of a specific soils map for site selection to ensure the viability of the site after construction. Each proposed site is visited, mapped, and evaluated by a well-qualified soil survey team.

DHAS has learned the importance of using proper construction material for sluice gates. On the large dikes, which require well-sealed gates, concrete sluice gates are desirable. The smaller barrier dikes and paddy dikes can use PVC pipe with a hinged flap gate, since it is now illegal to cut logs for this purpose.

As DHAS has improved the prevention of salt-water intrusion and fresh-water seepage, rice production and yields have improved. The traditional practice of flooding the protected fields with salt water to reduce acidity and release available nutrients has not been attempted by DHAS. Redesign and redimensioning of sluice gates will be needed to accommodate the two-way flow needed to flood upstream lands with salt water. Marigraphs and improved hydrological analysis of upstream flows of fresh-water discharge will be needed to implement these designs.

WATER MANAGEMENT

In the South Coast region, water management for rice production was developed using local materials and experience acquired in manipulating salt- and fresh-water flows behind small-scale structures. Individual farmers made water management decisions with little impact on neighbors. The SCAD project has introduced a land-reclamation approach that requires heavy and intermediate equipment, engineering

design, and coordinated management of water retention and releases of fresh- and salt-water flows. Since the project agreement, three barrier dikes have been built across estuaries:

- o The Biombo site (built in 1985) protecting 205 ha;
- o The Quinara site (built in 1985) protecting 180 ha; and
- o The Cablol site (built in 1987) protecting approximately 300 ha.

In the Cablol site, two-way water flow was facilitated by a channel constructed to and from the sluice gate with six culverts made of 50-gallon barrels welded and fitted with a flap gate. Nearly all of the land was reclaimed or is in the process of reclamation. The structure needed better design and materials. Other structures built in 1981 and 1982 were better designed and constructed with concrete sluice gates. These structures needed minor repair and vegetation control.

An estimated 685 ha of rice land have been protected by major barrier dikes since 1983. DHAS foresees constructing an additional 16-18 dikes in the South Coast region. When completed, they will protect an estimated 7,200 ha, or only about 10 percent of the cultivated rice land in the South Coast region. New rice soils reclaimed from this effort will represent about 3-4 percent of the region's total paddy rice.

In the *bolanhas*, some paddies had not been planted this year. Near the barrier dike all *bolanhas* had some land abandoned to salinity, many paddies were in the ripening process, and little uncleared land remained. But the question is larger than land developed behind the dikes of the proposed sites. Land is being opened outside the upper watersheds. Although there is not a definitve inventory on the change in land use in and outside the project area, it appears that as much new land is opened as is lost to paddies that are abandoned. The cause is not apparent. The newly cleared land seems to have good water control and good water management. New

land usually lies near established rice fields, and the same production practices are applied to both. In areas where traditional rice production is well managed, the soils can produce for at least 35 years. An estimated 5 percent of each rice *bolonha* has areas abandoned as a result of extreme salinity or acidity.

A well-constructed barrier dike must sustain the highest tides, especially those accompanied by storms. The dike should deter salt-water intrusion during high tide since rice produces better in fresh water. This dike should, however, retain the fresh water held on its land side. Thus, the placement of the dike is the key to the success of the rice field it protects. Hand-made dikes are elevated between 1 and 1.5 meters and therefore resist tides between 0.5 to 1.0 meter. Machine-built dikes constructed across dams (*barragens*) are elevated 2-3 meters and can protect more land. Constructing these oversized barrier dikes is a principal objective of the SCAD project. Properly located, these dikes can cost-effectively protect a large portion of the watershed behind a shorter and better-constructed structure that is designed to withstand the longer period flood tides and storms.

The improvement of barrier dikes on proven rice soils is also a cost-effective goal. Aerial photographs and ground reconnaissance are helpful in identifying those soils that have continuously produced rice. Those areas selected on the basis of land use capability classification (Scale 1:50,000) should be targeted for improved management as well as potential sites for barrier dike construction. There is an urgent need to develop a site-selection process for determining expansion of paddies into marginal estuary or interfluvial areas. To repair and maintain existing structures, DHAS needs improved coordination with local groups.

DHAS can address the problems of water control and management of small and intermediate-sized rice fields. However, it is unable to provide extension service or community development assistance since those responsibilities are assigned to another department. DHAS now builds dikes to protect land without knowing if it is socially or economically suitable to do so in the long term.

Key water management issues requiring additional attention by the DHAS and technical assistance are the following:

- Water release and gate operation to maintain the fisheries in the estuaries to be closed by the major new dikes;
- Redesign of sluice gates to permit two-way flows and allow farmers on higher land to rejuvenate their lands by flooding with sea water;
- Hydrological studies to permit the adequate sizing of dikes and gates to handle peak runoff flows and downstream tides over an economically acceptable return period (15-25 years);
- Improved low-cost gate design to replace the traditional canoa log pipe outlets for small dikes; and
- Improved coordination with other departments to develop the upstream structures and operating procedures to regulate water depth better for rice production.

To date, about 2,000 ha of new rice land has resulted from DHAS construction of barrier dams and sluice gates. With more direction focused on areas outside of the upper watersheds, water control and management would reach more land faster and ensure that crops grow to full maturity. Investments must be kept low since the yields are low and not likely to increase dramatically in the near future. Traditional rice growers can produce the same yield without the investment but are unable to construct the barrier dikes, which offer access to new lower lying lands.

THE CATIO REGIONAL CENTER

A major accomplishment of SCAD was the construction of the regional administrative and maintenance center in Catio, which is 95 percent complete and expected to be completed in March 1988. Because management of a major development program and maintenance of equipment at a distant outpost with a lack of facilities posed major logistic and personnel constraints to rice-land rehabilitation and reclamation, DHAS recognized the need for a regional center to serve as a focus for the delivery of development assistance in the area.

The center is designed to house the regional office of DHAS and provide housing for technical staff and workers. Seventeen more living units will be added to house temporary laborers.

The offices of regional management and the soils cartographic staff are naturally well lighted and ventilated. The center is spacious, attractive, and functional, with a food warehouse and a parts warehouse. There are sufficient supply and parts control offices. The garage is equipped to care for any machine of any size that may be used in the area. The center has its own electricity supply and is connected to the municipal grid. It has its own 90-meter well and a 36-cubic-meter storage tank. The building is insured for 10 years against faulty materials and workmanship. Construction materials can all be replaced locally, and construction is familiar to local tradesmen. A good maintenance plan needs to be developed for this center.

Since there will be fewer large structures built in the future, and most of the heavy equipment is available, the current need is for intermediate-sized equipment such as cement mixers and trucks.

The center has already begun work. In addition to the regional director, the Hydrology and Soils sections are represented at the center. There is a mechanic and work brigades to build structures as well as a soils cartographic lab that performs analyses and makes maps for the soils investigation team. DHAS has an engineer. However, the hydrologist and mechanical engineer have not arrived, pending the center's completion. Lack of personnel has delayed technical assistance and consequently few technical designs and decisions are being made.

ESTUARINE RESOURCE MANAGEMENT

The Mangrove Ecosystem

Mangroves form extensive homogeneous forests covering an estimated 2,430 square km. The highly dissected coastline has seven major estuaries, and numerable smaller tidal inlets and seasonally freshwater creeks. From north to south, the major estuaries are the Rio Cacheu, Rio Mansoa, Rio Geba, Rio Grande do Buba, Rio Tombali, Rio Cumbidja, and Rio Cachine. Intertidal zones, including mangroves, are most extensively developed in the north on the Rio Cacheu and in the vicinity of the Rio Cumbidja in the south. The mangrove ecosystem consists of a belt of halophytic,

tropical hardwood trees and associated plant and animal species occupying the sheltered coastlines, bays, coastal lagoons, and river mouths where tidal action creates a salinity regime that excludes other species. Mangrove forests receive fresh-water inputs and are subject to tidal flooding and almost always experience a net deposition of sediments, which are trapped by root structures resulting in lower current velocities and retarding coastal erosion.

The Structure and Function of Mangroves

The mangrove forests in Guinea-Bissau are dominated by *Rhizophora mangle*, *R. racemosa* (red mangrove), *Avicennia africana* (black mangrove), and *Laguncularia racemosa* (white mangrove). All are characterized by special structural and physiological adaptations that enable survival in saline, anerobic soils.

The *Rhizophora* species tend to colonize the margins of tidal creeks, banks, and outermost vegetated zones where rapid sediment deposition and nutrient inputs account for high productivity. *Avicennia* is present on the shallow tidal flats between the creeks, while *Laguncularia* dominates the in-land bankside vegetation along larger rivers. Mangrove ecosystems have low species diversity and a high number of individuals, and are adapted to a wide range of stresses that include salinity and temperature gradients as well as varying levels of nutrient inputs. For example, mangroves are found growing in conditions that range from seawater (salinity: 34 parts per 1,000) to brackish and in-land fresh-water bodies (salinity: less than five parts per 1,000). Animal species have behavioral adaptations in which a mobile species may utilize only an estuary or portion of an estuary when conditions are appropriate. A combination of physiological and behavioral adaptation is commonly manifested in the use of an estuarine environment during only a part of a species life cycle, for example, the commonly known use of estuarine nursery areas by postlarval and juvenile Penaid shrimp.

The extensive Guinea-Bissau mangrove forest has developed on the estuarine terrace deposits characterized by the large tidal amplitude that ranges from 2.7 meters at Cacheu in the north to 4.4 meters at Bubaque. Even greater tidal amplitudes are infrequent in the interior of the funnel-shaped estuaries, particularly

during the wet season when river discharges are high. The general flat topography of the mangroves is highly dissected by a network of deep, steep-banked creeks, which occupy a large portion of the flooded swamps. As a result of the micro-relief and large tidal amplitude, most of the mangrove-forested area is briefly inundated at high tide; however, nearly the entire surface is inundated simultaneously and water velocities in the channels can be high. The *Avicennia* flats, which make up the largest unit within the mangrove, range in elevation from areas that are briefly flooded on each high tide to zones that flood only monthly during spring tides.

The large leaf-litter production from mangrove forests is the basis of the marine detrital food web and the important upland link to estuarine productivity. The fresh leaf litter falls to the tidally inundated forest floor, where it is colonized by bacteria and fungi. These organisms enhance the protein content of the detritus as they digest the available carbohydrates and begin to decompose the more resistant cellulose materials. The process is enhanced as larger marine invertebrates mechanically disrupt the detritus as they ingest it, primarily to consume the colonizing microorganisms. The crabs, shrimp, other crustaceans, polychaete worms, and forage fish directly involved in detrital consumption are, in turn, preyed upon by larger fish. The process of leaf litter input, decomposition, and energy transformation through the food chain is reflected in the productivity of fish and shellfish that are ecologically adapted to estuarine conditions.

Where tidal amplitude or fresh-water in-flow is substantial, much of the detritial processing takes place in the tidal creeks, estuaries, and near-shore marine environments where detrital material has been transported. The location and intensity of leaf litter decomposition varies according to the micro-relief and hydroperiod of a particular mangrove ecosystem. Seasonal changes in fresh-water flow and mangrove productivity will impose an annual cycle on detrital production and coupled with salinity cycles regulates the estuarine productivity.

Factors that Influence Mangrove Productivity

The following factors regulate the quality and integrity of mangrove ecosystems and should be considered when evaluating the environmental impact of proposed human activities that influence the long-term mangrove/estuarine productivity:

- **Fresh-water flow and hydroperiod:** Mangrove forests depend on both tidal mixing and fluctuating fresh-water flow to maintain their characteristic high productivity. Changes in water level trigger plant and animal reproduction and permit the oxidation of accumulated organic material that would otherwise cause eutrophication;

- **Habitat structure:** The variety of physical substrates such as rock outcrops, mud banks, fallen trees, shallow and deep holes, living tree roots, and anchored vegetation strongly influences the abundance and diversity of fish and other aquatic life. Furthermore, the presence of vegetative cover reduces erosion and filters sediments and nutrients from overland runoff;

- **Energy source:** Mangrove ecosystems have evolved to adapt to various energy and food sources. The estuarine mangrove system generates its own food via photosynthesis and is also dependent on dissolved organic matter; and

- **Water quality:** Measured by physical and chemical parameters such as temperature, dissolved oxygen, suspended solids, nutrients, salinity, and acidity, water quality determines the productivity of fisheries. The presence of toxic substances and disease-bearing organisms will have direct impact on fishery resources.

The intrinsic quality of a particular body of water is determined by interaction among these four parameters. Changes in habitat structure and hydroperiod caused by human activity coupled with nutrient and increased sediments from agriculture will affect energy sources and thus estuarine fisheries production.

PROJECT IMPACT ON MANGROVES

Mangrove Conversion Rates

The conversion of mangrove forests into rice fields is a process that has been ongoing in all of the coastal regions of Guinea-Bissau for many years. Because mangrove conversion and estuarine fisheries' productivity are closely linked, the

SCAD project cannot be considered in isolation, but must be viewed in the context of the whole coastal ecosystem.

For the country as a whole, Diemont (1985) estimated that 2,000 ha per year of mangrove had been converted for rice culture during 1953-1976 (a total of 45,830 ha). The area estimates for total rice fields, cultivated lands, and converted mangrove lands in 1976 were taken from a photogrammetric soils and land use analysis developed for the GOGB (SCET, 1978). However, the origin of the 1953 estimates are unclear and their accuracy cannot be evaluated. Diemont reported that *bolanhas* had increased from 124,770 ha in 1953 (all cultivated) to 170,600 ha in 1976, 116,000 ha of which was on mangrove soils. However, the amount of land actually in cultivation was only 107,000 ha at the end of the 23-year period. This represents a decline of 17,700 ha from the 124,770 ha of land assumed to be in cultivation in 1953. Diemont attributed this decline to disruptions caused by the war for independence and to increasingly unfavorable rice-growing conditions resulting from the long-term drought since 1968.

To obtain his estimate of the annual rate of conversion, Diemont assumed that all rice-land increases had occurred by conversion of mangrove forests (45,830 ha) when even in his own publication he says that rice lands on mangrove soils totaled only 116,000 ha. Although this may be a conservative assumption from a preservationist viewpoint, no direct evidence was presented. Thus, 2,000 ha per year must be regarded as an overestimate of mangrove conversion rates during 1953-1976.

Table 6 (extracted from Volume II of SCET, 1978) gives the areas occupied by mangrove forests, salt flat (*tanne*), mixed scrub mangrove and salt flat, and mangrove land converted to rice land and other rice lands. The salt flats are generally located in the upper intertidal and are barren or sparsely vegetated with algal mats or a halophytic herbaceous cover (*Sesuvium*, *Portulaca* or *Phylloxeria* spp.). These areas are typically of low productivity compared with areas vegetated by mangroves. The mangrove and salt flat units, together with the rice lands on mangrove soils, total 472,900 ha and represent all the intertidal wetlands of Guinea-Bissau. These estimates were based on planimetry of panchromatic black and white and false-color infrared aerial photography at a scale of 1:100,000. Ambiguity in the assignment of

small (100 ha) units to mangrove, mixed mangrove-salt flat, or abandoned rice polder categories was considered the major factor affecting the accuracy of the map units summarized in Table 6. These estimates are substantially higher than the 243,000 ha listed for Guinea-Bissau by the IUCN (1983).

TABLE 6

AREAS (HA) OF INUNDATED RICE LANDS AND INTERTIDAL WETLANDS BY CARTOGRAPHIC UNIT IN GUINEA-BISSAU AS OF 1976

Region	Mangrove	Mangrove and Salt Flat	Salt Flat Mang. Soil	Rice on Rice	Other
Cacheu	115,100	20,400	32,800	27,500	7,900
Bissau	24,800	1,400	1,700	15,300	-
Oio	7,400	2,400	400	31,900	13,100
Gabu	-	-	-	-	7,700
Bafata	-	-	-	1,200	20,900
Buba	29,300	800	500	12,400	11,700
Tombali	67,000	500	800	26,800	11,100
Bolama/ Bijagos	43,500	6,700	1,400	900	-
TOTALS	287,100	32,200	37,600	116,000	72,400

In 1976, 73 percent of the original mangrove wetlands (445,300 ha including the mixed mangrove-salt flat units) in Guinea-Bissau remained after conversion of 116,000 ha for rice culture. Most of the total intertidal wetlands and the remaining mangrove were located in the northern coastal cartographic units of Cacheu and Bissau, and particularly along the estuary of the Rio Cacheu.

Table 7 shows actual land by type of rice cultivation in Guinea-Bissau for the period 1953-1985 (FAO, 1985; MDRP, 1985).

TABLE 7

AREAS (HA) USED FOR RICE CULTIVATION, BY TYPE, IN GUINEA-BISSAU

Year:	1953	1960	1976	1981	1985
Type:					
Bolanha Salgada	124,765	95,204	107,000	49,500	67,500
Bolanha Doce				27,000	41,000
Segueiro	28,265	1,547	15,000	16,100	27,000
TOTAL	157,030	96,751	122,000	92,600	135,500

These data indicate that, although new mangrove wetlands may still be in the process of conversion, the net trend over this period has been to abandon those rice lands and to expand fresh-water wet-land (*bolanha doce*) and up-land rice (*segueiro*) cultivation. The sudden appearance of fresh-water wet-land rice areas in 1981, concurrent with the precipitous drop in intertidal wet-land rice acreage, suggests that the *bolanha salgada* areas of the previous years may actually include some portion of fresh-water wet-land area.

It is probable that the rate of abandoned rice land will not be uniform throughout the country as a result of the varying rainfall. Problems with soil salinity and acidity are likely to be more extensive in the north than in the south, leading to higher rates of abandonment in the north and possibly lower rates of simultaneous mangrove conversion as a result of past experience. Hamilton and Snedaker (1984) indicate such problems to be the case in the Casamance estuary immediately to the north of Guinea-Bissau.

MDRP (1985) presents a chronology of *bolanha* reclamation for 1975-1985, giving some information on locations and the nature of work done. Included are the salinity barriers (Ca Balanta, Incomene, and Cantone) constructed as part of the SCAD project. (Note: These regions do not correspond to the cartographic units of Table 6.)

Region	Ha
Biombo	2,107
Cacheu	290
Quinara	2,582
Tombali	908
TOTAL	5,887 ha

It is noteworthy that Cacheu, the northernmost region and the one containing the largest amount of remaining mangrove, experienced the least mangrove conversion. This information indicates a conversion rate of 589 ha per year, only about one quarter of that estimated by Diemont (1985), if all the affected area represented virgin mangrove forest. However, an unspecified proportion of this area consisted of abandoned rice fields or fresh-water marsh, and therefore does not represent additional clearing of mangrove. Based on this information, mangrove conversion rates during 1975-1985 appear to have been less than 500 ha per year, assuming that there are no other significant agencies of mangrove conversion. No information was available to evaluate the mangrove converted to rice culture by traditional methods and unaided by DHAS.

Most recently Cassama (1987) asserted that about 115,000 ha of mangrove, 30 percent of its original area, had been converted to rice culture in Guinea-Bissau. However, this estimate does not appear to have been based on any new information but was derived from the SCET (1978) data.

Except for Diemont (1985), the extent of unused or abandoned rice lands, or the rate and fate of abandonment, is not documented. Similarly, data are unavailable on the extent of traditional dike construction and converting mangrove lands by local groups unaided by DHAS.

Water Quality

Data on the physical and chemical characteristics of the fresh and salt waters of Guinea-Bissau are almost nonexistant. DHAS has records of pH and salinity measurements in the vicinity of some study areas, particularly the existing salinity barriers. However, these data are neither extensive nor systematic and would be of limited use in a detailed study of the mangrove and adjacent tidal waters.

A water chemistry laboratory was recently constructed and equipped at the new Secretaria das Pescas building in Bissau. In terms of ecological field data, an estuarine sampling program is planned to include regular collection of data on temperature, pH, dissolved oxygen, salinity, chlorinity, ammonia, nitrate, phytoplankton, and zooplankton. This planned program is constrained by the lack of sampling gear and suitable boats.

Fisheries

Numerous publications are available, primarily from FAO, that address offshore pelagic and demersal fisheries of West Africa (for example FAO, 1979; Troadec and Garcia, 1980; Sutinen et al., 1981; Everett et al., 1980; 1982; Greboval, 1982; ADF, 1983). Nearly all these publications, however, are either general in nature or deal primarily with the development, economic, and legal aspects of the fisheries. The available documents rely almost exclusively on commercial catch statistics. Some life history and quantitative information are available for selected commercially important species. Available data include preferred depths and locations of fishing grounds, migratory behavior, spawning grounds, standing stocks, and potential yield estimates. What is conspicuously absent is information on the dependence of these species on in-shore waters as nursery areas or for significant contributions to shelf productivity.

An office of fisheries surveillance has been set up under the Secretaria das Pescas to monitor the catches of foreign vessels in Guinean waters. The surveillance system and the program to train personnel to operate it have been set up following

recommendations by Kaczynski (1986) from the University of Washington. They do not, apparently, monitor the catches of the joint-venture companies such as Estrela do Mar, but continue to rely on reporting by the vessels. Catch summaries are available from the surveillance office and will be used in future annual statistical summaries. Those available (MDRP, 1984; 1985) contain data generated by the old self-reporting system although it is believed that substantial underreporting took place, since fishing license fees are based on catch.

Some information on marine littoral, estuarine, and fresh-water fisheries in West Africa have been published but are not available locally. Environmental assessments and studies conducted in the estuarine and riverine zones of the Senegal, Gambia, and Casamance rivers (DeGeorges, 1985; DeGeorges et al., 1985; CRED, 1985; Goodson, 1987; USAID, 1987) are available and provide valuable information on local aquatic species and ecological conditions, based on the effects of the north-south rainfall gradient. Additional information is provided in a few publications on artisanal fisheries, but these documents are typically oriented toward development planning and evaluation (the fisherman and the local economy) rather than the fish and shellfish stocks to be exploited. Finally, catch statistics beginning in 1984 are available from Pescarte, the government agency responsible for developing the artesanal fishery, and shipping and marketing fish caught by fishermen participating in their program. Pescarte's responsibility includes fresh and brackish waters and marine littoral waters up to two km offshore. Artesanal fish catches are summarized in the annual statistical reports (MDRP, 1984; 1985).

Incidental information on fish and shrimp farming, particularly in association with rice growing, is available, but nothing gives reliable data on estaurine populations, distributions, life history characteristics, or ecological relationships. Few of the publications deal with ecosystem structure and function, but are taxonomically focused in an attempt to identify the fish or invertebrates discussed listing local names or, in some cases, family names. Where possible, important fish species were identified using FAO fish identification sheets obtained from Secretaria das Pescas.

PROJECT IMPACTS

Impact on Mangroves and Related Resources

Conversion of mangrove forests for rice culture has been most extensive along the Rio Mansoa; the southern shore of the Rio Geba; and on the Rio Cumbidja, including the extensive lower delta south of Catio.

To estimate the total converted mangrove land, one can use the SCET (1978) figure of 116,000 ha for rice land on mangrove soils, regardless of whether it is in production, and add new mangrove land at a rate of 500 ha per year. This will result in a total of 121,000 ha of converted mangrove at the end of 1985. Only 67,000 ha of mangrove land were in rice production in 1985, indicating that 54,000 ha (45 percent) is abandoned, fallow, or not yet brought into production. One explanation for the descrepancy in this data is that shifting cultivation may be practiced here where fields are cropped and then fallowed before cropping again. The fallow period may allow for sea-water flooding in order to release more nutrients. The remaining problem is to determine the abandoned area that can revegetate to conditions similar to the original mangrove forests. Abandoned lands that were converted with traditional dikes will probably be subject to tidal inundation within a short period after maintenance on the main dike ceases. This would be most likely only in cases where salinity, acidity or other soil problems occur over a substantial portion of the *bolanha*. However, abandoned land behind salinity barriers may be reinundated only after a long period, if at all. Many of the approximately 40 dams or salinity barriers built in Guinea-Bissau since the 1960s have been abandoned because of soil problems, and no attempt has been made to remove the salinity barrier so the land can be reclaimed by mangrove species (Hesslink and van Slobbe, 1987).

Since 1975 about 20 dams have been constructed by DHAS, with assistance primarily from AID and Holland, which have converted 5,000 ha of mangrove swamp. Unless the previously constructed dams were substantially larger than the later ones, a maximum of 10,000 ha of mangrove has been converted by this method. Presumably, the remaining 57,000-111,000 ha of converted mangrove was cleared and impoldered by traditional methods.

In any case, the dam construction program since 1975 has resulted in the conversion of only a relatively small fraction (less than 8 percent) of the total amount of mangrove that has been cleared for rice culture, or about 1 percent of the original mangrove area of Guinea-Bissau. Even if extensive population data were available for estuarine and marine species in the region, a diminution of the presumable resource base of this magnitude has virtually no likelihood of being detectable except at the most local level. For example, as larger tidal creeks are impounded, the distance that individuals will have to travel to deploy trap nets in tidal channels, gather mangrove oysters (*Crassostrea gasar*) from *Rhizophora* roots or rock outcrops, catch crabs, or perform other subsistence fishing may increase substantially even though the larger system productivity may not be detectably affected.

People living in *tabancas* in the upper reaches of the basin will have to travel farther for oysters and estuarine fish. Nothing in the fresh or brackish impoundment is as fast growing and easily gathered as the mangrove oysters. The open water of the reservoir will probably require different harvest methods than those now used to fish for personal and family consumption, even if fish yields are equal to or greater than those of the tidal creeks.

Assuming that 20-25 of the original mangrove has been cleared, it is probable that some impact on marine and estaurine resources has already been experienced. Two primary impacts can be recognized: 1) loss of physical habitat area, and 2) reduction of the quantity of mangrove detritus entering the aquatic system. Although the physical habitat loss is the most immediately obvious effect, most of that area consists of *Avicennia* flats that are at best only inundated for a short time twice per day. Although the flats are important to the fiddler and ghost crabs that are the permanent inhabitants, and have some role as feeding grounds for fish such as croakers (Sciaenidae), they are unlikely to be critical as either spawning or nursery habitat simply because they are usually unavailable. This habitat functions in marked contrast to areas that experience lesser tidal amplitudes and substantial fresh-water flooding during the wet season (CRED, 1985). The critical habitat areas, at least from the standpoint of species requiring estuarine nursery, seem to be the

mid-sized tidal channels that retain some water even at low tide. Dam construction removes portions of these mid-sized channels from the estuarine system, an impact not seen in traditional diking systems. Dam or salinity barrier construction has not yet progressed to an extent great enough to have resulted in a significant impact.

Removal of the mangrove detrital production from the estuaries, whether by diking or by salinity barrier construction, may be a more important impact. Assuming an original mangrove area of 435,000 ha with an average litter production of 10 metric tons per ha per year yields a total production of 4.35 X 10^6 metric tons per year available to support aquatic production in the adjacent estuaries and nearshore marine littoral. Taking 1 million ha as an estimate of the open water estuarine plus nearshore marine environment (the Guinean continental shelf area is given as 5.25 million ha by Sutinen et al., 1981) with an average annual rate of primary production not likely to be higher than 2 metric tons dry weight per ha per year yields an additional 2 X 10^6 metric tons per year. This material is of higher quality, however, as much as 50 percent protein. As a result, substantially higher ecological efficiencies (amount of animal produced and amount of food eaten) can be expected, if food chains are of equivalent lengths. All this suggests that original mangrove production could have been the basis for one-fourth to one-third of estuarine and near-shore fish and shellfish production.

Assuming the entire Guinean shelf area of 5.25 million ha (inside the 200 M isobath) has an average primary production of one-fourth to one-half that of inshore areas, the original mangrove could have been the basis of as much as one-sixth to one-fourth of secondary production throughout that area. Reduction of the mangrove contribution by 25 percent as a result of conversion to rice culture might still not be detectable in offshore fish-catch statistics because of inaccuracies in standardization of fishing efforts; perturbing effects of other environmental variables; effects of migratory stocks; lack of real dependence by offshore stocks on mangrove detritus; and the possibility that the species fished might not be food limited, at least when they are under harvest pressure.

However, reductions in population sizes of pink shrimp (*Penaeus duorarum*) and other estuarine species such as blue crab (*Callinectes* sp.), tainha (*Liza falcipinnis*), bagre (*Arius, Chrysichthys* spp -- catfishes), bentana (*Fonticulus elongatus*) and djafal (*Ethmalosa fimbriata*) may have shown reductions in population sizes in response to the presumed 25-percent reduction in mangrove detritus input if detailed studies had been performed before and after the conversion occurred. In areas of most intense rice culture, the estuaries of the Rio Mansoa, Rio Geba above the Rio Corubal confluence, and in the south, the Rio Cumbidja, reductions in estuarine productivity may have been pronounced as a result of extensive mangrove conversions completed long before the current projects were implemented.

At least that might be the case if the detrital input was a controlling factor in population growth of these species. There is no quantification of the loss rate of the detritus, for example, through burial or dispersion of small particals by tidal currents to the point that they are no longer energetically profitable to collect. It is entirely possible that, depending on the seasonality of detrital input and its rate and mode of use by the animals, much of the material may never be cycled through the system at all because it cannot be captured by fish species humans care about.

Potential Effects on Mangrove-Related Resources

Except for the Penaeid shrimp and other species directly dependent on estuarine nurseries or detrital food chains (the shrimp seem dependent on both), there is little chance that any reasonable amount of mangrove conversion would be unequivocally reflected in offshore fishery catch statistics. Intensive monitoring of selected species might reveal a decline in stocks proportional to mangrove loss, but this methodology is difficult and would unlikely be economically meaningful. In contrast, substantial declines as a result of either decreased detrital input or of loss of nursery habitat could prove to be correlated. In the case of traditional mangrove conversion and salinity barrier construction, the reductions in detrital input is proportional to the areas converted. However, nursery area loss is probably substantially greater with dam construction than with conversion by traditional diking methods.

In either case the resource loss would probably have to amount to at least 25 percent of the base-line level to be reliably detectable by any feasible sampling program. This does not imply that 25 percent of the remaining mangroves in Guinea-Bissau can be converted before any adverse effects on estuarine resources will be noted. Rather, specific estuaries, or portions of estuaries, will begin to exhibit reduced numbers of some fish and shellfish species as habitats and detrital inputs are reduced within that hydrologic unit. Although no effects may be discernible in the estaurine ecosystem as a whole at a given level of development, those impacts may be pronounced within individual hydrologic units where the level of development is much greater than the system average. The best examples are to illustrate the kinds of impacts to be anticipated are the Mansoa and Cumbidja estuaries and their tributaries. The estuary of the Rio Tombali appears to be under substantial development pressure as part of the South Coast project, and declines in its productivity may begin when a substantial proportion (10-25 percent) of its mangrove and tidal creek habitat has been converted.

Potential Mitigation by Fresh-Water Fisheries Development

The potential for offsetting losses in estuarine fishery resources by developing fresh-water fisheries behind the salinity barriers is dependent on a number of factors:

- **Reservoir water quality:** Very soft waters, or conversely waters dominated by sodium, chloride and sulfate ions, tend to exhibit the lower range of fish productivity (Bernacsec, 1984) while slightly brackish water, 5-10 ppt, will support only a very restricted selection of species. Either of these conditions are expected to be reasonably common behind salinity barriers here;

- **Periodic salinity shocks:** If the salinity barrier is operated to allow occasional flooding with salt water, the salinity variations will discourage the development of a stable estaurine community and severely restrict the fish and associated species capable of surviving there;

- **Food sources:** A broad, shallow reservoir basin with an abundance of rooted aquatic vegetation will have the larger productive potential, given similar water chemistries. Reservoirs dependent on algal production for a food base will be good producers only if herbivorus species (for example, *Tilapia* spp.) are available, acceptable, and can tolerate the water chemistry. Algal- based systems may also need to be fertilized periodically to maintain productivity;

- **Harvest methods**: Even where production is high, capturing the fish may be a problem compared with estuarine areas, where the tides can be used to do much of the work; and

- **Relative areas**: Although the reservoir behind a salinity barrier may be comparable in area and volume to the tidal creek system it replaced, the impacts of the lost detrital input and reduced habitat may adversely affect downstream areas that are still estuarine. In that case the reservoir would have to exceed the arieal productivity of the estuarine area to break even.

In summary, it is unlikely that unmanaged reservoir fisheries will equal or exceed the fisheries productivity of the estuarine areas they replace. Although some of the reservoirs may have productive fisheries, others will not because of inappropriate water quality for sustained fisheries production. Other reservoirs may exhibit an initial high productivity followed by a long-term decline caused by nutrient depletion or excessive siltation. In the absence of scour from tidal currents, siltation can be a long-term problem in shallow reservoirs, substantially reducing their areas and volumes over 10-50 years. The sedimentation problem will, however, be minimal in basins with intensive water management. Finally, reservoir fisheries will not supply the variety of the estuarine species or food, while harvest will be more difficult.

Managed reservoir fisheries, or a large pond-rearing system, might result in equal or greater yields than the estuarine areas they replace, but would require substantial initial capital investment and a sustained high level of management. This type of fishery involves maintenance of a hatchery, or a reliable source of wild fry; feeding or fertilization; elimination of competitors, predators, and pests; and a harvest system, usually achieved by draining the ponds. A harvest area that exceeded a few ha would probably overwhelm the local capacity to consume, preserve, or transport the catch. Considering the difficulties now experienced with water management for rice alone, it appears impractical to consider imposing yet another set of perhaps conflicting management criteria requiring extensive cooperative planning.

Fish culture within the rice polders, rather than in large reservoirs, has by far the greater productive potential because of the relatively large areas available, the greater ease of harvest, and the simplicity of management by individual farmers. Some rice and fish culture is now managed in Guinea-Bissau, but it is almost incidental to the rice growing, with no systematic attempts to stock the rice fields or to manage the fish stocks effectively. In contrast, obtaining sustainable rice and fish yields with this alternative may not be easy as it may require farming techniques, rice varieties, water management methods, and other activities (that is, obtaining fry) not easily adaptable to the local conditions and traditions. An extensive discussion of producing rice and fish together is the subject of an abundance of literature and expertise, but beyond the scope of this document.

CHAPTER SIX

SOCIAL CONSTRAINTS TO RICE PRODUCTION IN THE SOUTH COAST

TRADITIONAL RICE CULTIVATION IN TOMBALI REGION

Historical Overview

In the region of Tombali, three major ethnic groups are engaged in rice cultivation. These are the Balantas, Beafadas, and Papeis. The Mansoancas and Nalus also cultivate rice but not to a significant degree. Population figures from 1980 place the Balantas at 50 percent, the Beafadas at 10 percent, and the Nalu at 10 percent. Population figures were not available for the Papeis or the Mansoancas. It appears from interviews, however, that the Balantas have been to migrating into the area since 1980. The Nalus were the original inhabitants of the region. The Beafadas arrived there before the Balantas, but the date of their arrival is uncertain. The migration history of the Papeis and Mansoancas is also unclear but appears to be later that the initial migratory wave of the Balantas. The Balantas started to migrate south in significant numbers in the late 1920s and the 1930s to escape colonial rule, which imposed enforced labor in rice production as well as road and building construction. When the Balantas arrived in the Tombali region, neither the Nalus nor the Beafadas were exploiting the mangroves for agricultural production. This fact is significant for later land tenure disputes. The Balantas brought with them the technique of rice cultivation in salt-water *bolanhas*, and the Nalus and Beafadas who now cultivate rice in *bolanhas* reclaimed from mangroves learned to do so from the Balantas. Because the Nalus and Beafadas learned from the Balantas, all three groups cultivate rice in approximately the same manner and share in a similar rice culture.

Rice Culture

Rice "culture" is one in which rice is the major and preferred food staple. It is considered the only good and desirable food, all others being inferior even if, such as fish, they constitute an important source of nutrition. The ability to produce rice and to possess adequate (and surplus) rice accrues prestige, symbolizes manhood, and

is a focal point of ethnic identity. Perhaps of greater significance, it enables the farmer to subsidize and perform the rituals that establish and maintain his ties to his gods, ancestors, and kin (ensuring among other things his rights to his *bolanhas*, thus his very subsistence) and ensures the continuity of his group (his immediate family and kin and his ethnic group in general). Rice is also used to barter for *cana* (alcohol), palm and honey wine, and tobacco -- items necessary as payments for laborers outside the family unit of production, as well as for feeding them.

Rice Cultivation

Since rice cultivation in salt-water *bolanhas* is discussed elsewhere, the following is a brief description. With the onset of the rainy season (April/June), the *bolanhas* are allowed to fill with rain water, several times if necessary, and drained to rinse the soil of salt and other toxins. At this time, repair of dikes is undertaken, and weeds are pulled and allowed to remain uprooted. Also at this time rice seedlings are produced in *viveiros* (nurseries) -- either in *bolanhas* or higher up in the *lalas* (higher ground between the *bolanhas* and the homestead) or in upland (plateau) fields. In August when the soil is wet and pliable, it is turned, turning in the plant stalks of the previous crop and the weeds that were pulled. When furrows are repaired and mounds properly "puddled," the seedling are transplanted. Growing season varies according to seed varieties and planting times. Harvest can start as early as late November and may continue until January or February. Rice sprigs are harvested individually by hand and carried to drying area where rice kernels are removed. Once dry, they are dehulled and divided into seed stock, subsistence stock, and stock that will be sold or traded. Seed stock is carefully stored in a sacred granary. Subsistence and trade stock may be stored together or apart. The amount of rice stored is usually a family secret, and access to rice stock is strictly controlled by the head of the *tabanca* or, in rare occasions, by the principal wife in the absence of the *tabanca* chief.

Less rice has been stored since 1985 because that year GOGB agents intervened to oblige the farmers to sell their stored surplus to the government at an official price that was not attractive to them. The farmers were left with no rice to feed their families between harvests and had no use for the money they received since few goods were available in markets accessible to them. Since then, many farmers

will leave rice in the fields and harvest it only as needed to feed their families. This is a typical illustration of the negative effects of improperly implemented central government policies on production.

Components Most Relevant to and Affected by the Project

Land Tenure

Two issues are involved in the question of land tenure: one, the distribution of new rice fields; two, the rights to abandoned rice fields brought back into cultivation. There is an ongoing debate about the nature of land ownership in Guinea-Bissau, that is, communal versus individual ownership. Traditionally, ownership is based on rights of usufruct -- that is, rights by usage. In the Tombali region, the head of the founding family (that is, the family that first settled an area) is considered the owner of the land. It is he who allocates rice fields to his own sons, to his kin, and to non-kin who may arrive later. Thus this aggregate of kin, and perhaps non-kin, cultivates a *bolanha* and constitutes a *tabanca*. Once an area is well populated, newcomers may have to go to the head of the founding *tabanca* and "borrow" rice fields to cultivate. In some instances, after extended use, these borrowed fields may pass into ownership of those cultivating them. In general, however, they continue to belong to the head of the founding family and may be reclaimed with due notice (two seasons' notice to allow farmer to establish a new field elsewhere, or at the least before the season starts, that is, before the arduous work of turning the soil begins). In the case of new rice fields from mangrove, for example, those made possible by the construction of a dam, distribution is still under the direction of the head of the founding family.

Disputes that may arise in these situations are based on water management potential. New fields are closest to the dam and sluice gate, and their owners have greater control over water management. Once a rice field is given to an individual, it is usually consecrated to his ancestors to whom he will intercede for its welfare. This adds a religious aspect to ownership that cannot be disregarded. In theory, once a field belongs to someone it will always belong to him and his family. In the event that fields are abandoned for long periods of time, as they were during the war for independence and a dry period that followed, ownership of fields that have

been reclaimed by mangrove and its dikes partially or totally destroyed becomes problematic. Owners must then demonstrate that those were indeed their fields. This may also be the case with abandoned fields that did not return to mangrove. It should be noted, however, that within one *tabanca*, within one ethnic group, land tenure problems are usually resolved without much difficulty.

Water Management

The management of water in the *bolanhas* has always been a problem, even within one *tabanca* and within the same ethnic group. These are more easily solved, however, within one *tabanca* and within one ethnic group. Traditional distribution of rice fields in a *bolanha* is called a *sistema de corda*, in which a *bolanha* is divided into narrow, parallel strips perpendicular to the river. These strips are not necessarily straight, but each strip has access to the river and the outer dike (*ourique de cintura*). Each strip is then autonomous, and its owner able to control its own water. In practice, rice fields may not always form autonomous strips with access to the river, or inside parcels may be "lent" to individuals outside the family, leading to water management problems. Even within a strip, within a family, family members still have to coordinate the discharge and reserve of fresh water from each field, and water management problems may occur.

Labor

Age and sexual division of labor vary slightly by ethnic group, but not at one of the most critical points of the cultivation cycle -- the soil preparation. Among the Balantas, the preparation of the soil is the most physically demanding, and this is done by a particular age set that consists of males ages 17-30. Weeding is done by women, young men and women, and occasionally men. The production of the seedlings is done by both men and women. The seedlings are watched by young children from predation by birds and are later transplanted by both men and women. Once in the rice fields, young boys watch the young seedlings from predation from birds, as the boys are responsible later on for the maturing rice kernels before and at harvest. Women may have this task if young boys are away at school. Men harvest the rice, but women transport it back to the drying areas nearer the *tabancas*. They do so in baskets or by canoe if the fields are far and waterways

available. Removing the rice from the sprigs may be done by both men and women. Selection of seed stock is usually done by the head of the *tabanca* and other older experienced males, and occasionally by older women who have demonstrated their expertise in this matter. The division of the harvest into seed, consumption, and trade stock is done by the head of each household and controlled by him. The principal wife in a polygamous household may have access to the consumption stock. It is claimed that outward migration of young men is seasonal and that they return for the critical period of soil preparation.

Even in traditional rice cultivation, without dams, individual families seldom supply all the labor necessary for every production cycle. This is particularly true for the soil preparation. Reciprocal exchanges of labor are the norm, usually in the context of work parties/age sets. The labor of individuals outside the family production unit is also sought, and they are paid in kind (rice) at harvest time. All laborers are fed by the farmer. Drink (*cana*, honey, and palm wine) and tobacco are also used to pay men, especially those preparing the soil.

CULTURAL ACCEPTABILITY AND UTILITY OF THE WATER AND SOIL MANAGEMENT STRUCTURES AND TECHNOLOGIES

For the most part, the dams, subsequent basin, and additional rice fields are welcomed by farmers in the Tombali region in spite of new problems that have appeared or existing problems that have become more serious. The following is a discussion of the positive and negative aspects of the water and soil management structures and technologies supported by the project.

Anti-Salinity Function of Dams

This feature appears to be universally welcomed by all farmers. The construction of the dam includes the construction of a substantial dike that is able to withstand the highest tides. This structure replaces the traditional outer dike (*ourique de cintura)* that was often breached by high tides. Control (blocking) of salt-water intrusion is an important factor in rice cultivation in salt-water *bolanhas*.

Salt Water Intrusion

Dams constructed in the past, and those under construction for the SCAD project, have one-way sluice gates (*comportas)* that do not allow the occasional intrusion of salt water perceived as necessary by the farmers. Local farmers feel that every few years (three to six years) the *bolanhas* should be flooded with salt water to control soil acidity and weeds. They perceive the salt water as revitalizing the rice fields.

Results of Dam Construction

The dams and outer dikes increase the area available for rice cultivation by facilitating the reclamation of abandoned fields and the creation of new fields. This should result in increased rice production.

Problems Created or Aggravated by Construction of Dams

Land Tenure

The construction of dams has created land tenure problems in two areas. In some instances, the ownership of abandoned rice fields (sometimes reclaimed by mangrove) has come under dispute. Although once rice fields are allocated to an individual, they belong to him and his family whether he works it or not; proof of ownership can be problematic if old property dikes cannot be identified. If the disputed fields are close or closer to the dam and its sluice gate, and thus ownership signifies control over water management, the ownership of these fields may be disputed unless clearly identified. In the case of new fields, farmers anticipating the construction of a dam may stake claim to new fields before actual construction (sometimes starting work such as dikes) in order to claim "prior" ownership. Since ownership is traditionally based on rights of usufruct, this is seldom disputed but it can lead to claims of unfair advantage. As a result of the nature of basins formed by the dams, all new rice fields will be on lower grounds in relationship to existing fields. This makes them highly desirable and equitable distribution problematic. Owners of fields farthest from the river (dam) and thus with less control over water and with poorer rice production want preferential claims to new rice fields. At the

same time, farmers with better fields are unwilling to give up claim of what they perceive as their rightful share of new fields. Dam construction has acerbated land tenure problems among members of same *tabancas* and same ethnic groups, and has created land tenure conflicts between *tabancas* of different ethnic affiliations.

Water Management

The construction of dams has aggravated water management problems in several ways. First, by increasing the surface of rice fields, it increases the complexities of water management. The traditional *sistema de corda* appears to be impracticable or impossible. Second, fields that were already in the uppermost reaches of the *bolanhas* become farther still from the point of water control. Third, the resulting basin and new rice fields create a new, a large *super-bolanha* that expands and incorporates smaller and previously autonomous *bolanhas*. This on occasion forces previously independent *tabancas* of different ethnic affiliations to cooperate among themselves and coordinate a much larger and complex water management system -- something totally outside their experience.

Inter-Ethnic Conflict

The construction of dams has led to increased inter-ethnic conflict. Conflict has not meant serious hostilities, but it does mean an inability or unwillingness to cooperate. This lack of cooperation extends to not working together in evacuating or retaining water from one field to the next, in building or repairing common dikes between two fields belonging to different owners, to arbitrary opening and closing of sluice gates to satisfy the water needs of those closest to the dam and ignoring the needs and requests of those farther away. The egalitarian nature of these rule-by-elders and rule-by-consent societies does not provide a mechanism for joint leadership among a group of *tabanca* chiefs of the same ethnic group, much less among a group of *tabanca* chiefs of different ethnic groups. DHAS has assisted in the formation of the latter -- the Comite de Bolanha, but it has proven to be a weak superstructure.

Labor (Construction and Maintenance)

Originally it was projected that farmers benefiting from a dam would assist in its construction and its maintenance. It has been difficult, at least for the current project, to obtain such farmer labor and DHAS laborers have been used instead. Furthermore, it is difficult or almost impossible to get an equitable labor contribution from the farmers to maintain the outer dikes created by the dam. Traditionally, every farmer constructs and maintains his own dikes, and farmers away from the dam perceive it as the obligation of those closest to it to maintain and repair it. Farmers closest to the dam complain that they are forced to do all of the maintenance. On occasion, they have had to appeal to local authorities, who in turn have contacted DHAS, to compel recalcitrant farmers to do their share of maintenance work. Appeals to the Comite de Bolanhas have proven ineffective.

Fishing and Foraging

The creation of a large and nearby fresh water basin has temporarily provided fishing for local women using scoop nets, and even to local men such as the Papeis, who traditionally fish with throw nets from canoes. At this point it is not known if this basin is a temporary or permanent bonus from the dam construction. Local people who fish are pleased, but no studies have been made to determine if these new areas are being overfished and stock depleted. Mangroves that once existed in the reclaimed areas provided significant protein to farmer families in the form of oysters, crabs, shrimp, and salt- and brackish-water fish. Now that they are gone, women must travel farther to gather these food items as well as to collect firewood.

THE PLANNED LONG-TERM INSTITUTIONAL CAPABILITY TO BE DEVELOPED WITHIN THE CATIO CENTER

Assuming the successful construction of projected dams (at the proper sites and being of the appropriate sizes), the project would have succeeded in increasing the land area available for rice production in the Tombali region. This long-range goal responds to the expressed wishes of the local farming communities for more bolanhas in order that they may be, at the very least, self-sufficient.

Whether local farmers today are not self-sufficient in rice is unclear. Statistics indicate that since 1985 rice production has increased significantly and that the quantities produced for the region should be adequate for self-sufficiency. This economic and agricultural assessment may not take into account that in this region the definition of rice self-sufficiency cannot be restricted to consumption alone.

In addition to family consumption, rice is needed and used for socioeconomic activities. Some of the major areas in which rice is expended and thus removed from consumption stock are the following:

- Extra rice is needed to feed all laborers from outside the family work unit for work in the *bolanhas*, whether for work teams or individuals;
- Extra rice is needed for barter to obtain *cana*, palm or honey wine, and tobacco with which to pay these outside workers;
- Extra rice is needed (taken from the harvest) to pay most individual outside workers;
- Extra rice is needed for barter to obtain consumable and non-consumable goods not produced by the family work unit itself. Many merchants in the Tombali region do not accept pesos from farmers but demand rice for their goods;
- Extra rice, in large quantities, is needed for almost all religious ceremonies; and
- Ceremonies critical for the welfare of the *bolanhas* as well as the welfare, cohesion, and continuity of the social group itself.

Thus, if the long-range goal of the project is to improve the socioeconomic, health, and nutritional level of the farmer communities in the Tombali region, a comprehensive understanding of the farmer's need for rice is necessary. And that need exceeds what has commonly been assessed as consumption need.

Farmer communities in the Tombali region are interested in achieving and maintaining rice self-sufficiency. Whether they are interested in producing surplus rice will be discussed separately. To achieve this rice self-sufficiency, they will need technical assistance in soil and water management. If successful, the Catio regional center should be able to provide the water and soil management structures and technologies needed by the farmers to achieve their goal.

DHAS at the Catio center will not, however, provide the transfer of technology to the farmers themselves, that is, it will not implement the extension work necessary for the farmers to learn to participate successfully in the more complex soil and water programs needed as a result of the larger cultivation areas created by the dams. In this respect, the long-range institutional capability of the Catio center will not correspond to a basic socioeconomic need of the local farmer communities.

APPROPRIATENESS OF METHODS USED BY PROJECT

Technical Skills

The project has undertaken to train eight nationals who will staff the Catio center. Three individuals were to receive B.S. degrees in the United States in hydrology, cartography, and soil science (the candidate for B.S. degree in hydrology failed to complete his studies; of the other two, one is doing extremely well and the other's work is adequate). Five other nationals received less intensive training in administration and general accounting, photo interpretation related to soil science, management of irrigated perimeters in Africa, and use of greenhouses. Four of the five appear to have had good academic progress. The quality and appropriateness of fields of study, as well as the study programs themselves, should be evaluated by experts in those fields.

The Catio Center

The Catio center, as designed, has no capability to ascertain and analyze existing social constraints or to adapt ongoing projects to accommodate the socioeconomic needs of local rice producers. None of the center's national staff is scheduled to receive any training in social science analysis. It would appear, however, that these duties will be assumed by other host country agencies.

Department of Agricultural Hydraulics and Soils

DHAS has no capability to implement any socioeconomic studies. However, its director, Justino Vieira, is cognizant of, and in full accordance with, the need for sound socioeconomic studies before selection of dam sites and design and implementation of subsequent water management programs.

National Institute of Studies and Research

The National Institute of Studies and Research (INEP) appears to be well qualified to undertake the socioeconomic studies needed for dam site selection and water management programs. Within INEP, there is a Center for Socioeconomic Studies. FAO will be primarily responsible for the implementation of these socioeconomic studies and is contracting with INEP to perform them.

Department of Agricultural Research and Studies

DEPA has an extension center in Caboxenque, which is in the Tombali region and not far from the Catio center. DEPA has a small department of socioeconomic studies (Gabinete de Estudos Socioeconomicos [GESE]) and has conducted several such studies. A few of them are related to rice production, for example, women's association for dehulling rice, introduction of sluice gates in a *bolanha* in Caboxenque, and a study of participating and non-participating *tabancas* in a *bolanha* in Quebe. Although DEPA has no official role in the ongoing project, it can provide the extension service necessary to implement the water management programs in the *bolanhas*. In this instance, extension refers to transfer of technology (training of rice farmers) in the appropriate and effective use of water management techniques. Local rice farmers, of course, already use traditional water management techniques, but these will probably not be adequate for the more complex water management that will be required as a result of the larger cultivation areas created by the dams.

U.S. Agency for International Development

At present AID has no role in assisting DHAS at the Catio center, or the other donors such as FAO, in ascertaining and analyzing social constraints to dam construction or subsequent water management of new, larger *bolanhas*. AID may be requested to provide or support the necessary socioeconomic studies if they are not adequately executed by others. However, AID's role remains, for the moment, as an alternate donor and resource.

CHAPTER SEVEN

LESSONS LEARNED

INTRODUCTION

Comments in this section have been drawn from interviews with host government agencies and international donors, relevant literature, and a field trip to Catio. From Catio a visit was made to the AID-funded dam site Ca Balanta (most of which is located in the region of Quinara), and four *tabancas* affected by the dam. The *tabancas* were of four different ethnic groups: Balanta, Beafadas, Papeis, and Mansoanca. Information was also gathered from a visit to a traditional *bolanha* nearer Catio on the river Cobade, and a visit to Tite in the Quinara region to examine water management techniques and programs.

Construction of dams in the past, such as Ca Sao Miguel, also known as Ca Balanta, has created large drainage basins and lakes, and significantly increased the surface available for rice cultivation. The construction of dams has been well received by local farmer communities because they are effective in blocking salt water intrusion, especially at high tides. However, the increased areas of cultivation, as a result of reclamation of abandoned *bolanhas* and creation of new ones, change the traditional configuration of rice fields and disrupts traditional water management patterns.

Traditionally each farmer decides when he will plant, what seeds he uses, the number of varieties and their differing maturation rates, and when and how much water he needs. If the long-range goals of this project -- increased rice production in the south coast area and the improved socioeconomic conditions of the local farmer communities -- are to be achieved, project implementation must be compatible with the cultural parameters presented by local, traditional social structure and customs. This will entail a dovetailing of the more complex water management programs necessitated by the larger cultivation areas produced by the dams to existing traditional rice cultivation practices.

The construction of dams, in most instances, has brought together in the new larger *bolanhas* numerous formerly smaller and independent *bolanhas* belonging to

tabancas of different ethnic affiliations. Each of these *tabancas* experiences the same increased internal water management problems. In addition, each *tabanca* is forced to interact with other tabancas that may be of different ethnic affiliations, in more complex water management patterns.

All the ethnic groups in the south coast region that are involved in rice production have similar cultural traditions. They are egalitarian societies governed by elders and what is commonly known as rule of consent. Although these societies have well-defined age sets and sexual division of labor -- for example, they do not have a hierarchical social structure that allocates unequivocal governing power to a principal chief. DHAS has wisely assumed the policy that any new technologies introduced should be compatible with existing technologies and social customs. An improved management system that conforms to existing social customs needs to be developed to address these new, more complex problems.

One major problem facing this project has been the almost complete lack of coordination among the various donors. This lack of coordination has led to poor project design and implementation. The problems related to social constraints exemplify this lack of coordination. First, when the GOGB declined AID plans to provide an agricultural social scientist and it developed that FAO would provide technical assistance, the nature of that assistance was never clarified. At present, AID is in the awkward policy position of supporting the need for social impact analysis and other social science analysis before and during implementation of the project. Yet AID has no access to or knowledge of the procedures and results of such studies.

Second, this lack of coordination among donors, at least in part, has been responsible for a situation in which dams sites have been chosen (four as of this date) and dam construction initiated without the necessary socioeconomic studies. This has occurred in spite of a DHAS policy that sites will not be selected or dam construction initiated without socioeconomic studies.

Third, the success of water management programs in the larger *bolanhas* resulting from dam construction will depend on the cooperation among local farmer communities concerned. This cooperation has not been forthcoming and will not be

achieved without these important social impact analyses. It is imperative that they be performed at the appropriate times. Equitable distribution of new *bolanhas* created by dam construction will depend on developing equitable water management programs. Fourth, the FAO is contracting with INEP to perform the socioeconomic studies required by the project. Although a contract has not been signed, INEP was to have started such studies in July 1987. Some studies have been initiated but not completed (as a result of contracting difficulties), and the selection of dam sites and construction has started without the benefit of such studies. These socioeconomic studies are now scheduled to resume in February 1988.

To date, the major social constraints to the successful implementation of this project remain unresolved. Discussion with sociologists at INEP about their terms of reference for conducting these socioeconomic studies suggests that they will be amply qualified for doing so. It is still unclear, however, how AID and IFAD, for example, will benefit from these socioeconomic studies. In December 1987, INEP was unaware that three international donors were involved in the project with three subprojects that also required various aspects of socioeconomic analysis.

One major concern of this evaluation is the availability of labor to cultivate new *bolanha* areas created by dams. There are no reliable figures. However, several factors indicate that there should not be a labor shortage:

- There is a general north-south migration pattern among rice producers as the northern sectors of the country suffer increasing problems of soil acidity;
- Preliminary surveys by INEP in the Tite, Quinara, region indicate that the Balantas, the principal rice producers, are slowly migrating southward through the Tombali region and, failing to find available *bolanhas*, are slowly drifting into Guinea Conakry; and
- In Guinea-Bissau, young males who migrate seasonally leave the *tabancas* to search for employment elsewhere because there are insufficient *bolanhas*, rather than because Bissau and other regional capitals can offer them a better lifestyle.

Labor patterns among the Balantas and other rice cultivators in Guinea-Bissau, especially in the South Coast area, are complex. The labor pool cannot be properly

assessed with standard census procedures (workers per household, etc.). Consideration must be given to complex reciprocity patterns among household members, among *tabanca* members, and even among different *tabancas* of the same and different ethnic affiliations. Work parties and individual laborers are traditionally conscripted for different stages of the rice production cycle. Especially designed socioeconomic surveys must be developed to obtain an accurate assessment of the labor available.

Examples from throughout the developing world, and more specifically from the Rice Production Project in Contuboel, indicate that most agricultural development projects increase the labor demanded of women, who generally make up a significant if not larger percentage of the agricultural labor pool (even when these projects address male farmers as primary beneficiaries). When this happens, women have less time to plant and care for their own gardens, cash crops, livestock, and craft production. They also have less time to prepare and produce household foods, to forage (commonly a significant contribution to household nutrition), and to care for their children. This invariably leads to less food for household consumption with detrimental effects on the health and welfare of the women and their children. Additional agricultural labor, without technical inputs (for example, mechanized rice dehullers) to facilitate some cycles of the woman's agricultural and household labor, contributes to physical deterioration and ill health.

Another concern of this evaluation has been the lack of participation among rice farmers in the construction and maintenance of dams, dikes, and sluice gates. A comparative study of two dam sites in the Tite area (Brambanda and Nan Balanta) suggests that the degree of interest and willingness to work may depend on the ability of local farmers to participate in such works. At the Brambanda site, sluice gates were built primarily of locally available materials and in a traditional fashion, and there was a high level of enthusiasm and participation among farmers. At the Nan Balanta site, the sluice gates were constructed of cement and other imported materials and participation among farmers was minimal due to an apparent inability to master the unfamiliar techniques. Obviously, one objective of the project is the input of new technology. Consideration must be given, however, to the manner in which new technologies are introduced and adapted to traditional technology and customs.

Food Sources

A broad, shallow reservoir basin with an abundance of rooted aquatic vegetation will tend to have the larger productive potential, given similar water chemistries. Reservoirs dependent on algal production for a good base will be good producers only if herbivorous species (for example, *Tilapia spp.*) are available, acceptable, and can tolerate the water chemistry. Algal-based systems may also need to be fertilized periodically to maintain productivity.

Harvest Methods

Even where production is high, capturing the fish may be a problem compared with estuarine, areas where the tides can be used to do much of the work.

Relative Areas

Although the reservoir behind a salinity barrier may be comparable in area and volume to the tidal creek system it replaced, the effects of the lost detrital input and reduced habitat may adversely affect downstream areas that are still estuarine. In that case, the reservoir would have to exceed the aerial productivity of the estuarine area to break even.

In summary, it appears unlikely that unmanaged reservoir fisheries will, on the average, equal or exceed the productivity of estuarine area fisheries they replace. Although some of the reservoirs may have productive fisheries, others will not due to adverse water chemistries. Still others may exhibit an initial high productivity followed by a long-term decline caused by nutrient depletion or excessive siltation. In the absence of scour from tidal currents, siltation can be a long-term problem in shallow reservoirs, substantially reducing their areas and volumes over 10-50 years. This problem will, however, be minimal in basins with intensive water management. Finally, reservoir fisheries will not supply the variety of foods of the estuarine areas, while harvest will tend to be more difficult.

Managed reservoir fisheries, or what amounts to a large pond-rearing system, might result in equal or greater yields that the estuarine areas they replace. However, they would require substantial initial investment and continuing management inputs. This type of fishery involves that maintenance of a hatchery capability, or a reliable source of wild fry, feeding, or fertilization; elimination of competitors, predators, and pests; and a harvest system, usually by draining the water out. Harvest in such a system that exceeded a few hectares would probably overwhelm the local capacity to consume, preserve, or transport the catch. Considering the difficulties now experienced with water management for rice alone, it appears impractical to consider imposing yet another set of perhaps conflicting management criteria requiring extensive cooperative planning.

AGRONOMIC CONSTRAINTS FACING SOUTH COAST RICE PRODUCERS

The principal agronomic constraint to increased rice production in the project area is the inability to manage water levels within the existing fields of the *bolanha*. At present, yields vary within *bolanhas* from approximately 800 kg per ha to 2,500 kg per ha, principally as a function of the field's placement within the *bolanha*. The implementation of large-scale water management systems could have a significant impact on reaching the GOGB's goal of rice self-sufficiency, providing that producers had an incentive to increase production.

Traditional water management systems consist of clearing areas of mangrove swamps and constructing an outer earthen dike to protect the cleared area from salt water intrusion, while retaining rainwater. Smaller dikes are then constructed within the cleared area to hold water within individual plots.

There are several problems associated with traditional methods. The amount of area that can be cleared within a mangrove swamp is limited by the ineffectiveness of long outer dikes. Traditional diking methods are subject to substantial erosion and must be repaired, on average, every three years. The ability of individual farmers to manage the water level within their plots is hampered by the necessity of evacuating water through their neighbors' field, as there is generally no central drainage canal. Often water cannot be evacuated in a timely manner, as it will not

be drained until the down-field farmer has finished preparing his plot for planting. These problems have resulted in average yields for approximately 1,200 kg per ha on area *bolanhas*, far below the potential with improved water management systems.

SCAD'S RESPONSES TO RICE PRODUCTION CONSTRAINTS

The SCAD project's contribution to increasing rice production in the project area is indirect. Certain preconditions (increased availability of consumer goods and improved marketing channels) must be met before the impact of AID's participation can be felt. Nevertheless, the construction of the center in Catio responds to a clear-cut need for infrastructural development. The equipping of a vehicle and machine maintenance facility will permit the GOGB to repair needed equipment in a timely fashion. At present, equipment must be transported to Bissau for repair. Because dike rehabilitation can be undertaken only in the dry season, timely intervention by the DHAS is necessary. The training component of the project addresses the enormous human resource deficiencies of the GOGB. Although programmed project activities will not have a direct impact on increased rice production, they respond to needs that must be fulfilled if the South Coast is to play its role in the GOGB's medium-term agricultural policy.

CHAPTER EIGHT

RECOMMENDED COURSE OF ACTION

IMPLEMENTING THE AID-FINANCED AGREEMENT

Subject to a positive environmental and social analysis, it is recommended that the SCAD project, as described and agreed upon in the project agreement, be continued to its full conclusion. No increase in project funds will be required as long as only two long-term specialists are provided.

- AID should obligate the remainder of the funds ($147,851) for the project in fiscal year 1987-1988.
- If long-term technical assistance is provided, the PACD will have to be extended from September 30, 1989, to September 30, 1991.
- Internally, AID must pay greater attention to implementation matters, particularly when the technical assistance is obtained.
- AID should use REDSO more effectively to support project implementation, especially by coordinating short-term consultancies in advance and following up on REDSO's recommendations.
- AID must re-establish a system of PILs, update the Financial Plan, and straighten out the filing system.
- The Procurement Plan should be revised and updated, and the ADO should consult with REDSO's commodity procurement officer.
- AID should order furniture as soon as possible to make the houses at Catio livable for the U.S. and counterpart technicians.
- Provision of heavy equipment by the United States is not appropriate, especially since such inputs are probably available from other donors. The same can be said for the provision of spare parts for non-U.S. equipment.
- Greater donor coordination is indispensable for the appropriate management of the project, both between donors and with the GOGB. Formal and informal contacts should be established and maintained.

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IMPROVED COORDINATION AMONG DONORS

The major donors in the project area and the GOGB should develop a document that clarifies the respective roles of the individual donors in the project area and establishes an integrated implementation plan for the region as a whole. Regularly scheduled meetings should be held to review the progress of the various activities in the South Coast region.

An effort should be made to coordinate the procurement of commodities by the donors to avoid non-compatability and redundancy. This could be accomplished by circulating procurement lists before the commodities have been ordered.

Once the center at Catio is operational and implementation plans have been solidified, a detailed study of the recurrent costs of the center should be made and a plan outlining ways in which the GOGB will finance these costs must be developed. The feasibility of charging user fees for DHAS services should be investigated.

NATURAL RESOURCES MANAGEMENT

Riceland Management and Planning

A land use capability survey (scale 1:50,000) based on recent aerial photographs and ground reconnaissance is recommended to provide the basic information required for dike location, potential rice land expansion, and monitoring of actual land use and rice production. An unknown area of cultivated rice land is abandoned each year while new marginal areas are being drained and diked. Actual land use inventories would assist in identifying those lands in continuous rice production where improved levels of technology and water management have proven to be cost effective. Reliable estimates of land use including new land undergoing ripening, rice production land, and abandoned land unsuitable due to acidification or salinization would guide DHAS planning management for projected expansion as well as maintenance of exiting protected areas. DHAS which as requested this survey would need technical assistance for implementation and training.

DHAS recognizes that rice cultivation has occupied the best intertidal soils and can only expand into marginally productive areas with problematic soils and water management constraints. Emphasis on increased rice production should focus 1) on highly productive intertidal soils that have been in continuous production for long periods; and 2) encourage rice cultivation expansion on upland soils that are suitable for freshwater flooding and have proven response to fertilizer and intensified level of management.

DHAS should develop a systematic measurement of rice yields on acid mangrove soils and upland soils as an indicator of project progress and attaining rice self sufficiency.

DHAS should continue support of the tidal rice farmers by constructing large barrier dikes and providing improved water management technology. Barrier dikes, effective barriers to salt water intrusion and freshwater seepage have brought more new land under cultivation, but has led to the abandonment of established paddies elsewhere. Barrier dike construction yields a net gain of 25 percent rice land whereas traditional lower contour dikes yield less than 10 percent cultivable rice land. Additional advantages to large barrier dikes are the protection of a much larger area per unit length, improved resistance to deterioration and require less maintenance and require less fill due to short length as compared to traditional low-contour dikes.

However, the lack of upstream water control reduces that capability to provide optimal flooding depth and water level control for paddy rice production since the dikes only function in one direction. Future design of barrier dikes should consider additional canals and drains in order to facilitate individual farmer control, provide two way flow for periodic salt water flooding and provide seasonal freshwater control.

Technical assistance is required to assist DHAS with key water management issues which include:

- Water release and gate operation to maintain fresh and salt water flows required by downstream estuarine fisheries;

- Redesign of sluice gates to permit two-way flows and allow farmers at higher elevations to periodically rejuvenate their lands by sea water flooding;
- Hydrological studies to permit the adequate sizing of dikes and gates to handle peak runoff flows and tides;
- Improved low-cost gate design should replace the traditional canoa pipe outlets for small dikes; and
- Improved coordination with other departments to develop the upstream structures and operating procedures for efficient water level control for rice production.

DHAS is capable of water control management and barrier dike construction, but unable to offer extension services to farmers or assist in community development which is assigned to another department. DHAS should assist in coordinating the other donors as well as local groups in an overall extension program. Similar coordination and planning is required in the maintenance and repair of old water structures that will recuperate abandoned rice lands which should return to prior levels of production.

Estuarine Resource Management

Assess the impacts of converting mangroves to rice land by selecting specific watershed units in the intertidal zone that represent: 1) areas that have experienced extensive conversion, 2) an undisturbed mangrove area, and 3) and an area in the process of conversion. If such representative areas could be established for baseline data collection, a minimum of two years preconversion and two years post conversion monitoring might be required for reliable results. Additional sample units can be added to account for the large diversity of estuarine habitats found along the south coast. The purpose of this baseline study is to define the biological, hydrological, and ecological relationships between upland freshwater runoff and the downstream estuarine mixing and resultant fisheries and associated species productivity.

A sampling program should be established to collect fish and macroinvertebrates from as many different habitats as possible. Collections during both the wet and dry season should assist in identifying the major species present, general habitat preferences and seasonal abundances. A reference collection will be maintained for

training and use by local scientists as well as other experts. Information on the ecological relationships of the collected species will be developed.

The populations of important estuarine species should be documented as well as life histories and reproduction cycles. Target species and sampling locations should be guided by the fish and invertebrate survey suggested previously. Quantitative sampling at selected locations will be designed to monitor changes in population size, migratory movements and seasonal use of specific habitats.

The hydrology of the estuarine system will be quantified by periodic monitoring of selected sites in major estuaries in order to characterize seasonal changes in water flows and water quality. Parameters to be measured should not require elaborate equipment or highly trained personnel and include such measurements as salinity, temperature, dissolved oxygen, essential nutrients, and water velocities. Sampling design should take into account tidal cycles as well as seasonal variation of runoff. More sophisticated equipment is required to monitor pesticide contamination and nutrient content of the water, but is highly useful in determining estuarine productivity.

More direct measurements to help estimate the loss of estuarine productivity due to mangrove conversion involve the uninterrupted overland freshwater flows, leaf litter or detritus input, and tidal mixing. Field sampling should be established to monitor aquatic and terrestrial primary productivity and the production and transport of mangrove leaf litter. All of these baseline measurements will help determine the impacts of the barrier dike construction in reducing freshwater flows, estuarine mixing, and changing water quality on estuarine productivity.

While subsistence fishing has been sustained for a long time, controls will be necessary to avoid overfishing and stock depletion that could result from successful commercialization.

It is unlikely that unmanaged reservoir fisheries will ever equal or exceed the fisheries productivity of the estuarine areas they replace. Large pond-rearing fisheries require large initial investment and a sustained high level of management. Considering the difficulties now experience with water management for rice alone, it

appears impractical to consider imposing yet another set of conflicting management criteria requiring cooperative planning. Fish culture within the rice polders holds by far the greater potential due to the relative large areas available, but need further background investigation before proven recommendations can be offered.

REMOVING SOCIAL CONSTRAINTS

Coordination Among Donors

It is imperative that the three international donors participating on this project -- USAID, FAO, and IFAD -- coordinate their activities. Although FAO is financing the socioeconomic studies, the DHAS use the FAO's findings to implement phases of projects funded by AID and IFAD. The objectives, methodology, and terms of references of these socioeconomic studies and their results should be made available to all parties concerned. The former should be made available immediately and the latter as they become available.

AID, with the assistance of an agricultural social scientist, should evaluate these studies and determine if they adequately assess the social constraints that might impinge on site selection and subsequent water management programs. This social science analysis should take place at the initial stage (that is, as soon as studies have been formulated) and with one or more follow-up evaluations thereafter since it will take time to carry out the studies and to analyze and use the resulting data to implement the various phases of the project.

Since coordination among the international donors has been so feeble, it is incumbent upon AID to establish these lines of communication and coordination. It also behooves AID to be in direct contact with INEP since communication and coordination among donors and host government agencies are not always satisfactory.

Socioeconomic Studies

One segment of the socioeconomic studies to be undertaken by INEP will address the question of available labor for the increased areas of rice cultivation created by the dams. Preliminary interviews with INEP staff during this evaluation

suggest that their objectives, methodology, and terms of reference are appropriate for a survey of the labor situation. However, since these studies are at early design phases, they should also be assessed and monitored by an agricultural social scientist.

Intra- and Inter-Tabanca Conflict

Intra- and inter-*tabanca* conflict has resulted from dam construction and the subsequent development of more serious and complex land distribution and water management problems. In some instances, for example, Nhala in the Quinara region, these problems have led to serious inter-ethnic conflict. Some method of resolving these land tenure and water management problems must be developed. There are not easy answers. It is possible that once DHAS is on site at Catio, these inter-*tabanca* and inter-ethnic problems can be more easily solved. However, it is more reasonable to expect, given the social customs involved, that conflict resolutions will have to be accomplished slowly through experimentation. An attempt to impose a foreign social structure in this situation is not likely to succeed. Water management programs should give individual farmers as much water control as possible and water reserves to those farthest from dam, for example, pits, trenches, etc. This may entail a subdivision of water basins and limiting sizes of basin and areas created by dams, allowing for autonomous *tabanca*-controlled areas.

Farmer Participation in Dam Construction and Maintenance

Farmer participation in dam construction and maintenance has been problematic in the past. It is vital that farmers perceive these structures as their own and feel compelled to participate. All farmers, regardless of their field position in the *bolanha* should participate in the construction and maintenance of ancillary soil and water management structures. Aside from the dam itself, other structures should be constructed as much as possible of locally available materials and as technically similar to traditional methods as possible. Working together (members of same *tabanca*, different *tabancas*, and different ethnic groups) at these early phases of dam construction will encourage and facilitate later cooperation and coordination in maintaining activities and water management programs -- especially as it relates to control of sluice gates. This recommendation is based on available cultural information and interviews with host country nationals with the most experience

working with these South Coast rice producers. No foreign solution can be imposed on the situation. One must again rely on a regrettably slow experimental method. The solution will develop, or evolve, from the attempt itself as it adapts to the farmers' needs and social customs.

Role of Women and Women's Needs

The SCAD project will inevitably increase the workload of women rice producers. It is imperative for the health and welfare of the women, and their families, that some consideration be given to their circumstances. Should the health of such a critical segment of the rice-producing labor force be impaired, it will affect rice production and thus the success of the project itself. From the preliminary interviews with INEP, is not evident that these concerns will be addressed by the socioeconomic studies. An assessment of the women's workload, both agricultural and domestic, and a judgment about the necessity of including technical assistance to women in the project should be made. This technical assistance, in the form of mechanical hulling machines, improved stoves, etc., could be implemented through DEPA, which already has the local infrastructure and ability to do so. AID would simply have to provide funding.

FUTURE INVESTMENTS IN SUPPORT OF RICE PRODUCTION

For the GOGB to make significant strides in the short and medium term toward its goal of rice self-sufficiency, the areas of improved monitoring and marketing of South Coast rice production must be addressed.

The GOGB has embarked on a fundamental change in policy direction with respect to pricing and marketing decisions. The GOGB has, however, inadequate financial and human resource capacities to evaluate the effects of this shift in policy direction on South Coast rice producers. AID should therefore consider:

- Financing technical assistance to bolster the GOGB's capacity to evaluate production trends in the project area. This assistance could take the form of hiring an agricultural statistician to develop a low-cost methodology for evaluating yields and production in the South Coast area and training and equipping GOGB technicians to monitor the effects of the changing policy framework on regional production. At present, the GOGB has almost no

ability to evaluate the impact of its new policies on South Coast rice producers. This capacity must be bolstered to adapt policies to changing conditions;

- Hiring a marketing specialist to study costs associated with the commercialization of South Coast rice, develop least cost scenarios, monitor marketing trends, and advise private sector traders concerning alternative marketing strategies; and

- Targeting the vegetable oil imported under the PL 480 program to the South Coast area by requiring that the GOGB sell the oil to wholesalers operating in the project area. Counterpart funds generated by the sale of the vegetable oil could be earmarked for supporting operating expenses at the Catio regional center.

AID could improve marketing channels by:

- Improving the road between Bambadinca and Xitole. Enlarging and grating this one-lane track would facilitate road transport between Bissau and the project area, decrease marketing costs, and encourage private traders to take a more active interest in possible economic opportunities in the South Coast area;

- Improving the area river transport capacity by purchasing small barges to deliver consumer goods and inputs and take out rice to those areas inaccessible by road. If producers in isolated areas are to respond to the favorable pricing policies enacted by the GOGB, they must be able to exchange their crop for desired consumer goods. Although three new barges have been recently purchased by the Dutch, barge capacity remains woefully inadequate. Area port facilities have been rehabilitated by several donors, but the GOGB must expand its river-carrying capacity if large-scale marketing increases are to be expected from the region; and

- Improving grain storage capacity in the region, possibly by financing site construction. The paucity of storage silos increases on-farm post-harvest rice losses because the GOGB and private traders are unable to purchase rice from farmers in a timely manner for lack of storage space. Next year, the Dutch will undertake a study pinpointing regional storage needs, but will finance only a portion of the silo construction. AID should evaluate the possibility of financing silo construction in the project area.

ANNEX A

BIBLIOGRAPHY

ANNEX A

BIBLIOGRAPHY

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ANNEX B

LIST OF PERSONS CONTACTED

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ANNEX C

GLOSSARY OF ACRONYMS AND TERMS

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ANNEX C

GLOSSARY OF ACRONYMS AND TERMS

ADP	-	Armazens do Povo (parastatal trading organization)
bolanha	-	Portuguese for a crop production area
Cana	-	Alcoholic drink (sugar cane)
Comite de Bolanha	-	Rice fields(s) committee
Comite de Tabanca	-	Village committee
comparta	-	Portuguese for sluice gate
DAI	-	Development Alternatives, Inc.
DEPA	-	Department of Agricultural Research and Experimentation
FAO	-	Food and Agriculture Organization of the United Nations
GESE	-	Cabinet of Socio-economic Studies (a division of DEPA)
GOGB	-	Government of Guinea-Bissau
INEP	-	National Institute of Study and Research
lala	-	Creole for field between bolahanas and plateau
MCT	-	Ministry of Commerce and Tourism
oririque de cintura	-	Portuguese for outer dike
ourique	-	Portuguese for dike
PIC	-	Integrated Project of Caboxanque Criolle
PIL	-	Project Implementation Letter
PIO	-	Project Implementation Order
PIR	-	Project Implementation Report
REDSO/WAAC	-	Aid's Regional Economic Development Support Office/West Africa Accounting Center
REDSO/WCA	-	Aid's Regional Economic Development Support Office/West and Central Africa

SCAD	-	South Coast Agricultural Development Project
sistema de corda	-	Portuguese for a system of narrow, parallel, rice field strips, each within its own access to outer dike and river
tabanca	-	Portuguese for village
viveiros	-	Portuguese for nurseries