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Virginia Tech

VIRGINIA POLYTECHNIC INSTITUTE
AND STATE UNIVERSITY

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InterCRSP

REPORT

by

Dr. Andrew Manu
Dr. John W. Pendleton
Dr. Mamadou OuattaraSeptember 1996

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IPM CRSP US Institutions

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Rodale Inst. Res. Ctr.
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University of Georgia
USDA Veg Lab
Virginia Tech

Host Country Institutions

Prime Sites

Guatemala - Agri-lab, ALTERTEC, CARE, ICTA
Jamaica - CARDI, Ministry of Agriculture
Mali - IER
Philippines - NCPC/UPLB, PhilRice

Satellite Sites

Ecuador - INIAP
Honduras - EAP
Thailand - Dept of Agriculture
Uganda - Makerere University

International Centers

AVRDC - Taiwan
IRRI - Philippines
CIAT - Columbia
CIP - Peru

Private Sector

The Kroger Company
Caito Foods
PICO

NGOs/PVOs

CLADES

Evaluation

The Hamdallaye Watershed Project, Niger, West Africa

Prepared for:

West Africa Natural Resources InterCRSP
IPMCRSP
Office of International Research and Development
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ACKNOWLEDGEMENTS

We would like to acknowledge the assistance, support and encouragement which numerous people offered in conducting this assessment. We are grateful to Dr. Issaka Mahaman for providing logistical support to the team in Niger. To all those individuals listed in Appendix 1, we are grateful for your willingness to endure our queries, and for the enthusiasm and support for the Hamdallaye Watershed Project in Niger. We would also like to thank the farmers in the Hamdallaye watershed for sharing their experiences and impressions on the project with us.

We received numerous comments and suggestions. We considered them all seriously and incorporated them in this document wherever possible. We accept responsibility for the final report.

A. M
J.W.P
M.O

EVALUATION METHODOLOGY

The evaluation was performed by request of the IPM CRSP which serves as the Management Entity of the West African Natural Resource Management (NRM) InterCRSP program. The team consisted of the following:

- Dr. Johnny W. Pendleton
- Dr. Mamadou Ouattara
- Dr. Andrew Manu (Team Leader)

Due to some logistical problems, Dr. William Leuschner, a forest economist, was not able to join the team. The team arrived in Niger on September 1 (except Dr. Ouattara who is resident in Niger) and departed September 9, 1996. Details of the list of individuals visited, documents consulted and the team's itinerary are presented in Appendices 1-3.

The purpose of the evaluation was to assess the Hamdallaye Watershed Project (HWP) experience in Niger, in terms of planning, execution and involvement of local communities in project activities. Findings of this evaluation will be used to assess the appropriateness and feasibility of the adoption of the HWP approach for implementing the Natural Resource Management InterCRSP in West Africa.

The terms of reference for the team as proposed by the West African NRM InterCRSP are as follows:

1. Identification of essential elements in the model, technical, administrative, community.
2. Identification of participants and the mode by which they participated.
3. Impacts of people in the community.
4. Appropriateness of model for other InterCRSP initiatives: lessons learned.
5. Externalities: pros and cons and ways around constraints.
6. Gender issues: inputs, impacts.
7. How well does the model support integrating of all components of (animal, fish), better collaboration among CRSPs.
8. Guidelines for development of new watershed model for development of follow-on work plans.
9. Submit a report to the NRM InterCRSP Coordinator, Mike Bertelsen, OIRD, Virginia Tech, 1060 Litton Reaves Hall, Blacksburg, VA 24061-0334.
10. Debrief Dr. Curtis Nissly, Division Head, Agriculture and Natural Resources Office, USAID, Niamey, Niger.
11. Present the above report at the InterCRSP Program Development Workshop on September 16 and 17 in Dakar, Senegal. It is proposed that Dr. Mamadou Ouattara represents the evaluation team in this presentation.

Given the time constraints the panel reviewed project-related documents, interacted with scientists and technicians associated with the project, and visited the Hamdallaye Watershed

Project on two days and talked to farmers at two villages within the project area. The questions or answers may have been misinterpreted because of translation (from English to French to Hausa/Djerma) and back again. However, a friendly, open relationship was evident between the project scientists and farmers. The farmers did not circumvent, decline or hesitate to answer all questions

Background of the Hamdallaye Watershed Project

The 500 ha pilot watershed is located near the village of Hamdallaye, 35 km northeast of Niamey, the capital of Niger. Four villages (Hamdallaye, Bokotchili, Falanke Beri, Falanke Kaina) have administrative territory within the watershed; land in the watershed is owned by residents of these villages. The population of the four villages is about 2000 residents and they are predominantly of the Zarma ethnic group. The long-term average rainfall is 480 mm but rainfall in the watershed is variable both in time and in space. Rainfall varied from 390 mm in 1990 to 680 mm in 1992.

Two types of plant communities were identified in the watershed. On degraded plateau, a rhythmic arrangement of vegetation stripes are separated by bare spaces (tiger bush). Vegetation in the sand valley is characterized by scattered presence of *Guierra senegalensis* and annual grasses and lignaceous plants.

Millet (*Typhoides pennisetum* spp) and cowpea (*Vigna unguiculata*) intercrop is the dominant cropping pattern in the watershed. Area with more favorable moisture and nutrient conditions are cultivated to sorghum (*sorghum bicolor)*, maize (*Zea mays*), sorrel (*Hibiscus sabdarifa*), okra (*Hibiscus esculentus*), and peanuts (*Arachis hyogaea*). Farm sizes per household range from 0.7 to 16.4 ha. Farmers rarely use inorganic fertilizers; these inputs are either unavailable or beyond the purchasing capacity of the watershed residents.

Nearly three-fourths of the watershed residents own livestock, principally mixes of goats, sheep and cattle. Women own small stock of animals as a more secure investment than land that is allocated to them by men on temporary basis.

Baseline information gathered on their role in natural resources management revealed that women are aware of environmental degradation in the watershed. They cited soil and vegetation resource degradation, reduction in numbers of domestic animals, and scarcity or disappearance of several types of fauna as the major indicators of environmental degradation. They expressed a fatalistic sense that the decline of the natural resource base was primarily due to divine forces and it will therefore take divine intervention for natural resource restitution. On the other hand, they felt a sincere obligation to help in reversing the trends in environmental degradation because it is their traditional duty to gather firewood, edible plants and fodder from the communal lands. The social constraints that mitigate against women's participation in natural resource management include:

(1) heavy domestic daily responsibility
(2) lack of land rights, and
(3) limited access to knowledge and information on practical methods to rehabilitate degraded sites.
(4) social and religious traditions

The Hamdallaye Watershed Project Model: A Collaborative Effort

All agricultural development project models have constraints. The watershed management model is no exception. The following are just a few constraints that any agricultural development project will encounter in the Sahelian region of West Africa:

(1) erratic and variable rainfall over both time and space,
(2) some of the poorest soils in the world for crop production (acid, low organic matter and exchange capacity, Al toxicity and poor structure subject to erosion),
(3) serious pest problems (insect, diseases and weeds),
(4) common grazing of animals (little crop residue left in the production fields),
(5) land tenure and small farm holdings,
(6) lack of agricultural implements,
(7) lack of inputs such as improved seed and fertilizer, or the money or credit to purchase, and
(8) government policies not strongly supportive of agricultural food production i.e. more interest in export crops or other business enterprises.

The desertification process is therefore taking place at an alarming rate as a result of this myriad of physical, biological and socio-economic constraints seldom encountered in other agricultural production areas.

The initiation of the project was in response to a request from the United States Agency for International Development (USAID) Mission in Niger to plan and implement integrated land management research and demonstration activities in a small agricultural watershed to address some of these constraints. The project was a collaborative effort involving the Institut National de Recherches Agronomiques du Niger (INRAN), the Soil Management CRSP's at Texas A&M University, and the farmer community in the watershed.

This project was proposed to the village chief first, and with his approval, held meetings with farmers. According to INRAN scientists, all farmers wanted to be collaborators, but only sixteen were selected. Each farmer had land holdings of about ten hectares, but only farmed three-four hectares. The remainder was fallowed. The cultivated land was devoted primarily to millet with perhaps 20% interplanted with cowpea. Occasionally small fields of cowpeas alone were observed. In addition to helping shape the research and demonstration agenda, farmers played a significant role in all phases of the project. They were an integral part of overall planning of the project. They were also responsible for the daily management of trials and their impressions helped identify researchable and demonstrable issues in subsequent years.

Participants from INRAN included senior researchers, field and laboratory technicians. They collaborated with farmers and collaborating scientists from other research institutions in the determination of priority problems across disciplines and the identification of research themes. Scientists and farmers carried out revegetation activities on the plateau and soil and crop management trials on the sand valley. Laboratory technicians provided the much needed laboratory soil analyses. Field activities were overseen by a local technician who is a resident of the village of Hamdallaye.

In Niger the project established research linkages with scientists of the University of Niamey, ICRISAT, and IRI. Both formal and informal discussions occurred between scientists on program development and execution. The most active areas of collaboration has been agroforestry, soil fertility research with both mineral and organic fertilizers, field testing of new varieties of millet and cowpea and the conservation and efficient utilization of soil moisture.

Faculty and staff of Texas A&M University provided technical assistance to in-country scientists. To date five technical Assistance missions have been carried out by faculty of TAMU.

The project has been carried out in two phases. The first phase (1990) was a one-year feasibility study of the watershed attributes. Soil series and phases were mapped. Baseline data on plant species composition and distribution were compiled. Traditional land use and land tenure within the watershed were documented. In 1991, an assessment was made of the role of women in natural resources management. The second phase (1991-present) used baseline data to develop and demonstrate technologies needed to aid sustainable management of the watershed.

The watershed was used as a planning unit and the model adopted for this project recognized and utilized the natural interrelationships that exist among the component parts of the watershed. It involved the integration of effective upslope (Plateau) restoration, management and eventual surface stabilization through pasture and forestry management. This set processes in motion which had favorable ecological conditions and improved crop production in the sand valley below.

Agroforestry activities which exploited, rather than combat the water, nutrient and energy flows were used in the rejuvenation and stabilization of the degraded plateau surfaces. Microcatchments and contour dikes constructed through community effort, were used to harvest and store water and nutrients for the establishment of *Acacia holosericea*.

The rehabilitation effort was based on knowledge regarding deterioration patterns and nutrient flows on the plateau. Rejuvenation was therefore carried out in the context of the "tiger bush" configuration existing on the plateau. The establishment of the keystone specie created a favorable microenvironment which induced autogenic production of herbaceous and species.

Rocks and stones were used to plug up "selected" incipient gullies which bisect the steep sloping escarpment at the edge of the plateau. A combination of the revegetation effort and gully

plugging activities resulted in reduced runoff, and decreased formation of alluvial fans in the sand valley.

Activities on the arable lands in the sand valley consisted of agronomic research and demonstration activities on sustained production of millet and cowpea, the main crops in the watershed. Researchers and farmers demonstrated the influence of external inputs (manure, inorganic fertilizers, surface mulches) and appropriate agronomic practices (crop rotations, early planting, adequate plant densities, timely and appropriate weeding) on crop yields.

Elements of the technology transfer component of the HWP model included the following: (1) Farmer-to-farmer extension, through verbal expression of impressions at social gatherings or through the use of the show-and-tell approach in the field and (2) yearly field day exhibition of project activities to farmers, PVO's, NGO's and US Peace Corps Volunteers. Project results were also diffused through publications to a wider scientific audience.

Project Impacts: Farmer Impressions

The economic impact or added food production of this project has not been thoroughly documented, The project is relatively new (4 years) and impact data is difficult to obtain. However, views of farmers on issues pertaining to impact of specific project interventions were solicited. Assessment of view of participating and non-participating farmers was made through informal group discussions before and during this evaluation and through a survey questionnaire developed by the Department of Rural Economy (DECOR) of INRAN and the Ministry of Agriculture in Niger. Suffice to say, the cooperating farmers were positive in their support and they were satisfied with the overall approach of the project. They appreciated the choice of interventions, the objectives, results obtained and many have adopted several of the introduced technologies, and were eager to try more.

Farmers appreciated the beneficial impact of the rehabilitation activities on the plateau. They specifically cited the positive impact of tree planting on the landscape continuum. These include:

(1) Significant reduction in gully development in their fields,
(2) Curtailed erosion and ,
(3) Diminution in alluvial fan development in the sand valley

Farmers appreciated the value of the wood generated by the fast growth of the *Acacia holosericea* which would be used as fire wood or as building material. They also talked about the autogenic regeneration of herbaceous and shrub species, especially species that disappeared as a result of degradation. Increase in biomass will also benefit the livestock industry. Farmers have observed the reappearance of wild life (rabbits, snakes) in the vegetation.

While they are now capable and willing to undertake similar activities, even on community owned lands, they also talked about some constraints including;

(1) unavailability and/or unaffordability of appropriate tools (shovels, pick axes).

(2) During the root development period, plants require supplemental irrigation during any lengthy drought period which is very common in this environment. Farmers expressed sincere hopelessness in carting water from distant ponds and wells due to lack of animal traction.

While the choice of species was not cited as a major constraint, some of the watershed residents expressed dissatisfaction with *Acacia holosericea*. Their preference would rather be multipurpose local tree and shrub species like *Zizyphus mauritiana* and *Bauhenia rufescens*. On the other hand these species are slow-growing and it takes years to obtain adequate canopy cover for effective erosion control.

All participating and non-participating farmers appreciated the improved soil and crop management technologies demonstrated. They expressed their preference for the improved millet and cowpea varieties introduced. They consider manure as the primary soil amendment which is followed by inorganic fertilizers. Increasing yields resulting from an annual cowpea/millet rotations is very much appreciated. This is evidenced by the considerable number of hectares of cowpea monocrop on fields that were cropped to millet during the previous cropping season.

They listed their number one priority for research to be fertility studies as they realize that with the traditional system their fields are becoming "old and tired".

They however complained that:

(1) Lack of adequate fodder and reduced animal population have resulted in low volumes of manure in the watershed.

(2) Lack of means for transporting manure from homesteads to the field pose a big constraint to manure use in fields that are far away from homesteads.

(3) Fertilizers are not available and in most cases unaffordable (10,000 cfa $20.00 /50kg bag of TSP).

(4) Early maturing millet varieties are subjected to bird damage when neighbors continue to use long-season local varieties.

When asked about the project benefit to women, a farmer simply said the whole family benefitted from activities of the project. To ascertain the gender question, a female extensionist or researcher of INRAN should visit the village women with a carefully prepared list of questions.

General Observations, Suggestions and/or Recommendations of Panel

Based on review of project-related documents and the two visits to the Hamdallaye Project site, the panel made these observations and would like to make some suggestions for any future watershed research and demonstration projects.

The beginning baseline studies of physical and biotic factors on the Hamdallaye site are impressive, and even more so are the first class publications reporting the findings and presentations at scientific meetings.

The panel observed a luxurious growth of the keystone species (*Acacia holosericea*) and recommends that a follow up vegetative survey be made of the same plateau area to document the changes brought about by the introduction of *Acacia holosericea* four years ago. When farmers of Falanke Beri were asked for suggestions of trees to try on the eroded plateau, they were unanimous in choosing the neem tree(*Azadirachta indica*). They are aware of its utility as an excellent windbreak and it also provides dense shade and multitude of products. By noting how this tree thrives in Niamey and the small villages, it should be considered. Would the leaves or seed provide control for prevalent insect pests of cowpea and millet? The IPM CRSP might consider such possibilities.

Grazing of the plateau region by animals of the adjacent villages or roaming herds is not conducive to improved forage production, or preventing land degradation. Likewise, the dry season grazing of crop residues depletes the fertility and adversely affects the physical characteristics of the soil. However, restoration of the degraded plateau surfaces through agroforestry activities would generate enough wood as replacement for millet straw that is often used in village industry. These are policy and land tenure questions difficult for either agricultural scientists or farmers to deal with.

Organic matter additions are needed for soil and crop improvement but difficult to obtain in the amount needed for adequate plant nutrition. Therefore in spite of the low and erratic rainfall, inorganic fertilizer will be the long range key for maintaining crop production. Attention must be given by planners to encourage farmer co-ops, credit institutions or other infra structural methods to facilitate the timely availability of this input.

Striga, a serious parasitic weed, was noted in some millet plantings. This weed also attacks cowpea. At one time IITA reported resistance in cowpea germplasm to certain strains of Striga in Burkina Faso and IITA is also working on the basic physiology of striga in relation to maize. The INTSORMIL CRSP at Purdue University is having some success on striga research in sorghum. These program scientists should be contacted concerning their findings and relation to the striga problem. The IPM CRSP might consider this challenge to be an appropriate entry into the InterCRSP natural resource projects.

The gender issue must be approached in a flexible manner because the socio-economic

conditions in western Africa are different for different watersheds within regions and within different regions within countries. Specifically, the land tenure, the type of activities conducted by women , and their overall role in the extended family structure tend to be region specific.

As part of the assessment of baseline attributes of watersheds, land tenure issues related to gender should be deeply investigated and utilized during the subsequent intervention phase. If the land tenure within the watershed permits, special activities involving women must be encouraged. For example with women being traditionally responsible for gathering wood for household cooking, they should be strongly integrated in planning and management of revegetation activities on the plateau surfaces. Research and development activities on peanuts should be carried out with the input of women. The woman's role in small ruminant production has been documented in several areas of west Africa. The role of the small ruminant CRSP in nutrition research will be beneficial to women.

A "Wischmeier" set of three flumes were noted on a sloping area below the plateau to measure water and sediment runoff. These may have already served their original objective and might be discontinued, or moved to another watershed site.

Advanced agricultural training is still a constraint in the Sahel. The panel was told by the Director General of INRAN that his current staff includes only three agricultural PhD's. We were also pleased to hear that he plans to give this his highest priority in the future.

USAID personnel in Niamey were familiar and supportive of the Hamdallaye Watershed Project. They had recommended, provided funding and attended Field Days. Unfortunately their morale is very low at present, because the Mission is being closed at the end of 1996. The Division Head of Agriculture and Natural Resource Management (Mr. Curtis Nissly) was transferred to Washington while the review panel was in Niger.

World Bank and Africare personnel in Niamey were familiar with the project.

The INRAN scientific leadership afforded to the project by Dr. Issaka Mahaman was impressive and the supporting staff and laboratories in Niamey seemed to be functioning well. Both the personnel and equipment had benefitted from CRSP collaborations in the past.

The Hamdallaye watershed Project and The NRM InterCRSP

A solution for ensuring food security might be for world food policy makers to simply support agricultural research in more favorable environments and export the produce to areas of food need. But then the question arises of who pays and how? While population in the Sahel is growing at the rate of 3.5% annually, food production has either leveled off or is growing less than one percent annually. Secondly, the countries in the Sahel have few natural resources to sell and purchase food. Thus while recognizing the terrible environment for producing food, agricultural science projects offer some hope and inter CRSP programs will bring more

scientific expertise to bear. This seems to offer the cheapest and best solution, rather than simply ignoring the problem.

In spite of all the environmental and socioeconomic constraints, past CRSP programs have made well documented progress in certain countries by improving crop and livestock enterprises which has led to improvements in family livelihood. The CRSP model of utilizing American agricultural universities to train scientists of developing countries, and to collaborate on the planning, implementation and interpretation of in-country agricultural research has provided more "Bang for the Buck" than other introduced models.

The watershed model is a further improvement by recognizing even more of the environmental or natural resources that a farmer in the Sahel has available. The model exploits the linkages between the component parts of the landscape continuum. Secondly, it includes the farming systems or "bottoms up" approach which include the farmer in the planning stage and the on-farm trials using the farmers labor, implements and experience. The third strengthening push will come from involvement of several CRSPs in planning research and training future agricultural leaders for the developing country. For example in case of a new arising problem such as a particular pest (insect, weed or disease) livestock, or nutritional problem, there will be a greater choice of American scientists to give expert advice or assistance.

Admittedly, some of the commodity CRSPs may not have collaborated closely with the Soil Management CRSP, IPM or Small Ruminant CRSPs in the past. This could also be said of plant breeders or production scientists in American Agricultural Experiment Stations. An InterCRSP is a mechanism to help break down such walls between disciplines, and afford additional expertise for research or training to improving food crop production and natural resource preservation. It should however, be emphasized that while participation of individual CRSPs should be unique to specific research disciplines, it is necessary to identify appropriate watersheds in the regions where the maximum number of CRSPs can collaborate.

The adoption of the HWP as a model for the multi-CRSP collaboration should also be considered in the context of the socio-economic structures of the specific region of West Africa. This will result in the identification of interventions that are socially acceptable and politically attractive. The success of the project will also depend on the respect and integration traditional community heads (village chiefs, Chef du Canton, etc.) To facilitate efficient dissemination of project findings, the identification of researchable and demonstrable themes should involve non-governmental and private voluntary organizations in the region as well as local agricultural extension agents. The InterCRSP effort should also be made an integral part of the national natural resource management program. Thus national institutions would provide administration and on-site management.

The SMCRSP should take primary leadership for the soil, water, and nutrient management aspects of such a project. Other commodity CRSPs (INTSORMIL, PEANUT, and BEAN/COWPEA) could also play a major role in planning and supporting the on-farm trials by

providing improved cultivars and short term scientists for specific problems.

Human resource development (training) of both short and long time duration should be a part of InterCRSP at participating US CRSP Universities. For this activity has been a primary strength of past CRSP programs, and will provide long lasting benefits to food production. Advanced agricultural training is still a constraint for many countries in the Sahel. The panel was told by the Director General of INRAN that his current staff includes only three agricultural PhD's. We were also pleased to hear that he plans to give this highest priority in the future.

Watershed experiments in the InterCRSP context will require long-term commitment from all participants (CRSPs, national agricultural research institutions, politicians) to test introduced water/wind conservation or erosion control practices. The same might be said of crop studies. This is especially true in the Sahelian region which is characterized by extreme variability in rainfall between and within years.

Advice from national and international institutions (ICRAF, IITA, ICRISAT and ILCA) involved in agroforestry research should be avidly sought for species that could be established in the severe Sahelian plateau environment. Ideally, such species should provide all or one of the following: food, feed, or fuel. Future tree plantings on open grazing areas should include more introduced species, and all farmers should be involved early , and understand the objectives. Hamdallaye farmers were involved only in the planning of the cropping trials. Dr. B.T. Kang longtime agroforestry scientist at IITA was contacted and suggested *Moringa oleifere*, an excellent forage shrub be tried, or *Senna siemea*, a shrub not eaten by livestock.

Plateau plantings in the future might include different micro-catchments designs involving less labor. Attention should also be given to the use of animal power and comparisons with human labor be made. The farmers were reluctant to establish the catchments and plantings on land that was not theirs, and lacked tools or equipment to do so.

The panel also believes that more attention should be paid to nutritional studies of the diet of people and animals of the Sahel. For example, the *Acacia holosericea* in this project produces a nut, but no one seems to know its protein or nutritional attributes, or whether it might be beneficial to either animal or human diets. Before a tree species is included in future natural resource studies more of its nutritional attributes should be known.

Needed crop cultivars should be tested from the appropriate CRSP programs, for these would be low cost inputs for the farmer. Conversely high cost inputs such as fertilizer or pest control should also be tried on farm managed trials. While economic returns may not be favorable at the present, research is conducted for the future. Future crop intensification brought about by increasing human population and shorter fallow periods, plus a reduction in organic matter by animal over grazing will necessitate the introduction of inorganic fertilizers. Simple trials involving carriers, rates, timing and placement should be included. And let farmers choose the appropriate treatments visually and based on their available time, equipment, labor and monetary

inputs. The micro soil variability in the Sahel precludes the use of modern day statistical designs and procedures followed in other agricultural areas of the world.

A fenced area to preclude livestock grazing was noted in the project area and an effort should be made in similar trials to compare species, growth and soil factors in this enclosure with adjacent grazed areas. Such studies would fit very well as graduate thesis subjects for students interested in natural resource management. The same observation is offered for vegetative changes on the plateau following the introduction of *Acacia holosericea* four years ago; the benefits to women in the project area; and finally nutritional factors and possible uses of *Acacia holosericea*. For example, a calculation of the quantity and quality of fire wood from this planting would be useful and village women should be involved in such a study.

Conclusion

The Hamdallaye Watershed Project has adopted an integrated, participatory approach to develop low cost systems of soil, water, nutrient and plant management for food, fodder, and fuel production. The following are the significant components of the model:

(1) The project has provided the basis for considering the entire landscape continuum, with socioeconomic attributes, in the planning and execution of the research and demonstration activities.

(2) The project has created public awareness of the natural resource degradation and the possibility for its rehabilitation through community effort.

(3) The project adopted low cost rejuvenation methods to restore the overgrazed severely eroded communal plateau surfaces.

(3) Farmers conducted research and demonstration trials through crop and soil management to improve village food production and security.

In general, and given the many physical, biological and socio-economic constraints in the watershed, and given limited time duration of the project, the panel believes the project was a success in meeting its objectives. The panel is also sincerely convinced that the Hamdallaye Watershed Project would serve as an excellent model for implementing the Natural Resource Management (NRM) InterCRSP project in the West African Sahel. However, all planning, implementing, and monitoring of project activities must be carried out in the context of the socio-economic structures of each zone of intervention.

APPENDICES

Appendix 1: List of Persons Consulted

Dr. Gouro Abdoulaye, Director General, INRAN
Mr. Samba Ly, Scientific Director, INRAN
Mr Chetima
Dr. Issaka Mahaman, Coordinator, InterCRSP, INRAN
Mr. Moussa Salou, Head of Soils Laboratory, INRAN
Mr. M. Gandah, Researcher, INRAN
Mr. Ibrahim Zanguina, Researcher, INRAN
Mr. Curtis Nissly, Division Head, Natural Resources Management, USAID
Mr. George Thompson, economic Reform/Microenterprise Development Team, USAID
Elhaji Mousa Saley, Project Manager, USAID

Field Visit 1
Mr. Farmo Amadou, Department of Documentation, INRAN
Dr. Moussa Adamou, Plant Breeder, INRAN
Dr. Anoukou A.J. , Professor, Plant Science, University of Niamey
Dr. John Erickson, Consultant
Dr. John Russell, Consultant

Field Visit 2
Dr. I. Mahaman, INRAN
Dr. Moussa Adamou, INRAN
Mr. Hama Yayé, Field technician, INRAN

Participant Farmers
Mr. Moumouni Djibo
Mr. Hinsa Yacouba
Mr. Ibro Salou
Mr. Saley Ide
Mr. Mounkaila Niondou
Mr. Adamou Talfi
Mr. Alfari Ide
Mr. Badjo Ide

Appendix 2: List of Documents Consulted

Manu, A., A.S.R. Juo, S.C. Geiger, A. Pfordresher, and R. Puentes. 1991. Integrated management of agricultural watersheds (IMAW): Characterization of research site near Hamdallaye, Niger. TropSoils Bulletin No. 91-03. Soil Management CRSP, North Carolina State University, Raleigh, NC.

Taylor-Powell, Ellen., A. Manu, S.C. Geiger, M. Ouattara, and A.S.R. Juo. 1991. Integrated Management of Agricultural Watersheds (IMAW): Land tenure and indigenous knowledge of soil and crop management. TropSoils Bulletin No. 91-04, Soil Management CRSP, North Carolina State University, Raleigh NC.

Manu, A., T.L. Thurow, A.S.R. Juo, I. Zanguina, M. Gandah and I Mahamane. 1994. Sustainable land management in the Sahel: A case study of an agricultural watershed at Hamdallaye, Niger. TropSoils/TAMU Bulletin No. 94-01. Texas A& M University, College Station, TX

Natural resource management and InterCRSP in West Africa. 1995. Proceedings of the regional workshop: Technology development and transfer to improve natural resource management in West Africa. 18-22 September, Niamey, Niger.

Manu, A., Moussa Salou, L.R. Hossner, L.P. Wilding, and A.S.R. Juo. 1996. Soil-related plant growth variability in the Sahel with special reference to Western Niger. TropSoils/TAMU Bulletin No. 96-01. Texas A& M University, College Station, TX

T.L. Thurow and A.S.R. Juo. 1995. The rationale for using a watershed as the basis for planning and development. In: ASA Special Publication. No. 60. pp 93-116

Appendix 3: Itinerary

September 2, 1996 Team Arrived in Niamey, Niger at 9:00 p.m.

September 3, 1996

Team pays courtesy call on Dr. Issaka, coordinator of InterCRSP, Niger
Team was joined by Dr. Ouattara at the INRAN Soils Laboratory.
Discussed itinerary and work plan.

Paid courtesy call to Mr. Moussa Oumarou, acting Director General of INRAN.
Visited USAID personnel and Dr. Aaron Marshall, Director of Africare, Niger.

September 4, 1996 Visited Chef du Canton of the Hamdallaye region and briefed him on the objectives of the team.

Visited Hamdallaye Watershed Project site:

(1) Plateau rejuvenation
(2) Gulley control
(3) Soil and water conservation practices

Discussed issues relating to terms of reference and writing assignments.

September 5, 1996

Visited with farmer cooperators of Hamdallaye and Falanke Beri.
Primary attention was focused on-farm soil and crop management trials in the sand valley.
Frank discussions and questions of farmer participation, acceptance and suggestions for future collaboration/interventions.

Reviewed project documents and farmer responses.

September 6, 1996

Started report preparation.

Debriefed USAID
Continued publication review and outlining of project evaluation report.

September 7, 1996

Visited and debriefed Director General of INRAN, Dr. Gouro Abdoulaye
Discussed World Bank agricultural projects in Niger with World Bank personnel.

September 8, 1996 Continued and completed first draft of project evaluation report.

September 9, 1996 Departed Niamey at 0100.
Edited the first draft of the evaluation report in Delta Airlines Courtesy room at the Paris Airport during a six hour layover.
Home arrival: Champaign, IL. 10:30 p.m. JWP
Huntsville, AL. 7:30 p.m. A.M.

September 13, 1996 Preliminary report submitted to IPMCRSP.

September 26, 1996 Final editing and transmission of report to IPMCRSP.