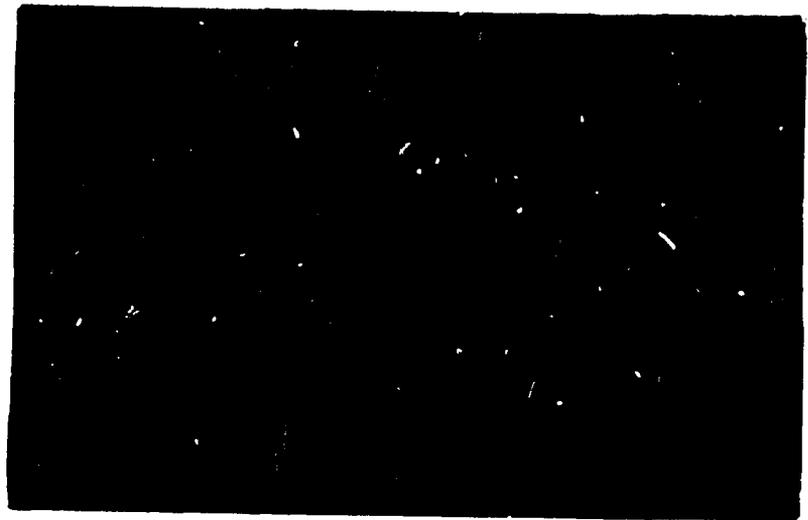
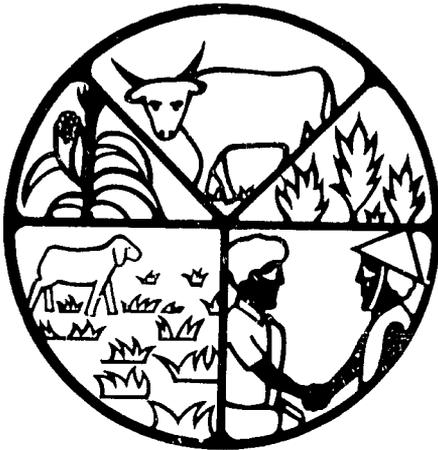


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GAMBIAN MIXED FARMING AND RESOURCE MANAGEMENT PROJECT

Ministry of Agriculture and
Natural Resources
Government of The Gambia
Consortium for International Development
Colorado State University

PDAAT-829

FINAL REPORT
RANGE ECOLOGY COMPONENT

by

Scotty Deffendol

Technical Report No. 14
May 1986

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Prepared with support of the United States Agency for International Development. All expressed opinions, conclusions and recommendations are those of the authors and not of the funding agency, the United States Government or the Government of The Gambia.

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**FINAL REPORT
RANGE ECOLOGY COMPONENT
MIXED FARMING PROJECT**

PART I - SURVEY OF OVER-ALL ACTIVITIES

INTRODUCTION

Major problems identified as constraints to an improved grazing and resource management system in The Gambia are the lack of quality forage in sufficient quantity to meet maintenance and growth requirements of large and small ruminants on a year-long basis, and the lack of sufficient basic field data to develop and implement effective grazing management plans with the existing livestock owners' associations and other cooperating groups. (PP/MFP 1979)

The thrust of the Range Management component of Mixed Farming and Resource Management Project was to work closely with Livestock Owners' Associations in identifying District range resources, developing range management demonstration trials, and demonstrating alternate cattle feeding using various crop residues and deferred range lands. Seed multiplication and technical training were also important complementary aspects of range activities from 1981 until 1986.

Maize, Forage, and Range components of MFP have cooperated in matters of seed production, forage species trials, and village cattle feeding trials. Activities have stayed clear of promoting politically sensitive issues such as water and livestock trail development, or issues such as water wells for livestock use being addressed by other development projects.

Part I is meant to describe as briefly as possible those activities implemented by the Range Ecology component, present the findings, and make recommendations. The Range Ecology component is more commonly known as the Range/Pasture component of MFP.

Recognition is given to DAH&P and DA technicians and livestockmen responsible for implementing range related activities. (Appendices 7 and 12)

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A TRIBUTE

This is a technical report, but space for tribute to a fine man must be given somewhere. The Late Musa Sawani, for three years the capable driver assigned to the Range Component of MFP, was always willing to do whatever was needed to get the job done. Musa passed away in June 1984, after a short illness that wasted away his body to skin and bone. He will be remembered by some forever.

////////////////////////////////////

LIVESTOCK OWNERS' ASSOCIATIONS (LOAs)

LOAs first came into being in 1977 through extensive efforts by DAH&P officials. Simple LOA by-laws were constructed in 1977, but loosely applied. (Appendix 13) Each administrative district has at least one LOA, some have two, some three. There are thirty-six districts in five Divisions, with a total of forty-three LOAs. (Appendix 1) In 1980 the membership was estimated at 5,380. Each has its own elected officers, including a president, vice-president, secretary, treasurer, and up to ten committee members. The district administrator, the Seyfo, acts as advisor.

Each LOA was supposed to have had a DAH&P Animal Health Care Coordinator to assist the membership technically, administratively, and to coordinate group functions. Each Division was to have a Divisional Coordinator Supervisor. Each LOA also had a buying agent who was selling animal health care commodities such as anthelmintics, mineral salt blocks, and insecticide powder. The program was set up by DAH&P and the German and Dutch governments. The revenue from commodity sales was deposited into individual LOA bank accounts to someday replace the commodities sold. This program and infrastructure has since ceased to exist.

The Gambia Livestock Marketing Board purchases livestock through the LOA organization and at one time promised to loan individual LOAs sums of money for cattle purchases. A commission of 10% was to be paid to the LOA making purchases on behalf of LMB.

It was through the LOAs that MFP implemented the range management and crop residue feeding programs. MFP limited range activities to URD and MID. The argument for not extending range programs to other divisions was simply the lack of trained field staff and supervisory personnel, and the lack of infrastructure and money to sustain a countrywide program. Sixty percent of the national cattle population is found in MID and URD. There are thirteen LOAs in MID and seven in URD, representing 2,503 members (1980).

First, MFP programs were presented to the Divisional Commissioners (administrative authorities in their respective divisions) and the DAH&P Divisional Supervisors. Mr. Momar Joof, YBK Divisional DAH&P Supervisor, and Mr. Abdou Jallow, Basse Divisional DAH&P Supervisor for extension activities, and their staffs were extremely helpful.

MFP and DAH&P conducted a series of meetings with each LOA in URD and MID. Initial meetings were to explain generally subject areas that MFP would be working in over the next five years. The second aspect of initial meetings was to present two range management proposals: 1) creation of a two hectare range management demonstration plot in each LOA, and 2) the suggestion that each LOA have regularly scheduled quarterly meetings. Implementation would be through Departments of Agriculture and Animal Health and Production. Included in the presentation was the working philosophy of the Range component, or what membership could expect from MFP and what MFP expected in return. Membership approval or rejection concerning proposals could be given to Divisional LOA supervisors.

In every case approval was given. The step by step planning and implementation of the Range Management Demonstration Plots was carried out in twelve of thirteen LOAs in MID, and six of seven LOAs in URD. MacCarthy Island at Georgetown in MID and Fulladu East at Bakadagy in URD were dropped from MFP range activities in March 1982 because of their inability to complete fencing for the range management demonstration plot.

Observed Deficiencies in LOA Organization

Deficiencies occur in the organization of the LOA as a body capable of entering into the dialogue necessary for the planning and physical implementation of their own projects. Some of these deficiencies and problems are:

- There is not a national governing body of members to oversee common interests and have a voice in the development of national projects.
- There is very little understanding concerning the roles of the elected members (the officers and committee members).
- There have been no regular meetings. Meetings are called by the president, but only after the Seyfo (LOA Advisor) concurs. Many times very few attend the meetings unless the Seyfo sends his messengers to the individuals concerned informing them of the meeting.
- Inability of majority membership to participate in group functions, especially work details.
- Inability of LOA organization to monitor monetary/banking transactions, and report back to the general membership.
- The physical size in land area of some LOAs makes communicating a problem.

The Range Unit recommended that the Socio-Economic unit of the MFP enter into an in-depth evaluation of the LOA as an organization. (See MFP Technical Report No. 5)

Working Philosophy of the Range Ecology Component, MFP

The implementation of all Range-Pasture programs within eighteen LOAs in the MID and URD has been in close coordination with personnel of the Department of Animal Health and Production. The actual field services have been carried out by Department Pasture Assistants. Each Pasture Assistant has been responsible for no less than three LOAs and has been posted within travel distance of all three.

Implementation of pasture programs depends upon the cooperation and participation of the mass membership in each LOA. No projects with individual stockmen have been undertaken. Technical proposals, resulting from dialogue between the LOA membership, Department of Animal Health and Production field staff, and the Project range management technical staff, are presented to the LOA membership for approval before steps are taken to plan implementation. The acceptability of a technical proposal and the willingness of the membership group to assist physically in the implementation are prerequisites to implementation planning.

Technical proposals may be rejected by the membership, and ultimately may not be implemented by that LOA. However, by accepting the proposal the LOA membership tells the Project staff they are ready to continue with the step by step implementation process. Each step of the implementation process is preceded by dialogue, assuring that each step of implementation is explained beforehand, and what each party (LOA and the Project) is expected to contribute is well understood. Usually there is about a one year lapse between presenting a technical proposal to LOA membership and actual implementation. An example is the Deferred Range and Crop Residue Feeding program implemented first in 1984 at Boiram-Njoben; the proposal was made one year earlier, in 1983.

The Project has not reimbursed any LOA member, or general LOA membership, for manpower in implementation procedures, as agreed to beforehand in the technical proposal and continuing dialogue.

The Project contributes technical assistance, supervision, and materials as agreed to beforehand in the technical proposal and continuing dialogue.

The long term objectives of the project, as stated earlier, are the primary concern of all technical staff activities. Adherence to stated objectives is a must. However, this does not mean that the staff cannot participate in identifying and more clearly defining other problem areas of related nature within the livestock sector. There is a willingness to give the LOA assistance in establishing dialogue concerning possible alternative solutions to problems identified as those other than of primary concern. Assistance from other national departments has been solicited.

Annual LOA Evaluation

In annual workshops held in 1982, 1983, and 1984 Pasture Assistants were asked to evaluate and rank each of the LOAs they individually worked with during the course of the year. Afterwards, the group discussed the rankings, from the best in cooperation, effort, objective understanding, and physical implementation, to the very poorest. The criteria for ranking the eighteen LOAs was based more on substance, or what was physically accomplished and maintained. The eighteen are ranked 1 (best) to 18 (poorest). (Appendix 2)

It has been observed that the work completed at a Range Management Demonstration Plot is accomplished by those farmers living near the plot, and not by the general LOA membership.

Department (DAH&P) Livestock Owners' Association Coordinating Committee

As a result of recommendations made by participants in the coordinated technical workshop held 14-16 April 1982, a coordinating committee was established with representatives from all projects working with LOAs and the DAH&P. The purpose was to find ways of coordinating various activities being implemented through the LOAs. This was an attempt to approach the LOA in a unified way, eliminate confusion in the field, and look at all the projects as a departmental function. The composition and functions of the committee were:

- Chairperson - (The Late) Mr. Pa Ceasay, Acting Director of DAH&P, or in his absence Mr. Jabel Sowe will act.
- Members
- Animal Health Care Program (operational manager and Gambian counterpart)
 - Mixed Farming Project (Range Management component)
 - Sheep and Goat Project (Mr. Omar Jallow)
 - Extension Aides, Mr. Denbo Bojang, Farmer Training Officer
 - Formal Training Officer, Mr. Abdoulaye Loum
 - Divisional Coordinating Officers

The possibility of having a representative from the Livestock Marketing Board was discussed. Due to the fact the LMB is under the Ministry of Agriculture and not the Department of Animal Health and Production, and that it is more commercial than developmental, LMB might not be interested in participating. However, an attempt was made to have someone from the LMB, preferably a decision maker, serve on the committee.

The committee also recommended that Mr. Dembo Bojang be responsible for the training of field personnel working with LOAs, coordinators, and pasture assistants. The training programs would take the form of practical technical workshops and field visits.

With the return of Mr. Abdoulaye Loum, Formal Personnel Training Officer at the school at Abuko, from his training course in Dakar, it was hoped that the formal (classroom) training of personnel could be handled through his expertise, and that he and Mr. Dembo Bojang could coordinate the whole training program.

The Abuko Training School for Livestock Inspectors and Assistants was curtailed in 1983 and Mr. Loum transferred shortly thereafter to PPMU. As a result of the loss of the formal training school at Abuko no range training programs were set up through that means. MFP staff, with assistance from DAH&P, implemented annual workshops for Pasture Assistants, selected Department of Agriculture personnel, and other invited DAH&P personnel. Field training for Pasture Assistants was handled by the range staff of MFP/DAH&P.

The committee met every first Saturday in the month at 9:00 a.m. Three such meetings had been held when it was decided that the field Divisional Supervisors for the DAH&P would attend and participate every other month.

In two DAH&P Coordinating Committee meetings held in January (7th and 12th) 1983, the agenda included the following points:

- a. Discussion concerning MFP Range/Pasture component on emphasizing concentrated efforts in limited number of Districts (LOAs) in MID and URD while maintaining minimal activity in all eighteen existing LOAs.
- b. UNSO Bore Hole rehabilitation program.
- c. Proposed LOA sheep and goat project, pilot program with women in development.
- d. The training of additional Pasture Assistants, in response to points a. and b.

Discussions were between the MFP range staff and Momar Joof (MID) and Pa Abdou Jallow (URD), Divisional LOA Animal Health Care Coordinators. Mr. Fred Lusack, MID Senior Livestock Officer also participated.

Follow-up meetings were held in Basse on 10 February, and in YBK on 14 February 1983 to discuss Points a. and b. Discussions were between Omar N'Jai, Scotty Deffendol, MFP; Momar Joof (MID) and Abdou Jallow (URD), Divisional LOA Animal Health Care Coordinators; and Fred Lusack, MID Senior Livestock Officer.

Conclusions:

- a. A more condensed but expanded range program was favored, increasing size and scope of activities in the few most receptive LOAs and maintaining others as they are.
- b. The LOA, as a group, is too large to work with. It was suggested that individual farmers, or small groups of farmers within an LOA is preferable.
- c. A proposal was made that the Project develop a modest model range scheme with the government being the tenant. It was, however, the consensus that the proprietorship should remain with the farmer, or LOA group.
- d. There was agreement that the protection of any grazing area developed would be difficult but worth giving a try.

The Department LOA Coordinating Committee became inactive in 1983 because of lack of participation by designated members.

Recommendations

Reactivate a Department level LOA coordinating committee, consisting of those departmental units actively involved with extension activities, including participation by divisional staff. Quarterly meetings are probably adequate.

Continue to work with LOA groups, maintaining momentum with existing range activities, and continue to build upon the excellent rapport established by the range field staff in MID and URD.

PERSONNEL

Technical Counterparts

The Range Ecology component of MFP started on June 22, 1981. Two counterparts were already assigned from the Department of Animal Health and Production. They are 1) Mr. Alieu Joof, Livestock Officer, 2) Mr. Omar Njai, Assistant Livestock Officer. Alieu was quickly designated for participant training and was dispatched to Colorado State University for a B.S. degree program in Range Management. He left The Gambia in August 1981 to start course work at CSU, successfully completed his B.S. in Range Management, and resumed work with DAH&P/MFP on 12 September 1983. Mr. Omar Njai, acting as the range counterpart during the absence of Alieu, started his B.S. studies in Range Management in January 1984 and returned home late in May 1986.

Shortly after the startup of the Range Ecology component, field technical personnel were identified with the DAH&P as having had some experience with rangelands and seed multiplication work started by the department and aided by Hopkins Davis in MID and URD in the mid '70s. Several individuals were interviewed, but only six were selected and formally assigned to the joint effort of MFP and DAH&P. Individual postings in MID and URD were completed by December, 1981. All six individuals had attended the training school for Livestock Inspectors and Assistants at AbuKo and had ample field experience. They had titles of Pasture Assistants. Each PA was strategically posted so as to cover three LOAs. In 1983, Karamo Bojang departed for range training in Kenya; after returning home he went to work implementing the UNSO range program. Two additional PAs were recruited, bringing the present total to seven.

Mobility was made available to each Pasture Assistant first in March 1982 and again in March 1985. Suzuki 100 motorbikes (off-road type) were made available to each technician through a revolving fund. A five year contract was made with each of the PAs through the Ministry of Agriculture and the DAH&P. The first motorbike was paid off at the end of the third year and new contracts, same terms, were established for new motorbikes.

Existing Personnel

Two senior Range Officers with B.S. level training, one mid-level technician, plus seven qualified Pasture Assistants, and nine Stockmen is the total Range Management staff of the DAH&P. (Appendix 7)

TDY Personnel from CSU

In keeping with MFP policy of limited use of TDY personnel, the Range Management component needed timely help in specialized areas: data collection, plant identification and herbarium development, computer inputs, and cartography. The individuals chosen need to be commended for jobs well done. Their work is of excellent quality.

Dr. Don Jameson contributed wisdom and ideas in field implementation and the final selection of TDY range assistance. His friendship and guidance rendered to the two participant trainees during their tenure at Colorado State University was appreciated and frequently a topic of conversation.

Lauren LeCroy (Range Scientist), assisted the field staff in collection of range biomass information, assisted with collection and identification of herbarium specimens, and developed the cataloging system for the herbarium. She organized the range resource field data for computer analysis. Her length of stay in The Gambia was ten months (July 1985 - May 1986).

Ed Riegelmann (Cartographer), developed range inventory maps to accompany Part II - Range Resource Inventory of the final report. Ed used a number of different scale aerial photos to develop a final mylar overlay for each administrative unit in MID and URD. The final map is at 1:25,000. This difficult task was completed in three months (4 March 1986 - 7 June 1986).

U.S. Peace Corps

Mike Moran (DVM), a Peace Corps Volunteer assigned to DAH&P and the MFP from April 1982 until his departure from The Gambia in May 1983, was posted on the north bank of the Upper River Division in the village of Jar Kunda. Mike assisted DAH&P and MFP personnel in Sandu and Wuli Districts to implement activities in Sandu, Lower Wuli, and Upper Wuli LOAs. Mike also completed the River Accessway Inventory in the north bank of URD.

Operation Crossroads

Jane L. Harman (DVM), an Operation Crossroads participant, voluntarily assigned herself to the Range Ecology Component from June-July 1982 and was asked to prepare a technical paper concerning The Risk of Livestock Toxicosis Resulting from Agricultural Pesticide Use in The Gambia, 1982.

Recommendations

The key to the success of the MFP is due to the linking of key activities in both the agricultural and livestock sectors, such as the cooperation between the Maize, Forage, and Range Management components in developing crop residue feeding programs. This excellent cooperation needs to continue to insure program continuity. Inter-departmental cooperation in areas of bushfire control, forestry, range, and crop residue feeding needs further development and encouragement from Ministerial levels.

The Range Ecology component, formally supported by MFP, needs formal recognition as a Unit within DAH&P and the Ministry, and desperately needs assistance to continue identification and development of range resources, deferred rangelands, crop residue feeding, and river accessways, all within the LOA structure. Of utmost importance is to retain the existing group of Pasture Assistants and Range Officers as a team, allowing them to continue to build rapport with their constituency in MID and URD.

and continue to upgrade technical skills and knowledge through regular training programs and annual workshops.

Critically needed are seven additional Stockmen to replace those permanently laid off at YBK and Giroba Kunda Seed Multiplication Plots late in 1985. They are urgently needed to assure that the seed multiplication program continues at the present rate.

The two senior Range Officers should eventually be updated to an MS level to better handle planning and research components. Both are presently well qualified to supervise implementation of range extension programs such as those started with MFP assistance.

Mid-level supervisory personnel is presently the deficiency. There should be one resident supervisor for each Division.

Eventually a total of sixteen Pasture Assistants would be needed to implement range programs in all forty-three LOAs; allowing one PA to cover three LOA areas. Additional DAH&P personnel have been identified and interviewed for positions as Pasture Assistants. They have participated in annual training workshops. If and when additional PAs are required the following individuals should be considered:

Morro Nasso, Livestock Assistant
Monodou Nyassi, Livestock Inspector
Alpha Jallow, Livestock Assistant
Jati Bakary Jobarteh, Livestock Inspector

TRAINING

There are three types of training that this component has been involved in: 1) participant training abroad, 2) field training of existing staff, and 3) the training of potential new staff and additional persons. The latter two have been combined.

Participant Training

Mr. Alieu Joof received his B.S. degree in Range Management from CSU in August 1983 and Mr. Omar Njai received his B.S. degree in RM, also from CSU, in May 1986.

Field Staff Training

Possibly the most important aspect of the range component was the field training of Pasture Assistants, prospective PAs, and other personnel from the Departments of Animal Health and Production, and Agriculture. Twelve major field training sessions were held over the five year period. (See Appendix 8 for summary of Workshops, Field Training sessions, and subjects covered therein.)

Other Training

Senior range staff members made numerous speaking, audio/visual presentations to formally organized workshops conducted by the UN (First LOA Presidents' Conference, Yundum - 1985), ITC/DAH&P sponsored Rinderpest Meeting - 1985, and the First Agro/Forestry Workshop sponsored by Peace Corps - 1986.

Also, senior staff members participated in two Farming Systems Research and Extension Training Programs conducted in-country.

HERBARIUM

Work in the range herbarium has systematically progressed during the life of the project, and certainly has taken a leap forward under the able direction of Alieu Joof and Lauren LeCroy. Old plants have been newly labelled. Total numbered plant specimens are 348, of which 316 are identified to specie. (Appendix 26) There are 135 different species or varieties of dicots and 85 monocots, of which 13 are non-grass. Two different batches of collected specimens have been sent abroad for positive identification; in June 1984 eighty-one specimens went to CSU and on to the U.S. National Herbarium, Smithsonian Institution, Washington, D.C., and in May 1985 eighty-six specimens went to KEW Gardens, London, England. Additional specimens are ready to be taken to Kew Botanical Gardens (near London) for identification, all of which will remain there once identified.

The herbarium developed by MFP is a valuable resource for training field personnel in plant identification, so necessary for the analysis and management of rangeland resources. It is desirable that the collection remain with the Range Management Unit of DAH&P, and continue to be improved. Its practical consequences for livestock production far outweigh its relationship to the plant sciences, namely agronomy.

The herbarium is currently in a steel cabinet found in the Map and Herbarium room of the Range Management Unit of DAH&P at Abuko. It must remain housed in a clean environment, free of insects.

STOCK ROUTES AND ACCESSWAYS

Stock Routes

Stock Routes are passageways to give grazing animals access through cultivated fields. Many of these corridors, or dappos as they are locally known, have retained their distinct physical character of woody growth that distinguish the "route" from the surrounding cultivated areas. Many, through years of wood cutting, fires, and cultivation, have become treeless extensions to cultivated areas.

In the late 1970's an effort was started by DAH&P to mark routes with small eighteen inch high concrete marking posts. The effort was soon abandoned when numerous controversies occurred over what constituted a stock route and a cultivated field. Also, lack of transportation for markers and supervisors was a problem.

Stock Routes, by virtue of being an animal roadway, are termed sacrifice areas in range management terminology. In this case, very heavy use of such areas by livestock during the rainy season, makes any sort of vegetal rehabilitation inappropriate. It would not be possible to establish any sort of

improved plant growth, especially those grazed by livestock, within such an area, because animals would trample or eat newly germinated or post-germinated plant material. Efforts are best put somewhere else.

Dappo development was not addressed by MFP, not because of its unimportance, but because of lack of sufficient information on their physical whereabouts in relationship to other resources and physical features. Also, apparently some controversy exists between livestockmen and villages over their location.

MFP's Resource Inventory cartography will identify stock routes.

Livestock Accessways to The Gambia River

Gambia River water should be considered the primary drinking source for large ruminants within a ten kilometer distance, and for small ruminants within five kilometers distance from the river. For the most part of MID, and certainly for the whole of URD, salinity is not a problem. Salinity is not a problem from Kuntaur eastward, and is of marginal difficulty from Kaur east to Kuntaur. However, areas westward from Kaur experience difficulty with high salinity during low water periods. Animals are still observed drinking water from sources west of Kaur during the dry season.

Livestock Accessways to the Gambia River are passageways down steep banks allowing animals to drink from the river. Few accessways have actually been improved and approaches paved with concrete. Considering the longevity of the source in terms of years of service-free availability, not to mention the unlimited accessibility in terms of quantity, the costs of developing an accessway is but a portion of the cost of one concrete lined well. Certainly for livestock watering the river makes sense.



PHOTO: Steep banks along the Gambia River offer poor access to grazing animals, taken in Upper River Division

Improvement of Existing Livestock Watering Accessways

Local Government has been making efforts in URD to develop river accessways. Several have been improved and paved since 1983.

In collaboration with LOA membership, MFP has upgraded accessways at Sukuta, Baraji Kunda, and Sutukoba. Earth removal and the resulting concrete ramp were meant to complement existing crop residue feeding programs at Baraji Kunda and Sutukoba, and the combined deferred range/crop residue feeding at Sukuta. All labor was furnished by the villages, materials and supervision were supplied by MFP. All three accessways were completed in May 1986.



PHOTO: Completing earth excavation at Sutukoba river accessway, Leon Pron, construction supervisor, shown in foreground



PHOTO: Rock foundation for concreting ramp, Baraji Kunda



PHOTO: An example of a completed accessway in Kantora District, Upper River Division

Several attempts were made at Sambatako (MID) to plan an improvement of a partially started accessway. A proposal was made at Changally Chewdu to repair an accessway constructed in 1983. Both attempts ended in failure because the villages concerned were not willing to do the physical labor required.

MFP's Range Resource Inventory cartography will identify accessways. A list of proposed accessways is presented in Appendix 4.

Recommendations

More accessways need to be developed. Observations indicate that cattle herds are concentrating in the range areas around the few existing watering points along the river. Herds have been funneled into these infrequently spaced accessways in large numbers, causing trampling of vegetation and permanent trails. Access to the river is particularly difficult during the dry season when the natural level of the river is lower and the nutritional level of the animal is also lower, causing many of the more feeble to lose their footing, falling into the river and drowning.

LIVESTOCK POPULATION

Cattle population figures are gathered each year during the contagious bovine pleuropneumonia (CBPP) vaccination campaign carried out by DAH&P. Sixty percent of the cattle population was found in MacCarthy Island and Upper River Divisions. The sheep and goat census (DAH&P, 1979) for all The Gambia puts the sheep population at 145,959, and goats at 158,095. No accurate current census information exists for horses and donkeys. (APPENDIX 5)

RANGE SEED MULTIPLICATION

Introduction

Sometime in the mid '70s the DAH&P started several seed multiplication plots mostly in MID. MFP has consolidated these plots into two. The most important and largest is at YBK (6.6 hectares) in MID and the second is at Giroba Kunda (1.2 hectares) Mixed Farming Center in URD. Both have been fenced and expanded, and have undergone extensive reorganization. The original plot at YBK was 1.2 hectares and that of Giroba Kunda was .5 hectares. Multiple small plots containing interseeded cultivars of Stylosanthes hamata were eliminated. Species such as Dolichos lablab, Phaseolus lathyroides, Centrosema pubescens, and Mucuna utilis were also eliminated.

Emphasis is on producing drought resistant perennial plant material capable of furnishing quality forage for late dry season use. Ability to withstand burning is also a desirable attribute. Plant materials grown are Andropogon gayanus var. bisquamulatus, Cenchrus ciliaris, Panicum maximum, Leucaena leucocephala, , Stylosanthes gayanensis, and small quantities of Stylosanthes scabra and Stylo. hamata.

Rather than allowing animals to graze the perennial grasses following seed collection, burning was used to control the Cenchrus ciliaris in May 1982 and again in late May of 1983, and manual cutting has been practiced since 1984. Both the Cenchrus and Andropogon were cut to a uniform stubble height and the biomass stored on wooden platforms and later offered to interested farmers for livestock feed if they would haul the material away. In 1985 the maize stover stored at the Sukuta feeding program spoiled, and the Andropogon hay from YBK was hauled to Sukuta to replace the lost maize stover. The cutting and storage is completed by March each year. Panicum maximum has not survived the cutting, and drought conditions following cutting. Each year it has been necessary to reseed. It is better suited for higher rainfall areas and different soil conditions than experienced at YBK and Giroba Kunda.

The perennial legume Stylo. scabra, though showing substantial drought tolerance and ample forage productivity, has been hampered by termites cutting down the green stalks at the root crown. This occurs in February and March every year when there is a scarcity of green plants.

A smaller plot of Stylo. hamata is maintained at YBK. S. hamata is a prolific seeder, and its annual growth form at times demonstrates year long green growth. Most foliage is lost by February and the remaining dry stems offer little forage volume as the dry season progresses.

See Appendix 6 for seed and hay production at YBK and Giroba Kunda for 1984-'85 and 1985-'86.

Seed Cultivar Sources

An order for seed cultivars was placed with Wright Stephenson LTD, Sidney, 1982, for the following seeds:

50 kilograms of Cenchrus ciliaris
25 kilograms of Stylosanthes scabra
50 kilograms of Stylosanthes hamata
10 kilograms of Stylosanthes gayanensis

An additional order was made for Stylosanthes hanata seed in 1983, but the order was lost and never received. Insurance coverage did pay for the lost shipment.

Andropogon gayanus var. bisquamulatus cultivar has always been local. Cenchrus ciliaris, Panicum maximum, and Stylosanthes hanata cultivars originated from Australia in the mid-1970s'.



PHOTO: Stand of two year old Stylosanthes scabra, and Bobo Suso, MFP chauffeur

Labor

Most functions have been performed by using hand labor at both Giroba Kunda and YBK sites. All labor requirements have been furnished by DAH&P. (Appendix 7) Seven temporary Stockmen were permanently removed late in 1985, leaving the permanent labor force at both sites very short handed. A government mandate required the DAH&P to reduce their number of personnel; temporary labor was first to go. Requests have been repeated at headquarters, AbuKo, for six additional stockmen for YBK and one for Giroba Kunda. In addition, a sine hoe and donkey have been obtained for the 1986 weeding season, in an attempt to assist the labor force with the huge task of weeding the 6.6 hectares of area at YBK.

Root Transplanting of Andropogon gayanus (Gamba grass)

Root transplanting of mature clumps of Gamba grass during the month of August has produced surviving clumps of young seed-producing plants that have survived the post-planting dry season, even after having been grazed. Over ninety percent survival occurs where the larger clump does not have to be transported in open sunlight over long distances, and where time between lifting the large stock clump and transplanting does not exceed six hours. Soils where plants are lifted and transplanted must be thoroughly wet.

The original Gamba grass at both YBK and Giroba Kunda were the result of lifting mature rooted clumps at Yundum International Airport and transporting them by MFP transport to the respective sites, where each was broken into several small root sets and transplanted. (Appendix 10) A similar attempt was made at Boiram using Panicum maximum root stock from YBK Seed Multiplication Plot. Only one attempt was made in 1984, rainfall conditions were poor, and all the transplanted root material died in the following dry season.

Planting Spacing

Soil type would dictate intervals to place the root sets. An interval of one meter would be adequate on loose sandy soils. On heavier soils fifty to seventy centimeters would be adequate spacing. At YBK Seed Multiplication Plot soils are sandy and seventy centimeters is used. Roots set in August, with a normal rainy season following, should be grazed lightly before 30 June. This helps eliminate woody growth from the basal area of the bunchgrass, and opens the plant for new leaves. Also, animals passing through the planted area will pack wind blown seeds into the soil, where they will have better chance for survival.

Sowing Spacing

Continual close sowing at fifty centimeter row intervals is recommended for range seeding of Cenchrus ciliaris, allowing two full rainy seasons before grazing. Viable seed percentages are greatly variable, usually between thirty to sixty percent. Buffel grass does not propagate naturally. Broadcast seeding does work well if soil is well plowed and fluffy, and seeds are well covered, but not deeply.



PHOTO: Cenchrus ciliaris (Australian cultivar), young stand at Giroba Kunda

Andropogon gayanus var. bisquamulatus is continual spaced sown at fifty to seventy centimeter row intervals; very light grazing can be permitted late in the dry season the first year, allowing fallen seeds to be trampled into the soil by passing animals. Gamba grass requires very little soil preparation on loose sandy soils, and will propagate naturally on such soils if seeds are lightly covered by passing animals.



PHOTO: Row spacing of Andropogon gayanus var. bisquamulatus, note cut hay (background-center), Cenchrus ciliaris hay in background to the right, photo taken at YBK

Stylosanthes spp. can be seeded either by broadcasting or sowing in rows. Soil must be lightly plowed, but since the seeds are so minute, covering of the seed is not necessary. Covering is promptly taken care of at the first rain following sowing or broadcasting. First year's growth of Stylo. hamata can be grazed following seed maturity. The perennial Stylos are best grazed for the first time following the second rainy season, but after seed maturity. Stylos are usually prolific seeders. At Kundam, the Stylo. hamata stand was attacked by fungus during the rainy season of 1984, but in 1985 there did not seem to be a re-occurrence.

The Use of Chemical Fertilizer

Prior to July 1985 no organic or chemical fertilizers had been used on either seed multiplication plot. The broadcasting of twenty-five kilograms per hectare of compound fertilizer (15-15-15) to a maturing stand of Cenchrus ciliaris in mid-July, followed two weeks later with an application of Urea at twenty-five kilograms per hectare produced 25% more seed and 20% more hay than the previous year. This was the result at YBK. (Appendix 6) Compound fertilizer (15-15-15) was broadcast over the young maturing stand of Cenchrus ciliaris at Giroba Kunda at the rate of twenty-three kilograms per hectare, with an increase by 24% of seed and 31% hay over the previous year. No urea was applied.

Two applications of chemical nitrogen at about twenty-five kilograms per hectare, three weeks apart, before major formation of seed heads of Cenchrus ciliaris will increase both seed quantity and plant biomass produced. If urea is used it must be drilled into the soil. Broadcasting urea over the plants in moist conditions would burn them.

Organic fertilizer would accomplish the same end, but the introduction of other plant seeds in the fecal material would prove troublesome.

RANGE MANAGEMENT DEMONSTRATION PLOTS

Introduction

Non-arable rangelands, now occupied by native vegetation, are currently under stress. The lands and soils have been degraded by sustained over-use and neglect, and invaded by poorer quality vegetation tolerant to bush fire and poor shallow soils. The impervious surface soils have been responsible for large runoff losses of rainfall that should be retained and stored in the soil profile. Only the deeper sandy soils retain permeability. The necessary first step in the restoration and effective utilization of these lands has been taken by MFP. The Range Management Demonstration Plots and the existing four Deferred Range Management Sites are the beginning efforts to demonstrate to the farmer forage yield advantages and to monitor vegetal and soil changes. Proper protection and management must be assured over years. Range managers should think in terms of a succession of years to allow time to make beneficial changes and develop effective strategies.

Stockmen do not associate the widespread encroachment of unpalatable herbaceous weeds, grasses, and woody plants with overgrazing and the indiscriminate use of fire. (A. Blair Rains, 1976)

Eighteen two-hectare range demonstration plots were completed in May 1982, one in each LOA, with the exception of Georgetown (MID) and Bakadagy (URD). Both Georgetown and Bakadagy were dropped in May of the same year because of their consistently not being able to get participants to complete the fencing work. One hectare of the plot is fenced and the other unfenced. Fire lanes are maintained around each plot. All eighteen plots were installed using volunteer labor from the participating LOA. Seeding, weeding, fire belt construction, and fence maintenance was accomplished by volunteer labor.

Reasons for Implementation

- Assess LOA and inter-village members' willingness to implement range management program, first on a small scale
- Assess willingness of participants to sustain small range demonstration program over a period of time
- Determine site potential
- Determine selected species' adaptability to particular site
- Develop a simple range demonstration plot that belongs to participating livestockmen, with the idea of expanding plot size and program emphasis as dictated by course of events
- Initiate dialogue and confidence within LOA membership at the time
- provide a needed service

Seeding

Portions of all the plots have been seeded with Andropogon gayanus var. bisquamulatus (Gamba grass), Cenchrus ciliaris (Buffel grass), Stylosanthes hamata (Verano stylo), Stylo. quianensis, and Stylo. scabra (Seca stylo). (Appendix 9) Results vary between plots.

Best seeding results were obtained with the passage of a donkey or horse drawn cultivator, followed by manually sowing a band of seeds directly in the path opened up between cultivator feet, allowing row spacings of fifty centimeters minimum, and seventy centimeters maximum. Depth into soil by cultivator feet should be no greater than three centimeters, preferably following post emergence of annual forbs when soil has some moisture content. Mechanical covering of seed is not necessary, this will occur naturally following a substantial rainfall.

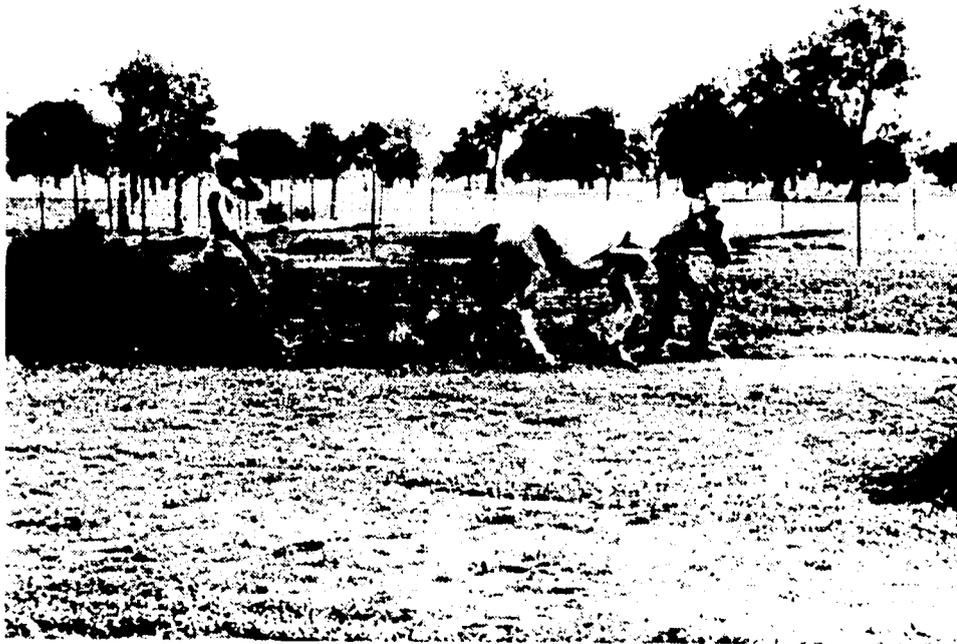


PHOTO: Typical horse drawn cultivator, crop residue storage fence in background, taken at Boiran

A first weeding should occur within five weeks of emergence and a second weeding is mandatory six weeks later. No subsequent weedings are needed for established stands. The first weeding is by hand, but the second can be handled by a donkey drawn cultivator, depending of course on the weed density.

Without post emergent weeding the likelihood of establishing a stand of plants is nil; individual plants may survive, however. With post emergent weeding and no followup weeding, the likelihood of stand establishment is dependent on height and density of competing ground vegetation.

Stylos were treated with and without nitrogen inoculants, and did equally well with either.

Two full rainy seasons are required to develop a seeded stand of legumes or grass before livestock grazing is permitted.

Shrub Control

By controlling the number of sprouting shrubs, ground level shading can be reduced, permitting reseeded or root transplanted species to more fully develop. Clear cutting of shrub only offers temporary relief from shading and soon after, sprouting multiplies and the canopy density increases, restricting passage of sunlight and limiting ground level plant productivity.

Control of shrubby regrowth of Terminalia macroptera, Guiera senegalensis, and the thick tuber rooted Icacina senegalensis proved eighty percent effective by injecting 2,4-D into the root crown. The prescribed dosage was .5 ml 2,4-D per 2.5 centimeter of stem. Injections are plant specific in that it only affects the plants injected. Injections proved most effective when made during the green leaf stage of growth.



PHOTO: Injecting 2,4-D into root crown of sprouting Terminalia macroptera tree, taken at Kabokorr

The 2,4-D used was manufactured under the name of WEEDAR 64, an amine form, 4 pounds acid equivalent per gallon, a U.S. product.

Another product proven successful, on a very small scale, at controlling plant growth, both to woody and non-woody vegetation, was a granular herbicide called GRASLAN. It is a broadcast product leached through the soil by rainfall, being picked up by emerging roots of annual weeds. Amounts applied must be carefully monitored to assure plant specific kill. This product is difficult to broadcast in controlled amounts and has only limited application in The Gambia.

Effects of Bush Fire

The Sukuta Range Management Demonstration Plot was completely burned by bush fire in January 1983, and the Piniai Deferred Range Management Site was 85% void of vegetal matter following a bush fire in March 1985. These two were the only bush fires experienced in any LOA fenced areas during MFP. The agreement with participating LOAs concerning destruction of fenced sites by bush fire was clearly understood: if any plots were burned as a result of carelessness, fencing would be removed and returned to the DAH&P, and reassigned to other areas.

Both fires occurred during the dry season, destroying the majority of biomass; little damage was sustained to the seeded stands of Cenchrus ciliaris and Stylos. No grazing was allowed in either case following the burn. Andropogon gayanus, when seeded or transplanted during the previous rainy season, had very low survival percentage. Those clumps having been established from previous years, though 90% destroyed above ground, survived.

Bush fires continue to be the major consumer of biomass in the GLUC number 4, 5/6, and 7; upland forests and forest/cropland fringes. The largest burns occur after January, but burns have been recorded in October.



PHOTO: Tree and Shrub Savanna (Land-Use Classification 6) before bushfire



PHOTO: Same Tree and Shrub Savanna LUC, after bushfire

Fencing

Fencing materials furnished by MFP were as follows:

- 2.5 meter Gmelina arborea posts, creosote treated
- 7 foot steel fence posts, "T" bar construction
- 3 foot heavy duty wire mesh
- Barbed wire
- nails and clips

- shovels, digging bar, and pick axes
- hammer, plier, and post hole driver

Fencing was installed and is being maintained by LOA members and others from villages near to the site of installation. Technical supervision is by Pasture Assistants. Fencing if maintained and used to protect community livestock pasture program remains the property of the LOA, however, at such time that fencing is no longer being used for this purpose, it will be removed and returned to the DAMRP and reallocated.

All fencing has required constant maintenance. Human destruction has been minimal except for isolated instances. The biggest problem has been the constant penetration by bush pigs, especially at the Sukuta Deferred Range Management Site.



PHOTO: Wooden corner posts and steel in-line posts supported thirty-six inch woven wire with one strand of barbed wire on top, taken at Charman

DRY SEASON CATTLE FEEDING PROGRAMS

Introduction

MFP recognizes that the livestock components are a necessary and contributing feature of balanced agricultural development. Livestock are not self sufficient on rangelands alone. They depend very heavily on the agricultural sector to provide three to four months of crop residues for feed. (TABLE: Seasonal Cattle Migration Patterns for MID and URD, p. 17) Nor is the production of crops on arable land able to survive without livestock inputs such as fertilizing and the removal of crop residues and other forage biomass from cultivated fields. This interaction and integration of both enterprises is necessary for progress in future development, and the full utilization of the natural resources.

MFP has demonstrated it is possible to maintain cattle weights during stress periods by wisely using stored maize and sorghum stover, groundnut hay, and rice straw, by feeding combinations of crop

residue: in rotation with deferred range areas, or by intelligently managing optimum numbers of cattle on deferred range areas.

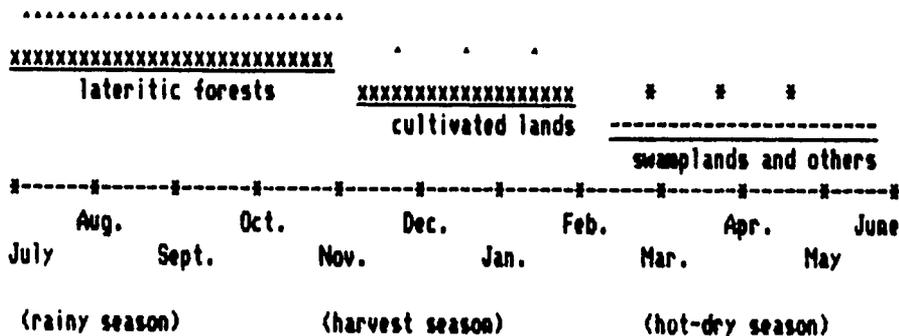
Long Term Strategy

The project strategy of MFP was to lay the groundwork for organizing community grazing management schemes. The long term strategy should be district self sufficiency, depending solely on grazing resources within a district area, and controlled and operated by local participating villages. MFP staff knew that the likelihood of organizing a large community range management program was faint during its five year tenure. But a gradual, step by step approach was wisely selected, integrating crop residue feeding with small deferred range sites. No detailed, mapped, resource data was available to assist in developing larger community range management and livestock feeding schemes. That kind of information has been developed by MFP. The alternative was to start an unorganized grazing program with little knowledge of social factors and physical whereabouts of resources.

Seasonal Grazing Pattern

Three seasonal changes occur that contribute to existing herd grazing management; 1) rainy season, 2) crop harvesting season, and 3) the dry season. Basically three major grazing migration patterns are observed in MID and URD.

TABLE: Seasonal Cattle Migration Patterns for MID and URD



Herding Practices

Herdsmen and animals are continually searching for grazing areas, shifting from the poor lateritic upland forests used in the rainy season, to the freshly harvested croplands, to the swamplands, and finally to wherever grazing can be found. (see Table above) Drinking water, or what seems to be the lack of it, is seen by most stock owners as their number one problem, followed by shortage of grazing. According to A. Blair Rains, 1976, there were few owners or herdsmen who did not complain about a serious shortage of grazing, which was attributed to the poor rains of recent years. Certainly, water availability is the single most important consideration when livestock migration decisions are being made. Availability of feed is of top priority. These two resources are often hotly debated by various interest groups within a LOA, as demonstrated during numerous meetings. (See Livestock Accessways, p. 9)

Cattle Herds

Herds can be composed of animals from several families, an extended family, or an individual owner.

Herd size for all Divisions has been documented by Rains (1976) and later by a Dutch survey team (1981). The relevance given to estimating herd sizes is to estimate the total number of grazing groups (herds) in a particular administrative area, and not to establish individual ownership. Herd size counts made on District level in URD and MID during the range resource inventory carried out by the Range component of MFP were of mature animals tethered or grazing. Only animals in herds were counted, and no distinction to sex of animal was made. Calves were counted separately. The year of count varies, depending on District. MID averaged 52 and URD 48 mature animals per herd during October - January period. (Appendix 23)

Watering livestock during the rainy season is by natural collection of rainwater, in temporary basins in upland forests. Post rainy season watering becomes more difficult as the dry season progresses. River water, seeps in tributaries, swamps, shallow wells in swamps, and deep wells are common sources, starting with the most preferred-least labor intense to the least desirable-most labor intense. Well over ninety percent of all sample plots analyzed during the range inventory were found to be no further distance from one of the above water sources than five kilometers. River water starts getting saline from Kuntaur, MID, westward, especially during low water. However, animals will still drink it.

Herders: Herdsmen are required to accompany cattle herds into the bush during the rainy season, keeping them out of cultivated areas or risk fines for destroying maturing crops. Once crops are harvested, animals are free to roam from their village bedgrounds, where they are staked through the night. After the morning milking, animals are released and are free to roam in search of food. They remain in herds, continually foraging in the bush near their bedgrounds, oftentimes without a herder, returning voluntarily during the day to drink or trailing to the River Gambia or one of its tributaries for water, returning to their bedground later in the evening to be staked-out and milked. Herders may retrieve animals for the return home. Calves forage separately from the adults during the dry season and are frequently seen scrounging for edible items near the village or bedground.

Herders may be members of an owner's family, or may be hired. They may be compensated monetarily or in kind, usually with milk or animals.

Cattle owners: Most owners do not spend time with the herd, or individual animals, this task is left to the herder. Infrequent visits are made when herds pasture away from the home village, but when herds move to the village area during the dry season, owners may visit the herd more often. They may or may not take an active role in the daily decision making concerning the herd, but when major decisions are made concerning herd movement, owners do have the final say.

In herds with multiple owners it appears that one designated owner takes charge and is the contact for the herder.

Rangeland Tenure

All animals share the rangelands with no constraints on movement, except for the cultivation season. Animals do cross international boundaries, Divisional boundaries, and District or other administrative boundaries in pursuit of water or forage.

Deferred Range Management Sites

By definition deferred rangelands are forage reserves, protected, often reseeded to improve productivity, and managed for optimum livestock grazing during a specific season of the year.

Rangelands are currently under stress. Shifting agricultural practices and the indiscriminate burning of rangelands appear to be among the main causes for the lack of adequate forage during the months of March through June, causing herds to concentrate in forage producing areas, resulting in overgrazing. All three practices have encouraged the invasion of noxious weedy plants that occur in almost pure stands, such as Cassia tora, Hyptis suaveolens, Leucosticte senegalensis, Loudetia togoensis, and Andropogon pseudopanicus, just to name a few. The absence altogether of perennial grasses such as the Andropogon gayanus varieties only emphasizes the state of the degraded rangelands. Livestock owners and herdsman find themselves faced with finding adequate pasture and stock water during the dry season, encouraging the shifting of livestock from one grazing area to another, oftentimes fiercely competing with animals already in residence there. With the emergence of early maturing annual grasses and forbs in early July, livestock cease excessive movement and usually remain in the upland forests and cultivated fringes near to their home villages during the rainy period. Generally, cattle do not migrate long distances from home base. Fallow lands are locked-in by surrounding cultivation and are only available for those animals from nearby villages that can be staked out; usually sheep, goats, horses, and donkeys.

MFP Pasture Assistants and other staff yearly evaluated the eighteen LOAs implementing the small range management demonstration plots. (Appendix 2) As a result, late in 1982 a proposal was presented to the Fulla Bantang LOA to expand their range management demonstration plot at Boiram by an additional nine hectares. The purpose was to fence a late dry season deferred grazing area that would fallow for one year and be used by a predetermined number of heifers late in the dry season, 1984. The same selected heifers would remain in the program for a succession of years, but only during the designated dry season months. The rest of the year participating animals would remain in their home herds. Work would be voluntary from the seven participating villages around Boiram. Initial allocation of heifers was based on labor furnished by the seven villages. (Appendix 16) Work began early in 1983. It was agreed that MFP would furnish fencing materials and technical assistance and the farmers would furnish land and labor needs. Boiram contributed land and most of the labor and fifteen heifers for the first year. Njoben furnished little labor and contributed five heifers. (Appendix 16) The deferred range site was used in rotation with the crop residue feeding program. Attempts to establish perennial grasses Andropogon gayanus var. bisquamulatus via root transplanting endured two early years of drought conditions to yield a stand of one and one half hectares of Andropogon gayanus in the northeast corner of the site. The Panicum maximum root transplantings (August 1983) failed, as did the earlier attempts to seed grasses and legumes. Years of drought did not help the situation.

In 1983 similar expansion programs were presented to LOAs at Karantaba Tuculur, Kumbul, Sambatako, Piniai, Sukuta, and Makama Sireh for completion in the dry season of 1984 and implementation in 1985. Several attempts were made to organize meetings at Sambatako, but each failed. No deferred range program was implemented at Sambatako. Selection of possible LOAs was based on their performance ranking. (Appendix 2) In early discussions concerning development of 10 - 15 hectare deferred range management sites a proposal was made to Makama Sireh to develop an unfenced seasonal grazing. Initially stockmen talked enthusiastically about the idea and agreed to keep their animals clear of a designated deferred site. However, as the time came to select the land, stockmen indicated they could not guarantee non-entry by passing animals. All four sites were fenced.

Conflicts in land ownership surfaced at both Makama Sireh and Kumbul. At Makama Sireh the site chosen belongs to Saikou Kamateh and family, which includes a good share of the population of Makama Sireh.

The Karmateh family voiced concern over who was to have control ultimately over the 10 hectare fenced site. Participants decided that as long as the land was used for the deferred range site, under management, there would be no problem, but when management ceased the land would again be under their control. The deferred grazing site was developed.

Kumbul, also in URD Kantora District, had worked hard to develop their range management demonstration plot and were proposed for implementing a deferred range program. The land was offered near the existing Range Management Demonstration Plot, very near to the village of Kumbul, and belonging to the family of Foday Baldeh, Fullas. However, just about every one of the larger villages participating are Sarahuli. The land offer was withdrawn because of fear that the stronger Sarahuli villages would ultimately gain full control. The deferred grazing site was not developed.

Boiram/Njoben

Four straight years of drought (1981 - 1984) has reduced the quantity and quality of available natural range forage in Fulladu West District. Cattle herds have transhumed earlier, starting in February and March, to their annual migration areas in the Casamance of Senegal and into the Niaminas'. Recent development of the Jahally/Patchar Irrigated Rice Project has greatly reduced the availability of swampland for dry season use. Traditionally the swamps, now being effectively put into irrigated rice fields, were dry season rangelands for thousands of cattle in the Fulladu West District. Boiram and Njoben livestock management has been affected by the rice cultivation program.

Drinking water for livestock can be a problem with herds drinking from river sources, hand watered in home village from deep wells, and hand watered from shallow wells bordering swamplands. Seventy-eight percent of grazing land is within one to five kilometers of a watering source, and eighteen percent is within one kilometer. (RRI, 1985) As grazing resources progressively diminish during the dry season, so do the number of herds, as they migrate to the Niaminas' or the Casamance of Senegal in search of feed and water.

Boiram was the first MFP Deferred Range Site to be expanded from the original demonstration plot of two hectares to ten hectares, and was first used by twenty heifers in February to April 1984, for 56 days, and by twelve heifers for 77 days in April through June, 1985. In 1986 there are twenty-three heifers using the site.

Alhaji Dusman Boye, Vice President of the Fulla Bantang Livestock Owners' Association and resident of Boiram, is responsible for the daily management of the range site and the residue feeding.

See Range Resource Inventory Map LOWER FULLADU WEST for location of site. The site is identified as Land-Use Classification 7, consists of one fenced parcel, rectangular in shape, and is approximately one kilometer west of Boiram.

A bull was run with the heifers during their sixty-one day tenure on the range site (1986).

History, Deferred Range Site, Boiram/Njoben

1984 (8 UBT X 56 days X 7.5 kilos biomass/day) - 20 heifers
Total Production Biomass (estimated Oct.1983).....3,500 kilograms/hectare
Total Residual Biomass (estimated May 1984).....2,960 kilograms/hectare
Stocking Rate (8 UBT).....consumed.3,360 kilograms biomass
Season of Use.....end February to mid April

1985 (6 UBT X 77 days X 7.5 Kilos biomass/day) - 12 heifers
 Total Production Biomass (estimated Oct.1984).....3,500 kilograms/hectare
 Total Residual Biomass (measured 28 June, 1985).....3,160 kilograms/hectare
 Stocking Rate (6 UBT).....consumed.3,465 kilograms biomass
 Season of Use.....Mid April to 30 June

1986 (14 UBT X est. 61 days X 7.5 Kilos biomass/day) - 22 females and 1 bull
 Total Production Biomass (measured Oct.1985).....3,310 kilograms/hectare
 Total Residual Biomass.....NI
 Stocking Rate (14 UBT).....consumed.est.6,400 kilograms biomass
 Season of Use.....May and June

Piniai/Choya

Cattle in the Niaminas' are mostly sedentary, remaining in the close proximity of home during most of the prolonged dry season, pasturing on the extensive swamplands bordering to the west, north, and south of the three administrative districts. The upland lateritic forest/tree and shrub savanna offers refuge for foraging herds during the rainy season, but annually, by February, is totally burned and offers little in the way of grazing biomass until the rains come in July.

Herds from other districts, like Fulladu West, move into swamps of the Niaminas as early as January/February in search of feed. Drinking water for animals is generally not a problem, although salinity of river sources is well above normal. Sixty-seven percent of the grazing land is within one to five kilometers of a water source, twenty-five percent within one kilometer, and eight percent greater than five kilometers from water sources. (RRI, 1982)

The original one hectare fenced range demonstration plot installed in 1982 was retained, and an additional 14.25 hectare fenced expansion was completed in 1984. Later, a second one hectare parcel was fenced within existing fence. Both two-hectare pastures were reseeded with Cenchrus ciliaris, Stylosanthes hamata, and root transplanted Andropogon gayanus var. bisquamulatus. Again, the lack of early weeding resulted in very low plant population. A good stand of Cenchrus ciliaris and Stylo. hamata is present in the original range plot, because they were properly hand weeded at post germination and at eight weeks.

An attempt to seed five hectares of gamba grass failed in June/July 1985 when promised participants repeatedly did not show to do the plowing and seeding. However, one half hectare was seeded and successfully maintained. Several individual plants exist as a result of transplanting over the past years, 1983-1985.

Seyfo, Alhaji Badjo Bah, and Sambaye! Bah, President of LOA Niamina West are instrumental figures in the range program. Tamba Chate has also been very helpful in assisting Lamin Jallow, Pasture Assistant, in completing work.

For site location see Range Resource Inventory Map, NIAMINAS. The site is identified as being in Land-Use Classification 9, an old abandoned village site.

A bull was run with the heifers during their tenure in the range site (1986).

History, Deferred Range Site, Piniai/Choya

1985 (0 UBT X 0 days X 7.5 kilos biomass/day) - 23 heifers

Total Production Biomass (measured Oct.1982).....4,450 kilograms/hectare

Total Residual Biomass (No Information).....Site Totally Burned 3/'85

Stocking Rate (0 UBT).....consumed.0 kilograms biomass

Season of Use.....Not Used

1986 (11 UBT X 45 days X 7.5 kilos biomass/day) - 18 heifers and 1 bull

Total Production Biomass (measured Oct. 1982).....4,450 kilograms/hectare

Total Residual Biomass.....No Information

Stocking Rate (11 UBT).....consumed .est.3,715 kilogram biomass

Season of Use.....Mid May to 30 June

Sukuta

Sukuta, similar to Piniai/Choya in physical setting, has abundant swampland to feed animals during the dry season, they share their dry season feeding areas with neighboring districts, and experience fire related destruction to the lateritic upland forest/tree and shrub savanna during the dry season.

Drinking water for animals is not a problem during early months of the dry season because of the availability of wet swamps, however as the dry season progresses, around March, the swamps dry up and access to river water is hampered by steepness of bank. Sixty-six percent of grazing lands are within one to five kilometers of a water source, thirty-three percent is within one kilometer of water. (RRI, 1985)

Alhaji Burema Ceesay, LOA Committee Member, and resident of Sukuta has been actively involved in developing the range program at Sukuta.

The original one hectare range demonstration plot was increased to an approximately two hectare parcel, and seeded with Cenchrus ciliaris, Stylosanthes scabra, and Andropogon gayanus var. bisquamulatus. In August 1984 and 1985, several root transplantings of Andropogon gayanus var. bisq. took place. Surrounding the two hectares on two sides is a fenced second parcel of eleven hectares. Fencing was completed in September 1984, but has been constantly under stress from resident bush pigs. Repairs are frequent. An attempt in June 1985 to open up the dense canopy by reducing the population of shrub/trees was foiled by lack of participation by farmers at Sukuta. Injectors and 2,4-D herbicide was made available for the work but labor was unavailable. Thoughts earlier turned to using solar powered electric fences to control bush pig entry, but this was rejected for reasons of safety and maintenance of the system. Meanwhile the bush pigs still roam through the fence, tearing big holes on entry and exiting.

The site is situated about 500 meters north of the village of Sukuta, on the cultivated fringe (LUC 7) of the forest type (LUC 3) to the perimeter of the flooded swamp (LUC 11). For the site location see Range Resource Inventory Map, NIANI.

History, Deferred Range Site, Sukuta

1985 (12 UBT X 58 days X 7.5 kilos biomass/day) - 26 heifers

Production Biomass (measured Dec.1985).2.37 ha..LUC 9...3,125 kilograms/hectare

Production Biomass (measured Dec.1785)..11 ha..LUC 3....5,028 kilograms/hectare

Total Production Biomass (average).....13.27 ha.....4,702 kilograms/hectare

Total Residual Biomass (measured 27 June 1985).....1,945 kilograms/hectare

Stocking Rate (12 UBT).....consumed...5,150 kilograms biomass

Season of Use.....May and June

1986 (10 UBT X 67 days X 7.5 kilos biomass/day) - 18 heifers

Total Production Biomass (average).....13 ha.....4,590 kilograms/hectare

Total Residual Biomass.....No Information

Stocking Rate (10 UBT).....consumed est.5,025 kilograms biomass

Season of Use.....Late April to 30 June

Makama Sireh

The most isolated site, situated very near the Senegalese border in Upper Wuli, north of Sutukoba. Hot, dry, dusty conditions prevail for most of the dry season.

Dry season availability of drinking water and grazing biomass is a problem. Indications are that the resource base is under stress, environmental degradation is occurring. Soil erosion rating showed 38% of samples indicating bare soil openings were large and frequently joined together, an additional 19% showed soil movement to be advanced to severe and bare ground dominating. By November 25% of the 165 samples had been heavily grazed, 22% moderately grazed, and 36% lightly grazed, grazing intensity that may be expected normally in January/February.

Animals foraging near the river have limited number of accessways. Steepness of river banks makes access impossible. Animals ten kilometers and greater away from the river are mostly watered from deep wells; some migrate daily to the river in search of pasture and water. Fifty-six percent of grazing land is within one to five kilometer of a water source, however, thirty-three percent is found beyond five kilometers from a source of water.

Participating heifers are exclusively from Makama Sireh. LDA members from adjoining villages have assisted in construction and maintenance of the fenced site, an extension of the one hectare fenced demonstration plot. Fencing around the demonstration plot remains to protect the seeded Andropogon gayanus var. bisquamulatus, Cenchrus ciliaris, Stylosanthes hamata, and Stylo. scabra. This small plot is grazed briefly during the deferred season. In July 1985 the nine hectares were plowed in irregular strips by using a donkey drawn sine hoe with cultivator attachments. Andropogon gayanus var. bisquamulatus seeds were drilled following the plow and good germination followed. However, no first or second weeding followed, and the young gamba grass seedlings were overcome by competition from the faster growing Pennisetum pedicellatum dominating the site; few seedlings survived.

Alkale Saikou Kazmateh, village of Makama Sireh, is in charge of the programs.

For site location see Range Resource Inventory Map, UPPER WULI. The site is identified as being in Land Use Classification 7, consists of one one-hectare and one nine-hectare parcels, and is about 500 meters south-east from the village.

A bull was run with the heifers during their sixty-one day tenure in the range site (1986).

History, Deferred Range Site, Makama Sireh

1985 (12 UBT X 78 days X 7,5 Kilos biomass/day) - 28 heifers

Total Production Biomass (measured Dec.1982).....2,810 kilograms/hectare

Total Residual Biomass (measured July '85).....1,650 kilograms/hectare

Stocking Rate (12 UBT).....consumed.7,020 kilograms biomass

Season of Use.....Mid-April to July

1986 (18 UBT X 61 days X 7.5 Kilos biomass/day) - 28 females and 1 bull

Total Production Biomass (estimated March 1986).....2,800 kilograms/hectare

Total Residual Biomass.....NI

Stocking Rate (18 UBT).....consumed est.8,235 kilograms biomass

Season of Use.....May and June

Crop Residue Feeding

Crop residues have not been used to any great extent by farmers in the past except for groundnut hay, fed to draft animals and small ruminants (mostly sheep) destined for religious holidays. Also, older cattle unable to keep up with foraging herds are kept in the home and usually fed groundnut hay, following the harvest season. Groundnut hay is an excellent feed, whose value is generally not recognized by all farmers. The hay is often sold to Senegalese traders by farmers whose animals later die from lack of feed. Numerous observations have shown that farmers storing crop residues, groundnut hay and maize stover, start feeding them too soon, in December and January. Under normal climatic conditions range animals start coming under feed stress in April. Visible signs of feed stress are protruding ribs and hip bones, saggy, straw colored coats, and weak condition.



PHOTO: Traditionally crop residues have been left in fields to be trampled and foraged upon in November to January



PHOTO: Good quality groundnut hay, stored traditionally



PHOTO: Protruding ribs and hip bones, feed stress symptoms, taken in Makama Sireh, March 1984

Animal Unit (AU) and UBT (Unitaire Bovin Tropicale) are synonymous, both mean an animal of 250 kilograms live body weight.

Feed rations are calculated at two percent (2%) UBT for supplemental feeding and three percent (3%) for full feeding, both are maintenance rations.

Boiram/Njoben

In the Boiram experience of 1984, the twenty heifers of the control group lost 201 kilograms, and the

twenty in the fed group lost only forty kilograms over the 182 day trial period. In general, the fed animals lost weight on the maize stover, gained on the sorghum stover, maintained weight fifty-six days on the deferred range site, and all but the older animals gained weight on the sorghum/rice straw/groundnut hay mix for the final fourteen days. The one year old calves all gained weight the final fourteen days, because they had unlimited access to the crop residues. There was no reliance on man to feed them.

In 1985 - a total of ninety heifers participated for a total of ninety-nine days on a combination crop residue feeding and deferred range program. The thirty-nine head fed and monitored for ninety-nine days gained an average of five grams per day, and the seven control animals monitored lost an average of three grams per day. Also, in the second year of implementation, participants experienced difficulties in collecting and storing of maize stover and groundnut hay. Several lots of maize stover had been field stored with no physical barrier to keep animals out; before it could be transferred to the central storage area most had already been consumed by foraging animals. Normally, transfer of crop residues is by donkey cart. Farmers complained of cart tire problems, locally available, sometimes not, but to them too expensive. MFP purchased used tires off the Black Star Line ship when calling at Banjul Port, and made them available for twenty-nine Dalasis (29.00) each. All were sold, and more were asked for. Groundnut hay was collected and stored inside the storage area in adequate amounts to meet the fourteen day feeding at the end of the program. Mysteriously, the entire stock disappeared by mid-May. As a result animals remained on the deferred range site an additional twenty-four days.

The recommended three month feeding strategy for 1 - 3 year old heifers:

April.....	feed 28 days....	maize stover (useable biomass, at 3% UBT)
May/June....	feed 49 days....	deferred range site
June.....	feed 14 days....	groundnut hay (useable biomass, at 3% UBT)
Total		91 days

The actual feeding was modified because of lacking groundnut hay:

April.....	fed 28 days....	maize stover (useable biomass, at 3% UBT)
May.....	fed 10 days....	on forage research plot
May/June....	fed 77 days....	deferred range site
Total		115 days

Both rations were for maintenance of body weight.

During the first year of the feeding and deferred range program it was observed that weights of the control group did not start to drop until the end of March (1984). As a result, the following year's prescribed feeding period was changed to April through June.

Watering of the heifers has continually been a problem. Dry season water for all livestock in Boiram/Njoben is drawn from open wells either by hand or by animal traction, usually horses, and hauled to the feeding sites by donkey cart. Cement water troughs have been constructed at both the range site and the crop residue feeding area. Each trough holds 600 liters of water. Discussions concerning who is to water the animals surface each year. In 1985 participants from Njoben were asked to pay those in Boiram to lift and haul water to the sites. Njoben refused. Only one of the four stockmen from Njoben participated. Another hassle, the same year, concerned pay back of the previous year's fertilizer loan for the maize package program. Those refusing to pay their fertilizer loan pulled out of the feeding program.



PHOTO: Cattle watering trough constructed by MFP at Boiram crop residue feeding site, from L to R in photo; Malang Sanneh (PA), unidentified boys behind Malang, Alhaji Ousman Boye (VP, LOA), Alieu Joof (Range Officer, DAH&P), Sait Swere (Ag.Demonstrator, Boiram)

Piniai/Choya

Piniai/Choya participants enthusiastically collected and stored large amounts of maize stover (almost five tons) and groundnut hay (one half ton) for the 1985 dry season. An existing abandoned well was deepened and repaired, and a concrete drinking trough constructed with materials and expertise furnished by MFP.

Twenty stockowners from eleven villages in Niamina West District brought twenty-three heifers to be placed in the feeding program. The participants had hired a Fulla herder to attend to the care of the animals, the feeding and watering. Four days later, on 10 March, the animals were quickly released from the fenced feeding area before a raging bushfire consumed them. The animals escaped unharmed, but wooden posts, pastures, crop residues, spring scales, and fencing equipment were all destroyed by fire. In the weeks that followed the fire, stockmen quickly replaced the burned fence posts and repaired the fence.

Alhaji Badjo Bah, the Seyfo in Niamina West, at Piniai, and Sambayel Bah, the President of the LOA in Niamina West, have been particularly instrumental in developing range activities in the District.

Sukuta/Tuba Kuta

Sukuta/Tuba Kuta in 1985 had collected and stored two tons of maize stover, conventionally stored horizontally on wooden platforms. Late heavy rains came in November ('84) causing most of the stacked stover to dry rot. All but 420 kilograms dry rotted. Sixteen hundred kilograms of gamba grass hay produced at YBK was transported to Sukuta by MFP transport as substitute for the spoiled stover.

The feeding strategy for the eighty-seven day period:

first 3 days.....maize stover (useable biomass, at 3% UBT)
26 days.....Gamba grass hay (75% useable, at 3% UBT)
48 days.....deferred range site
last 10 days.....deferred range site plus rice straw
Total 87 days

Average animal daily gain for the eighty-seven day program was .11 kilogram.

The control group was of insufficient numbers to give a good comparison of gain between fed and unfed animals.

The fed group was watered daily from The Gambia River, trailing five to six kilometers, round trip, to an accessway being developed jointly by the village of Sukuta and MFP.

Participating stockmen engaged a herder to oversee feeding and watering of heifers. Position is not full time.

Alhaji Eburayma Ceesay, Sukuta, was an instrumental figure in getting the range work implemented.

Makama Sireh

Makama Sireh stockmen were by far the most reluctant group to start the feeding program. Located in the more remote section of the country, in Upper Wuli District, on the north bank of Upper River Division, very near the Senegalese border. Major constraints are the shortages of dry season forage and water, brought on primarily by expanding populations, both human and livestock. Livestock are watered exclusively from wells from November through June. The same wells furnish water to the human population.

The 1984 cropping season was a poor one for maize. Coupled with the reluctance of local leaders to collect and store the stover, only two hundred kilograms of maize stover was collected and stored in the designated storage area. As a result twenty-eight heifers started directly on the deferred range area on the 17th of April and came off on 3 July (seventy-eight days). No body weights were recorded because of lack of scales in the area. Girth measurements were taken at the beginning and end. Over the seventy-eight days the average animal girth measurement was reduced by (-) .02 centimeters. No control group was ever established.

Drinking water was hauled in 50 gallon barrels by donkey cart to a provided concrete trough in the deferred range site. The last week spent on the range site, animals were trailed to a rain-fed water hole about one kilometer away.

All activities were under the direction of the village alkalo, Seku Kamateh.

The 1986 residue collection turned out to be more fruitful. A total of two tons of maize stover was collected and stored in eight compounds. This year's effort signals a reluctance on the part of individuals to collect and store maize stover communally. Some individuals participating in the feeding program neither have stover of their own, nor wish to help others with the collection and storage process. Also, some individuals have been accused of overusing their daily share of stover.

On May 1, 1986, the same twenty-eight heifers and one bull were turned into the deferred range site for sixty-one days, after which they will feed on the stored maize stover.

Supplemental Village Feeding

Four villages in Kantora District and five villages in Upper Wuli District collected and stored crop residues for supplementing heifers' diets late in the dry season of 1985. (Appendix 20) MFP's recommendation of supplementing the daily range diet of participating heifers was mostly followed, but feeding methodology differed from village to village. Some villages tethered heifers inside an enclosure. Once or twice a day individual owners placed a quantity of crop residue before their animal(s). An amount of two kilograms of maize stover was recommended for each animal per day, or about two percent of a ninety kilogram animal. Remembering that only about forty to fifty percent of maize stover is useable by cattle, various bundles of maize stover and rice straw were weighed until an appropriate hand bundle size was demonstrated to the farmer. The recommended ration was more than met. Other villages simply allowed all animals to enter the storage area freely, eating from stocks of residue at will. This practice is unacceptable and results in wasting potential stover.

Animals were in good condition following the feeding that lasted an average of 4.74 weeks for 139 heifers, and started the first week in May. The nine villages collected 28,059 kilograms of crop residues; eighty percent was maize stover.

MFP furnished steel fencing for eleven individual storage enclosures, or 1,038 linear meters of woven and barbed wire and 300 steel fence posts, 1500 clips, and six kilograms of U-nails.

In the 1986 supplemental feeding program, twenty-eight villages participated, collecting and feeding an estimated 85,000 kilograms of crop residues. (Appendix 21) Ninety-five percent was maize stover. Over fifty percent of this year's stored residues were offered to animals before April first, mostly in Kantora District. No information was available concerning number of animals fed and for how long. An additional 1,816 linear meters of woven and barbed wire and 454 steel fence posts, 2,270 clips, and ten kilograms of U-nails were issued for seventeen additional crop residue storage enclosures.

The use of crop residues, stored and protected by village units or individual compounds, and fed the latter weeks of the dry season, or just before the rains, has proven to be very popular with stockmen.

CONCLUSIONS

Crop residues are abundant at harvest time, but improperly used as forage at a time of year when other, natural plant growth is abundant. There are not enough residues to feed every animal during the critical dry season, therefore the farmer must make a decision as to which animal(s) is to be fed. MFP has encouraged farmers to collect and store their crop residues and feed their future female breeding stock during the late dry season. Feeding of heifers started around one year of age.

Feeding trials conducted by MFP have shown that maize stover, sorghum stover, rice straw, Andropogon gayanus hay (gamba grass) and groundnut hay can maintain livestock weight through the dry season. MFP recommends early feeding of maize stover to heifers. In the case of Boiram (1984 and 1985) maize stover was fed the first twenty-eight and twenty-four days, respectively. Animals consistently produced slight body weight reductions, but always good to excellent body condition.

Stockmen were surprised with the palatability of the maize stover and the acceptability to the heifers once animals got used to eating it. Also, the animal condition was impressive following only three weeks of eating. Rice straw fed in the later stages of the dry season resulted in no body weight loss.

The fact that thirty-three villages in eight administrative districts participated in either crop residue storage and feeding or deferred range programs in 1986 is significant. Many additional villages are storing maize stover in traditional fencing and on platforms within their compounds, free from any assistance from MFP extension agents.

An interesting evolution has occurred pertaining to crop residue storage and feeding. The initial emphasis was to get groups of villages working together to collect and store residues, later fed to collective groups of heifers. The very next cropping season individual villages communally collected and stored the residue, sharing it unequally. And this year (1985-1986) individual compounds collected and stored the residue, feeding it to their animals only.

Even individual heifers participating in the deferred range programs at Boiram and Pinjai are being fed residues in the home compound, or village, before being moved to the deferred range site. Previously all animals started the crop residue feeding together in a communal feeding and storage area. More residues are being collected and stored now by villages than by groups of villages.

The backbone of the range program has been the Pasture Assistants who are posted in the area and have from two to three LOA groups to take care of. Continued success of the feeding program hinges on continued professional visits by the PAs. Farmers have seen the beginning of the concept but they need follow-up visits to sustain their efforts.

RECOMMENDATIONS

Inter-departmental cooperation in practical areas of bushfire control, forestry, range, and crop residue feeding needs further development and encouragement from Ministerial level. Of utmost importance is to maintain the momentum started and sustained by MFP by retaining the existing group of Pasture Assistants and Range Officers as a team, allowing them to continue to build rapport with their constituency in MID and URD, and to continue to upgrade their technical skills and knowledge through regular training programs and annual workshops.

Theoretical and research elements concerning identification of natural resources, range and forest inventories need completing and continual up-dating, plant identification and cataloguing needs continued work.

More river accessways need to be planned and constructed, but only with complementary deferred range and crop residue feeding programs. All activities need to be implemented by farmer/stockmen groups, affiliated with LOAs.

Re-seeding and root transplanting of perennial forage species needs to continue over the years within protected deferred range sites. Complementary seed multiplication efforts at YBK and Giroba Kunda will assure an adequate supply of seed if these infrastructures are maintained. Their maintenance is minimal, requiring mostly manpower needs, including ample supervision.

MFP recommends feeding crop residues to heifers during April, May, and June. Stored crop residues should be properly rationed to recipient animals so as to allow continual daily feeding until the feed stress period has passed. Feed maize stover initially, at three percent UBT, saving groundnut hay until the latter days of June. Where possible, groundnut hay can be fed in smaller daily portions, and rice straw and other crop residues can be fed at two percent UBT, making up the required difference, as filler.

It is not, at this point in time, a necessity to enlarge the range effort into other Divisions; a more likely direction might be to continue to build village level deferred range sites, complementing them with a crop residue feeding program, and river accessways in the MID and URD areas. Ultimately village range and feeding programs need to be integrated into a District Resource Management Plan. More available use of the river should be made to livestock, but no indiscriminate use. Developing village resource management awareness will solidify existing efforts and gain more practical knowledge before an attempt is made to expand District level programs into the rest of The Gambia.

Part two of Final Report, The Range Resource Inventory - MID and URD, will make specific recommendations concerning district range resources.



PHOTO: Village crop residue storage, maize stover with rice straw on top , taken in Sutukoba village



PHOTO: Village crop residue storage unit, taken at Koli Kunda



PHOTO: Village crop residue storage, maize stover on platform, and rice straw on ground, taken at Setukoba number 2



PHOTO: Crop residue storage on platform, background, taken in Makana Sireh

APPENDICES TO FINAL REPORT
RANGE ECOLOGY COMPONENT
GAMBIAN MIXED FARMING AND RESOURCE MANAGEMENT PROJECT

Appendix 1

LIVESTOCK OWNERS' ASSOCIATIONS

1980

Division	District LOA	President	W/Qtrs	Enroll
Western	Foni Jarrol	Yusupha Sanyang	Kalaji	156
Western	Foni Bondali	Lamin Sanneh	Bondali	144
Western	Foni Kansala	Momodou Bojang	Bwiam	201
Western	Foni Bintang Karanai	Masire Badji	Sibanor	140
Western	Foni Brefet	Musa Kolley	Ndembani Jolla	132
Western	Kombo East	Alhaji Kamsu Jabang	Pirang	107
Western	Kombo Central	Bolong Jarumseh	Brikama	111
Western	Kombo South	Malanding Demba	Sifo	168
Western	Kombo North	Alhaji Abdou Sisay	Sukuta	105
Western	Kombo St. Mary	Madi Joof	Bakoteh	110
North Bank	Lower Niimi	Alhaji Ousman Betay	Chamen	155
North Bank	Upper Niimi	Alhaji Sukun Bah	Lamin	143
North Bank	Jokadu	Alhaji Amadou Kebbeh	Munyangen	102
North Bank	Lower Badibu	Alhaji Kairaba Makalo	Saba	110
North Bank	Central Badibu	Biji Penda Jallow	Ker Katim Fulla	115
North Bank	Upper Badibu	Momodou Kumba Bah	Duta Bulu	130
North Bank	Upper Badibu	Jangarido Bah	Dibba-kunda Fulla	121
Lower River	Kiang West	Momodou Ceesay	Keneba	70
Lower River	Kiang Central	Massaneh Konta	Kwineilla	112
Lower River	Kiang East	Alhaji Saikou K. Sanneh	Kaiaf	106
Lower River	Jarra West	Alhaji F. Saidiba	Soma Madina	110
Lower River	Jarra Central	Alhaji B. Jallow	Madina	118
Lower River	Jarra East	Alhaji S. Sanneh	Bureng	103
MacCarthy Is.	Niamina Dankunku	Ello Jallow	D/kunku F/kunda	135
MacCarthy Is.	Niamina West	Samba Y. Bah	Piniai	122
MacCarthy Is.	Niamina East	Alhaji K. Suma	Sotokoi	104
MacCarthy Is.	Lower Fulladu West	Bori Dem	Fulla Bantang	205
MacCarthy Is.	Lower Fulladu West	Alhaji Falai Baldeh	Sare Ngai	-
MacCarthy Is.	Upper Fulladu West	Sara Baldeh	Sare S/Tako	155
MacCarthy Is.	Niani	Kolly Bah	Kuntaur	168
MacCarthy Is.	Nianija	Samba York	Sinchu Demba	110
MacCarthy Is.	Upper Saloum	Alhaji S. Leigh	Leba	120
MacCarthy Is.	MacCarthy Is.	Jukung Jobarteh	Georgetown	60
MacCarthy Is.	Lower Saloum	Yoro Sey	Gorekura Tokolor	109
MacCarthy Is.	Sami Nana	Nofonye Jallow	Jamely Babou	100
MacCarthy Is.	Karantaba	Ba Mandou Gano	Karantaba T/kunda	116
Upper River	Sandu	Mutaga Bah	Sare Mataga	118
Upper River	Kantora	Foday Jawo	Jawo Kunda	181
Upper River	Tumana	Demba Sumareh	Dingirin	145
Upper River	Jimara	Alhaji J. Drammeh	Bakadaji	145
Upper River	Basse	Alhaji M. Baldeh	Masajang Kunda	181
Upper River	Upper Wuli	Amadou Jallow	Sare Bohum	115
Upper River	Lower Wuli	Demba Sowe	Sankabare	112

Appendix 2

PERFORMANCE RANKING OF LOAs

LOA	Div.	Year	Rating	Year	Rating	Year	Rating
Karantaba Tuculur	URD	1982	1	1983	11	1984	11
*Boiram	MID	1982	2	1983	1	1984	1
*Piniai	MID	1982	3	1983	2	1984	2
Kumbul	URD	1982	4	1983	8	1984	8
*Makama Sireh	URD	1982	5	1983	5	1984	5
Sabi	URD	1982	6	1983	14	1984	14
Sambatako	MID	1982	7	1983	17	1984	17
Njau	MID	1982	8	1983	6	1984	6
Jar Kunda	URD	1982	9	1983	12	1984	12
Diabugu	URD	1982	10	1983	13	1984	13
Charmen	MID	1982	11	1983	7	1984	7
Konko Duma	MID	1982	12	1983	18	1984	18
Sare Ngai	MID	1982	13	1983	9	1984	9
*Sukuta	MID	1982	14	1983	3	1984	3
Maunda Kunda	MID	1982	15	1983	15	1984	15
Balanghar	MID	1982	16	1983	16	1984	16
Kundan	URD	1982	17	1983	4	1984	4
Dankunku	MID	1982	18	1983	10	1984	10

* Deferred Range Management Areas

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Appendix 3

COLLECTION OF RANGE INVENTORY DATA BY YEAR

Sample Yr.	District	Division	**Hectares	RI-Hectares	No. Writeups
1982	Niamina Dankunku	MI	13,030	12,909	27
1982	Niamina West	MI	14,310	14,440	36
1982	Niamina East	MI	31,690	37,763	91
1982	Wuli (Lower)	UR	53,730	23,982	99
1982	Wuli (Upper)	UR	-	34,207	105
1983	Kantora	UR	33,075	30,065	66
1983	F-East (Tumana)	UR	40,275	27,690	50
1983-'84	F-East (Basse)	UR	-	21,519	72
1984	F-East (Jimara)	UR	40,275	29,586	45
1984	Sandu	UR	32,985	32,887	101
*1985	Sani	MI	46,865	49,373	134
*1985	Fulladu West	MI	79,055	78,837	188
*1985	Fulladu West	MI	-	-	-
*1985	MacCarthy Island	MI	1,165	1,042	13
*1985	Niani	MI	42,455	43,004	105
*1985	Nianija	MI	12,010	13,491	53
*1985	Upper Saloum	MI	27,760	26,469	87
*1985	Lower Saloum	MI	16,985	15,830	61
	<u>18</u>	<u>2</u>	<u>**485,665</u>	<u>***493,094</u>	<u>1,333</u>

(***506,300)

- * Two Collection Teams
- ** Land Resource Study 22
- *** Gambian German Forestry Project
- **** MFP Range Resource Inventory, LUC hectares, excluding LUC 13
(Presently lacking surface hectares for upper-most part of Upper Wuli, around Makama Sireh, to Senegalese border)

Appendix 4

PROPOSED LIVESTOCK ACCESSWAYS

Upper River Division

Sandu District
(1983)

- Darsilami Tenda
- Changally Lankadi (completed 1983)
- Kossemar Tenda
- Diabugu Tenda (completed 1984)
- Banatenda
- Alimaka
- Sami Wharf Town

Kantora District

- Garawal Tenda (accessible)
- Koina Tenda
- Sami Tenda
- Keneba Tenda (Rock concrete apron)
- Fania Tenda
- Baraji Kunda (MFP, 1986)

Wuli District

- Koina Tenda
- Kenniba
- Madina Yero east
- Fatoto (accessible)
- Madina Yero west
- Sutukoba south-east (MFP, 1986)
- Perai Tenda
- Fatta Tenda (Badja Kunda south)
- Kusi south-east
- Limbambula Bamo east
- Limbambula Yamadu east
- Dumboto (north Basse ferry)

Appendix 5

TABLE: CATTLE NUMBERS 1974, 1978, AND 1984 BY DIVISION AND DISTRICT

<u>Division</u>	<u>District</u>	<u>1974</u>	<u>'78-'79</u>	<u>'83-'84</u>	<u>'78-'84 Change</u>
Western	Foni Jarrol	-	2,477	2,393	(-) 84
"	Foni Bondali	-	2,517	1,849	(-) 668
"	Foni Kansala	-	3,263	3,500	(+) 237
"	Foni Bintang Karari	-	5,392	5,744	(+) 352
"	Foni Brefet	-	3,830	4,553	(+) 723
"	Kombo East	-	5,460	5,997	(+) 537
"	Kombo Central	-	5,204	4,593	(-) 611
"	Kombo South	-	7,973	6,526	(-) 1,447
"	Kombo North	-	5,674	3,788	(-) 1,966
"	Kombo St. Mary	-	1,569	2,408	(+) 839
"	TOTAL	57,035	43,359	41,271	(-) 2,088
Lower River	Kiang West	-	3,420	2,361	(-) 1,059
"	Kiang Central	-	3,427	3,733	(+) 306
"	Kiang East	-	1,767	2,291	(+) 524
"	Jarra West	-	4,680	4,114	(-) 486
"	Jarra Central	-	2,921	3,624	(+) 703
"	Jarra East	-	9,309	5,155	(-) 4,154
"	TOTAL	20,920	25,444	21,278	(-) 4,166
North Bank	Lower Niuni	-	12,672	9,816	(-) 2,856
"	Upper Niuni	-	5,291	4,663	(-) 628
"	Jokadu	-	6,811	6,268	(-) 543
"	Lower Badibu	-	2,929	1,874	(-) 1,055
"	Central Badibu	-	4,248	4,854	(+) 606
"	Upper Badibu	-	13,781	11,857	(-) 1,924
"	TOTAL	45,640	45,732	39,332	(-) 6,400
MacCarthy Is.	Niamina Dankunku	-	3,048	3,213	(+) 165
"	Niamina West	-	5,348	4,223	(-) 1,125
"	Niamina East	-	7,395	8,146	(+) 751
"	Fulladu West	-	40,298	30,706	(-) 9,592
"	MacCarthy Is.	-	642	310	(-) 332
"	Sani	-	13,882	9,400	(-) 4,482
"	Niani	-	11,490	9,118	(-) 2,372
"	Nianija	-	5,107	5,219	(+) 112
"	Upper Saloum	-	9,020	8,778	(-) 242
"	Lower Saloum	-	5,510	3,876	(-) 1,634
"	TOTAL	81,740	101,740	82,989	(-)18,751

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Appendix 5 continued

Upper River	Fulladu East	-	39,520	32,953	(-) 6,567
▪	▪				
	Kantora	-	12,753	10,789	(-) 1,964
▪	▪				
	Wuli	-	21,979	17,734	(-) 4,245
▪	▪				
	Sandu	-	13,045	8,985	(-) 4,060
▪	▪				
	TOTAL	65,755	87,297	70,461	(-)16,836
	COUNTRY TOTAL	271,090	303,572	255,331	(-)48,241

1978/79 and 1983/84 cattle population figures come from the Bureau of Statistics, DAH&P.

1974 figures were estimates found in Land Resource Study No. 22.

Appendix 6

RANGE SEED MULTIPLICATION PLOTS

Seed & Hay Production

'84-'85 and '85-'86

<u>Yr.</u>	<u>Div.</u>	<u>Plot</u>	<u>Genus</u>	<u>Ha.</u>	<u>Urea Kg.</u>	<u>Comp Kg.</u>	<u>Sd. Kg.</u>	<u>Hay Kg./ha.</u>
'84/'85	MID	YBK	<u>An. gay. bisq.</u>	.96	none	none	148	1,600
'84/'85	MID	YBK	<u>Cen. cil.</u>	.79	none	none	23	1,600
'84/'85	MID	YBK	<u>Pan. max.</u>	.15	none	none	22	1,500
'84/'85	MID	YBK	<u>Stylo. ham.</u>	.25	none	none	5	none
'84/'85	MID	YBK	<u>Stylo. scab.</u>	.10	none	none	none	none
'84/'85	MID	YBK	<u>Leuc. leu.</u>	.12	none	none	10	none
'85/'86	MID	YBK	<u>And. gay. bisq.</u>	2.0	none	none	197	2,000
'85/'86	MID	YBK	<u>Cen. cil.</u>	2.5	25kg/ha	25kg/ha	45	2,000
'85/'86	MID	YBK	<u>Pan. max.</u>	.45	none	none	34	no cut
'85/'86	MID	YBK	<u>Stylo. ham.</u>	.50	none	none	5	none
'85/'86	MID	YBK	<u>Stylo. scab.</u>	.05	none	none	none	none
'85/'86	MID	YBK	<u>Leuc. leu.</u>	.12	none	none	20	none
'84/'85	URD	G.K.	<u>And. gay. bisq.</u>	.56	none	none	83	2,000
'84/'85	URD	G.K.	<u>Cen. cil.</u>	.32	none	none	11	350
'84/'85	URD	G.K.	<u>Pan. max.</u>	.17	none	none	32	750
'84/'85	URD	G.K.	<u>Stylo. scab.</u>	.05	none	none	2	none
'85/'86	URD	G.K.	<u>And. gay. bisq.</u>	.60	none	none	109	2,900
'85/'86	URD	G.K.	<u>Cen. cil.</u>	.50	none	23kg/ha	31	1,600
'85/'86	URD	G.K.	<u>Pan. max.</u>	none	none	none	none	none
'85/'86	URD	G.K.	<u>Stylo. scab.</u>	none	none	none	none	none

Key: Yr. (year)
 Div. (Division)
 Ha. (Hectares)
 Kg. (kilograms)
 Comp. Kg. (Compound fertilizer 15-15-15, kilograms)
 Sd.Kg. (seed produced in kilograms)
 Hay Kg./ha. (hay produced in kilograms per hectare)

Appendix 7

RANGE MANAGEMENT (DAH&P), AND FORAGE COMPONENT PERSONNEL (DA)

<u>Name</u>	<u>Position</u>	<u>Posting</u>	<u>Div.</u>	<u>LOA</u>	<u>Site</u>
<u>DAH&P</u>					
Alieu Joof	Range Officer	Abuko	MI/UR	18	ALL
Onar Njai	Range Officer	Abuko	MI/UR	18	ALL
Karamo Bojang	Junior Range	UNSO	MI	Dankunku	-
Seedy Fatty	PA/LI	Charmen	MI	Kaur,Njau,Charm.	Bal.,Njau,Charm.
Monodou Fofana	PA/LI	YBK	MI	Kuntaur	Sukuta/YBK
Lamin Jallow	PA/LA	Well/Dank.	MI	D/kunku,Pin.,Kud.	Dank.,Pin.,Maoun/K.
Onar Janneh	PA/LI	Basse	UR	Tumana,Basse	Kundan,G.K.,Sabi
Monodou Jobe	PA/LI	Fatoto	UR	Up. Wuli,Kant.	Makana, Kumbul
Demba Manneh	PA/LI	Bansang	MI	Sani/Sambatako	Kar.Tuc.,K.D.,S/T.
Malang Sanneh	PA/LI	G/Town	MI	S/Ngai,F/Bant.	S/Ngai,Boiran
Vacant	PA/LA	Diabugu	UR	Sandu/Jar Kund.	Sandu/Lower Wuli
Lang Janneh	Stockman	YBK	MI	none	Seed Multiplication
Soto Bojang	Stockman	YBK	MI	none	Seed Multiplication
Sossi Bumaso	Stockman	YBK	MI	none	Seed Multiplication
Sulayman Faal	Stockman	YBK	MI	none	Seed Multiplication
Malang Ceesay	Stockman	YBK	MI	none	Seed Multiplication
Samuel Gomez	Stockman	YBK	MI	none	Seed Multiplication
Lamin Darboe	Stockman	YBK	MI	none	Seed Multiplication
Gallo Bah	Stockman	YBK	MI	none	Seed Multiplication
Vacant	Stockman	YBK	MI	none	Seed Multiplication
Vacant	Stockman	YBK	MI	none	Seed Multiplication
Vacant	Stockman	YBK	MI	none	Seed Multiplication
Vacant	Stockman	YBK	MI	none	Seed Multiplication
Vacant	Stockman	YBK	MI	none	Seed Multiplication
Vacant	Stockman	YBK	MI	none	Seed Multiplication
Abdoulie N'Goum	Stockman	Giroba K.	UR	none	Seed Multiplication
Vacant	Stockman	Giroba K.	UR	none	Seed Multiplication
Bobo Suso	Driver	Abuko	MI/UR	all	all
<u>D/AGRICULTURE</u>					
Bambo Ceesay	Ag. Officer	Abuko	ALL	ALL	Crp. Res.
Lamin Jobe	Ag. Assistant	Brik. Ba.	MI	Fulladu West	Crp. Res.
Sheik Onar Faye	Ag. Assistant	Sapu	MI	Fulladu West	Crp. Res.
Monodou Sabally	Ag. Demonstr.	Boiran	MI	Fulladu West	Boiran
Sait Swere	Ag. Demonstr.	Boiran	MI	Fulladu West	Boiran

Appendix 8

SUMMARY OF WORKSHOPS AND FIELD TRAINING SESSIONS

<u>Training</u>	<u>Date</u>	<u>Activities</u>
Workshop	15-16 Jan. '82	-Fencing techniques -9 participants
Field	4 Feb. '82	-Fencing plot at Dankunku LOA -25 participants
Field	Feb./Mar. '82	-Fencing training, each PA on first LOA Plot -21 sessions conducted
Workshop	14-16 Apr. '82	-Coordinated technical workshop co-sponsored by DAH&P projects; Animal Health Care, and MFP -58 participants
Field	11-12 May '82	-Seedbed preparation and seeding procedure -Plot design -9 participants
Workshop	20-24 Sep. '82	-Critiqued '81-'82 workplan -Discussed '82-'83 workplan -DAH&P projects update -GGFP Land-Use Classification -Field trip to Kabakor -Map reading and use of compass -Basic principles of range management -Biomass sampling technique -Herbarium plant material collection techniques -14 participants
LOA Demo.	21 Feb. '83	-35 key LOA members participate in a cattle feeding demonstration at Yundum (Forage component, MFP)
Workshop	19-23 Dec. '83	-Tour of YBK Seed Multiplication Plot -Tour of Boiran LOA Deferred Range Area and Crop Residue Feeding -Tour of Sukuta LOA Range Management Demonstration Plot -Basic principles of range management -Socio-Economic component, MFP -Forage Agronomy component, MFP -Maize Agronomy component, MFP -Introduction of crop residues in feeding livestock -Review of LOA participation -23 participants

LOA Demo.	May '84	<ul style="list-style-type: none"> -Members visit Giroba Kunda and YBK Seed Multiplication and hay production Plots -Members visit cattle feeding at Boiram
Field	15-16 May '84	<ul style="list-style-type: none"> -Held at YBK Seed Multiplication Plot and Boiram crop residue feeding site -Seeding and root transplanting, rainy season activities -Seed multiplication programs at YBK and Giroba Kunda -Weighed and measured heifers at Boiram, and weighed day's crop residue
Workshop	10-15 Sep. '84	<ul style="list-style-type: none"> -7 participants -Participants from DAN&P and DA in attendance, first time -The Use of Crop Residues in the Deferred Feeding of Cattle was theme of workshop -Update on DAN&P and MFP programs -Dry season crop residue feeding -EAU, Extension Methodology -Basic principles of range management -Basic principles of economics
Field	Oct.-Jan. '82-'86	<ul style="list-style-type: none"> -23 extension workers participated -Range Resource Inventory data collection -Plant collection and identification -Map reading and interpretation -7 Pasture Assistants

Appendix 9

TABLE: SEEDING OF RANGE MANAGEMENT DEMONSTRATION PLOTS

<u>LOA Plot</u>	<u>Andro.</u> <u>gayanus</u>	<u>Cenchrus</u> <u>ciliaris</u>	<u>Stylo.</u> <u>hamata</u>	<u>Stylo.</u> <u>quianen.</u>	<u>Stylo.</u> <u>scabra</u>
*Kumbul (Dantora-URD)	-	X	X	X	X
**Makama Sireh (U-Wuli-URD)	X	X	X	-	X
Jar Kunda (L-Wuli-URD)	X	X	X	-	X
*Kundan (Full. East-URD)	X	X	X	X	X
*Sabi (Full. East-URD)	-	X	X	X	X
Diabugu (Sandu-URD)	-	X	-	-	X
*Karantaba Tuc. (Sami-MID)	X	X	X	-	X
*Sambatako (Full. West-MID)	X	X	X	-	X
*Sare Ngai (Full. West-MID)	X	X	X	X	X
**Boiram (Full. West-MID)	-	-	-	-	-
Maounda Kunda (Niam. E.-MID)	-	X	X	X	-
Balanghar (L. Saloum-MID)	X	X	-	-	X
*Charmen (Niani-ja-MID)	X	X	X	-	X
Njau (Upper Saloum-MID)	X	X	X	-	X
Dankunku (Niam. Dank. -MID)	-	X	X	X	X
Konko Duma (Sami-MID)	X	X	X	-	X
**Sukuta (Niani-MID)	X	X	-	X	X
**Piniai (Niamina W.-MID)	X	X	X	-	-

* Excellent results

** Expanded to Deferred Range Sites of 10 or more hectares

Appendix 10

TABLE: ROOT TRANSPLANTING OF ANDROPOGON GYANUS VAR. BISQUAMULATUS (GAMBA GRASS) AND PANICUM MAXIMUM (GUINEA GRASS)

<u>Date</u>	<u>Site</u>	<u>Division</u>	<u>Source</u>	<u>Hectares</u>
1983	Kabokorr (LMB)	Western	Yundum	4.2
1983	YBK	MI	Yundum	.6
1983	Boiram	MI	Yundum	1.5
1983	Piniai	MI	Yundum	.2
1983	Sukuta	MI	Yundum	.3
1983	Njau	MI	Yundum	.1
1983	Karantaba Tuculur	MI	Yundum	.1
1983	Kundam	UR	Yundum	.1
1983	Giroba Kunda	UR	Yundum	.3
1984	Jar Kunda	UR	Giroba Kunda	.3
1984	Kumbul	UR	Giroba Kunda	.3
1984	Kabokorr (LMB)	W	Yundum	1.0
1984	ITC Sene-Gambia	W	Yundum	1.0
1984	Sukuta	MI	YBK	.5
1984	Piniai	MI	YBK	.5
1984	Boiram	MI	YBK	.3
1985	Boiram	MI	YBK	.5
1985	Piniai	MI	YBK	.7
1985	Sukuta	MI	YBK	.2
1985	ITC Sololo	MI	Giroba Kunda/YBK	1.0
3 years	13 different sites	3	3	13.7

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Appendix 11

DEFERRED RANGE MANAGEMENT SITES

<u>Community</u>	<u>LOA</u>	<u>Div.</u>	<u>Ha.</u>	<u>Treatment</u>
Boiran/Njoben	F.B.	MI	10.00	-fenced March 1983, one parcel -Aug. 1983, '84, & '85 root transplanted <u>Andro. gay.</u> <u>bisq.</u> , approx. 1.5 hectare -20 heifers, 90 days, Feb.- April 1984 -12 heifers, 77 days, April- June 1985 -18 heifers, 1 bull, approx. 75 days, April-June 1986
Piniai	N.W.	MI	15.25	-fenced March 1984, three parcels -seeding (Appendix 9) -Aug. 1984 and 1985 root transplanted <u>Andro. gay.</u> <u>bisq.</u> , approx. 1.9 hectare -23 heifers, 0 days, 1985 -bush fire 10 March, 1985 destroyed all biomass -burned wooden fence posts replaced May 1985 -19 heifers, 1 bull, approx. 60 days, May-June 1986
Sukuta	Niani	MI	13.27	-fenced September 1984 -seeding (Appendix 9) -Aug. 1984 and 1985 root transplanted <u>Andro. gay</u> <u>bisq.</u> , approx. 1 hectare -26 heifers, 58 days, May-June 1985
Makama Sireh	L. Wuli	UR	10.00	-fenced May 1984, 2 parcels -seeding (Appendix 9) -28 heifers, 78 days, April-July 1985 -28 heifers, 1 bull, 61 days, May-June 1986

Appendix 12

LIVESTOCKMEN INSTRUMENTAL IN IMPLEMENTING RANGE RELATED ACTIVITIES

Alh. Manga Baldeh	Pres. LOA	Basse
Malang Manneh	-	Kundam/Badeni(Tumana)
Lamin Jawala	-	Kundam/Badeni(Tumana)
Alh. Nene Sillah	-	Sabi(Basse)
Alh. Tankora Sillah	-	Sabi(Basse)
Baba Sillah	-	Sabi(Basse)
Foday Kebba Jatta	Seyfo	Wuli
Foday Dindind Jatta	-	Sutukoba(Wuli)
Njau Jabang	-	Sutukoba(Wuli)
Suwaray Jatta	-	Sutukoba(Wuli)
Alh. Tora Jatta	-	Sutukoba(Wuli)
Suwarayba Jari	-	Sutukoba(Wuli)
Seko Darbo	-	Brifu(Wuli)
Alk. Saikou Kammateh	-	Makana Sireh(Wuli)
Suwadu Bah	-	Koli Kunda(Wuli)
Yarray Wally	-	Willingara(Wuli)
Dinding Kuntu Saidy	-	Tabading(Wuli)
Babading Saidy	-	Tabading(Wuli)
Alh. Jarra Saho	-	Kunjur Tabokoto(Wuli)
Alh. Kebelly Baragi	-	Baragi Kunda(Kantora)
Alh. Monodou Tonkara	-	Suduwal(Kantora)
Fodayba Sanyang	-	Kantel Kunda(Kantora)
Da Foday Kumanneh	-	Koina(Kantora)
Alh. Jahara Jabi	-	Koina(Kantora)
Kumo Touray	-	Geda(Kantora)
Alh. Foday Baldeh	-	Kumbul(Kantora)
Alh. Bakumba Bachelly	-	Garowal(Kantora)
Sada Sanyang	-	Kusunuh(Kantora)
Alh. Falai Baldeh	Pres. LOA	Sare Ngai
Alh. Ousman Boye	V-Pres. LOA	Boiram
Alh. Chendu Boy	-	Boiram
Alh. Abdou Howa	-	Boiram
Alh. Abdou Fatim Boy	-	Boiram
Alh. Ousman Boy	-	Boiram
Alh. Omar Boy	-	Boiram
Alh. Mod Satu Jobe	-	Njoben
Kebba Ceessay	-	Njoben
Mod Ceessay	-	Njoben
Hamadi Sy	-	Fass
Alh. E. Boye	-	Fass
Hadan Sy	-	Fass
Nignsiy Ndubeh Boy	-	Fass
Alieu Boy	-	Fass

Alh. Ebrima Boye	-	Allulai
Alh. Ebou Yama Boye	-	Allulai
Mod Yasin Boye	-	Allulai
Maley Boy	-	Allulai
Alh. Malek Basin Boye	-	Allulai
Alikali	-	Fut Sare Buti
Alet Mballo	-	Fut Sare Buti
Samba Mballo	-	Fut Sare Buti
Alh. Badjo Bah	Seyfo	Piniai(Nia. West)
Sambayel Bah	Pres. LOA	Piniai(Nia. West)
Tamba Chate	-	Piniai(Nia. West)
Demba Bah	-	Dalaba(Nia. West)
Amadou Jobe	-	Dalaba(Nia. West)
Jambo Bah	-	Dalaba(Nia. West)
Demba Bah	-	Dalaba(Nia. West)
Lonkar Bah	-	Bah Kunda(Nia. West)
Demba Jallow	-	Bah Kunda(Nia. West)
S. Musa Bah	-	Bah Kunda(Nia. West)
Hamat Bah	-	Bah Kunda(Nia. West)
Yorro Jallow	-	Wellingara(Nia. Dank.)
Babukar Touray	Seyfo	Kaur (Lower Saloum)
Musa Cham	Seyfo	Charmen(Nianija)
Samba York	Pres. LOA	Sinchu Demba (Nianija)
Dikorr Jawo	Alkalo	Fulla Kunda(Niani)
Alh. Burema Ceesay	Comm. LOA	Sukuta (Niani)
(The Late) Pa Maodu Kano	Pres. LOA	Karantaba Tuc.(Sami)
Dawada Jobe	V.P. LOA	Karantaba Wolof(Sami)
Alh. Samba Leigh	Pres. LOA	Lebba(Upper Saloum)
	Seyfo	Njau(Upper Saloum)

Appendix 13

SUGGESTED LOA BY-LAWS

Dated: 1977/1978

1. Meetings

a. There should be a Committee meeting once a month. A General meeting of card holding members should take place every three to six months at the discretion of the Committee.

An emergency meeting can be arranged if it is felt desirable. In addition, there should be an Annual General Meeting.

b. The Committee member should keep a Register whereby a check can be made on members that have attended or absented themselves from meetings.

c. Where a Committee member through ill health or otherwise is unable to attend a Committee meeting, he should delegate a member to attend.

2. Committee Decisions

Committee must have at least a two-thirds majority before any decision is agreed upon.

3. Subscriptions

a. This has to be decided by the Committee. However, an annual fee of D5.00 (five dalasis) is recommended for every card holding member.

b. Members should be punctual in the payments of subscriptions. It is suggested that subscriptions be paid between the months of January and March. Failure to pay within this period means the member's name will be crossed off the register. He/She discontinues to be a member for that year running.

4. Financial Expenditures

The Committee should decide how the money should be utilized. The cashier must have the approval of the Committee before releasing out any money.

5. Care of Money

a. There should be some form of a deposit system. This is either through a bank/Post Office or in the care of the district commissioner.

b. The auditor should make a monthly check on the deposit book and the cash in hand.

c. The cashier should account for all the expenditures at monthly meetings.

6. Duration of Office - Re-election

a. We recommend a term of office for a minimum period of two years. But where a Committee has proved inefficient, an Annual General Meeting can dissolve the Committee and a new committee be voted for.

b. Only card holding members (i.e. those who were members at least a month before election day) will have the right to vote for committee members.

7. Discipline

The committee has the right to take any disciplinary action against a committee member who has failed to attend three consecutive committee meetings without adequate reasons and without delegating another member.

Appendix 14

TABLE: LAND USE CLASSIFICATION

1. Mangrove A: Mangroves more than 7 m tall, mainly Rhizophora.
2. Mangrove B: Mangroves less than 7 m tall, mainly Avicennia.
3. Gallery Forest: Forests bordering water courses, tree heights above 7 m.
4. Closed Woodland: Forests on freely drained soils w/tree cover.
5. Open Woodland: Forests on freely drained soils w/10-50% cover.
6. Tree and Shrub Savanna: Tree and shrub vegetation on freely drained soils w/less than 10% tree cover or tree heights less than 11 m.
7. Tree and Shrub Savanna w/Previous Cultivation: Fallowed for at least 4 years at time of sampling.
8. Wooded Upland Crops: Cultivated land on freely drained soil with at least 10% tree cover.
9. Upland Crops w/Isolated or No Trees: Cultivated land on freely drained soils w/relatively few or no trees.
10. Swamps, Cultivated: Mainly rice cultivation; near water courses.
11. Swamps, Uncultivated: Areas near water courses with vegetation cover, but not cultivated.
12. Barren Flats: Saline soils near water courses w/no vegetation cover.
13. Water Surface
14. Town Village

Appendix 15

RANGE MANAGEMENT UNIT, OFFICE AND EQUIPMENT INVENTORY

<u>Quantity</u>	<u>Item</u>
2	4 drawer filing cabinet, color black
2	3 drawer filing cabinet, color grey
1	2 drawer filing cabinet, color black
1	4 drawer filing cabinet, color brown
1	Steel storage cabinet, two door, locking
2	Plastic paper trays
1	Herbarium table, large size
1	Herbarium table, small size
2	Chairs, cushioned, color black
1	Chair, swing type, color black
1	Microscope
1	Map cabinet, wooden, 5 drawer
1	Map cabinet, steel, 5 drawer
1	Typewriter, Facit office, manual
1	Stapler
1	Two hole paper punch
1	Scale, dial type, to 200 kilograms
2	Scales, dial type, to 100 kilograms
2	Scales, spring type, Pesola, 1000 grams
2	Scales, spring type, Pesola, 500 grams
8	Scales, spring type, Pesola, 100 grams
1	Scale, spring type, 10 kilogram
1	Measuring tape, 35 meters
1	Measuring tape, 50 meters
2	Biomass sampling hoops, 2 meter square
6	Shears, biomass sampling
2	Compasses, pocket size
1	Planimeter
1	Leroy lettering set
1	Leroy pen set
2	Aerial photo cases, leather, belt type
2	Field cases, small leather, belt type
3	Clipboards, aluminum, covered
3	Rapidograph pen cleaning bottles
5	Scales, ruler type, multiple scales
4	Rulers, see through metric
1	Survey pins, set
1	Labels, expendable packet
2	Counters, hand
3	Stereoscopes, pocket type
7	Templates, mapping
3	Plant presses
1	Farm level, survey

3	Sighting poles, survey
1	Level rod, survey
1	Tripod, farm level, survey
2 rolls	Map backing cloth, iron on type
5	Jerry cans, steel, 20 liter
1	Tent, 4 man, cotton
1	Tent, 2 man, cotton
4	Camp Beds
2	Sleeping bags
1	Fireplace grid, camping
1	Dish set, camping
2	Coolers
6	Broadcast seeders
2	Creosote, 55 gallon barrels
3	2,4-D, 40 gallon barrels
12	Tree/Shrub injectors, for 2,4-D
4	Wheel barrows
20	Pickaxes
20	Shovels
8	Fence pliers
8	Fence post drivers (2 in store)
2	Handyman jacks
41	Sickles
5	Handles, extra
2665	Fence posts, steel
15	Woven wire, fencing, maintenance
9	Fencing clips ,10 X 100 = 9000
1	Fencing clips, 8 X 100 = 800
1.5 boxes	U-Nails, fencing maintenance

(Inventory completed 1 May, 1986)

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Appendix 16

TABLE: ALLOCATION OF HEIFERS FOR DRY SEASON FEEDING PROGRAM AT BOIRAM, 1983

<u>Village</u>	<u>##Labor Furnished (17/05 to 10/09)</u>	<u># Allocation</u>
Boiram	126 man days	11 heifers
** Fass	16 man days	3 heifers
***Sare Buti	13 man days	2 heifers
Njoben	10 man days	2 heifers
***Allulai	6 man days	1 heifer
* Tabanding	6 man days	1 heifer
Baya Fulla	2 man days	0 heifer
	179 man days	20 heifers

- * was not interested in contributing animals, but was interested in labor contribution
- ** complained early about no maize program, never contributed their animals
- *** do not wish to contribute animals, labor problems
- # allocation includes identical number of heifers for control group, heifer number is 20
- ## labor furnished to complete the fencing of deferred range site, 10 hectares

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Appendix 17

PARTICIPANTS BOIRAM FEEDING PROGRAM, HEIFER STARTING WEIGHTS AND GIRTH MEASUREMENTS,
14/12/1983

E. tag	Owner	Village	Orange/Fed		Yellow/Control	
			Kgms.	cm.	Kgms.	cm.
1	Alh. Ousman Boye	B	100	109	120	119
2	Alh. Ousman Boye	B	130	122	130	119
3	Sambala Damballe	N	75	102	95	106
4	Alh. Abdou Fatim	B	122	122	135	120
5	Mot Yai Boye	B	80	104	70	99
6	Alh. Omar Boye	B	75	100	70	99
7	Alh. A. Hawa Boye	B	135	122	115	115
8	Alh. A. Hawa Boye	B	95	108	90	107
9	Alh. Chendu Boye	B	60	110	60	103
10	Alh. B. Jimbi Boye	B	125	120	115	121
11	Alh. Babou Boye	B	85	104	115	117
12	Kebba Sise	N	85	100	125	120
13	Alieu Jobe	N	100	105	95	106
14	Alh. Mot Jobe	N	135	120	135	124
15	Alh. Mot Jobe	N	105	116	120	118
16	Alh. Baloon Boye	B	70	100	70	100
17	Alh. Abdou Hawa	B	70	94	115	115
18	Alh. Ousman Boye	B	140	126	150	122
19	Alh. Waggeh Gassama	B	140	125	150	122
20	Alh. Fatim Boye	B	150	123	130	125

Key: E. tag (ear tag number)
 Orange/Fed (Orange ear tagged heifers are fed)
 Yellow/Control (Yellow ear tagged heifers are in control group)
 B (Boiram village)
 N (Njoben village)
 Kgms. (kilograms)
 cm. (centimeters)

Appendix 18

TABLE: TREATMENT FOR THE 20 HEIFERS IN THE FED GROUP, BOIRAM FEEDING PROGRAM, 1984

Dates	Days	Treatment	Qty./Kgps.	% Utilized
28/12 - 25/01	28	**Maize stover	220 daily	40
25/01 - 22/02	28	**Sorghum stover	220 daily	40
22/02 - 18/04	56	Deferred Range Site	90 daily	100
18/04 - 16/05	28	# Sorghum stover, plus rice straw	220 daily *40 daily	40 60
16/05 - 13/06	28	##Panicum maximum hay, plus rice straw, plus groundnut hay	*90 daily *40 daily *40 daily	95 95 95
13/06 - 27/06	14	Groundnut hay, plus rice straw	*90 daily *40 daily	95 60
28/12 -27/06	182	-	-	-

* estimates

** mainly leaf material eaten by animals, little stalk consumed

sorghum stover gradually used up and the rice straw became the principle feed at an estimated 90 kilograms/day

combination of the two feeds were fed first, then rice straw, then groundnut hay

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Appendix 19

STATUS: DEFERRED RANGE SITES, PRODUCED AND RESIDUAL BIOMASS AND STOCKING RATES FOR 1984 AND 1985

Site	Ha.	V. Type MLUC	#Biomass kgm/ha.	S.R. '84 * UBT	& '85 * UBT	Time days	Req. koms.	+Res. k/ha.
M/Sireh	10	7	2,810	-	12	78	7,020	1,650
Boiram	10	7	1,500	8	-	56	3,360	948
Boiram	10	7	1,600	-	6	77	3,465	1,138
Sukuta	13.27	3 & 7	4,733	-	12	58	5,150	1,965
Piniai	15.25	7/9	4,450	-	0	0	0	4,450**

* UBT (Unitaire Bovine Tropicale) = 250 kilogram bovin, live weight, range ration is 3% body weight, or daily ration of seven and one half kilograms/day/UBT

** Site totally burned by bush fire 10 March, 1985

RRI combination production biomass from Grazing Preference codes 0, 1, and 2 (see Appendix 26, p. xxxiv for more detail)

+ Residual biomass mostly consisted of dry tree leaves that had fallen from above 1.5 meter height

Key

MLUC	:	MFP Land-Use Classification
GLUC	:	Gambia Land-Use Classification
S.R.	:	Stocking Rate
Biomass kilograms/hectare:		Code 1, desirable plants
Sukuta	:	LUC 7, 2.37 hectares # 3,125 kgs./ha.
	:	LUC 3, 11.0 hectares # 5,028 kgs./ha.
RRI	:	MFP Range Resource Inventory 1982 - 1986
Res. k./ha.	:	Residual kilograms per hectare (measured)

Appendix 20

SUMMARY: DRY SEASON SUPPLEMENTAL VILLAGE FEEDING PROGRAM - 1985

Village	Dis.	Fence m x m	Pltforms no.	Storage/kgms. D.M.				feeding	
				M.S.,	Mil.S.,	R.S.,	Gn.H.	Heif./	#Time
K/Tab.	U/Wuli	25x25	1	1,700	-	-	*2,800	12	4w
Well/M.	U/Wuli	25x25	1	3,380	-	-	-	8	4w
Koli/K.	U/Wuli	24x25	1	3,000	887	-	-	9	4w
Sutuko.	U/Wuli	15x25	1	3,985	-	1,544	-	25	4w
Sutuko.	U/Wuli	20x20	1	1,566	-	374	-	25	4w
Sare/K.	U/Wuli	-	-	-	-	-	-	-	-
Suduwoi	Kantora	20x20	2	2,200	-	-	-	24	6w
Kusunuh	Kantora	20x20	2	3,853	-	-	-	24	8w
Garawol	Kantora	40x40	7	**1,436	-	-	-	-	-
Bar/K.	Kantora	15x15	1	1,194	-	140	-	12	4w
Kumbul	Kantora	25x25	-	-	-	-	-	-	-
Sare N.	full/w	25x25	-	-	-	-	-	-	-
9		254x265	-	22,314	887	2,058	*2,800	139	-

- * Groundnut hay fed independently
- ** Animals broke down fence and ate all stover
- # Time is in weeks (w)
- M.S.(maize stover)
- Mil.S.(Millet stover)
- R.S.(Rice straw)
- Gn.H.(Groundnut hay)

Appendix 21

SUMMARY: DRY SEASON SUPPLEMENTAL VILLAGE FEEDING PROGRAM - 1986

Village	Dis.	Fence m x m	Platforms no.	Storage/Kgms. D.M.				Feeding	
				M.S.	Mil.S.	R.S.	Gn.H.	Heif/Time	
K/Tabor.	U/Wuli	25x25	3	1,950	-	-	#2,885	NI	NI
Well/Man.	U/Wuli	25x25	2	565	-	-	-	NI	NI
Koli/Kun.	U/Wuli	25x25	3	585	65	-	-	NI	NI
Sutukoba	U/Wuli	15x25	0	6,545	-	-	-	NI	NI
Sutukoba	U/Wuli	20x20	1	* 300	-	-	-	NI	NI
BriFu	U/Wuli	40x40	5	8,052	-	-	-	NI	NI
Sare Kobo	U/Wuli	-	-	-	-	-	-	-	-
Tanbading	U/Wuli	30x25	-	4,000	-	-	-	NI	NI
Koina	Kantora	30x35	4	12,000	-	-	-	NI	NI
Koina	Kantora	30x25	2	-	-	1,200	-	NI	NI
SuduwoI	Kantora	35x30	4	3,200	-	-	-	NI	NI
Kusunuh	Kantora	35x30	2	4,000	-	-	-	NI	NI
Garowol	Kantora	40x40	7	1,500	yes	-	-	NI	NI
Baraji/K.	Kantora	15x15	3	5,100	-	450	-	NI	NI
Geda	Kantora	25x25	2	4,000	-	-	-	NI	NI
Kantel/K.	Kantora	30x35	2	4,500	-	-	-	NI	NI
Kumbul	Kantora	-	-	-	-	-	-	-	-
Kundan	Full./E.	25x25	2	2,567	-	-	-	NI	NI
Sabi	Full./E.	-	-	-	-	-	-	NI	NI
K/Duma	Sani	22x22	-	500	-	-	-	NI	NI
Fass	Full./W.	22x22	-	2,000	-	-	-	NI	NI
Njoben	Full./W.	22x22	2	1,500	-	-	-	NI	NI
Allulai	Full./W.	22x22	-	1,200	-	-	-	NI	NI
F.Sare/B.	Full./W.	22x22	-	800	-	-	-	NI	NI
Sare N.	Full./W.	22x22	-	750	-	-	-	NI	NI
Fulla/K.	Niani	22x22	-	1,400	-	-	-	NI	NI
Dalaba	Niam./W.	24x25	1	1,850	-	-	-	NI	NI
Bah/Kun.	Niam./W.	24x24	2	3,923	-	-	-	NI	NI
Bakadagy	Nianija	22x22	4	**6,000	-	-	-	NI	NI
Welling.	Nianija	22x22	2	700	-	-	-	NI	NI
Buduk	Nianija	22x22	4	850	-	-	-	NI	NI
28		713x714	-	80,337	65	1,650	#2,885	NI	NI

Groundnut hay fed independently

* Remainder of maize stover, cattle were eating

** Bakadagy, Nianija, was last observed storing maize stover, no final measurement taken, tons of stover stacked in fields

NI(No information)

M.S.(Maize stover)

Mil.S.(Millet stover)

R.S.(Rice Straw)

Gn.H.(Groundnut Hay)

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Appendix 22

PARTITION OF ANNUAL WORK PLAN - RANGE COMPONENT

- October through January - Range Resource Inventory
 - Field Mapping
 - LOA Meetings
 - Constructing Fire Lanes
 - Collecting and Storing Crop Residues
 - Collecting Range Seeds
 - Plant Collection
 - Plant Identification
- February through June
 - Cutting and Storage Grass Hay
 - Implementing Feeding Programs
 - Implementing Deferred Range Programs
 - Seed bed preparation
 - Reseeding
 - LOA Meetings
 - Plant Identification
 - June, 2,4-D Root Injection-Shrub Control
- July through September
 - Reseeding
 - Root Transplanting
 - Weeding of Seeded Areas
 - Seed Collection
 - Plant Collection
 - Plant Identification
 - Field Storage Maize Stover

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Appendix 23

TABLE: AVERAGE HERD SIZE FOR DISTRICTS IN MID AND URD

<u>District</u>	<u>Div.</u>	<u>Yr.</u>	<u>Herds</u>	<u>Numbers</u>	<u>Average</u>
Niamina Dank.	MI	'82	NI	-	-
Niamina West	MI	'82	NI	-	-
Niamina East	MI	'82	NI	-	-
Fulladu West	MI	'85	38	2,347	62
Sami	MI	'85	22	989	45
Niani	MI	'85	23	1,340	58
Nianija	MI	'85	8	350	44
Upper Saloum	MI	'85	39	1,660	42
Lower Saloum	MI	'85	14	635	45
-	MI	-	153	7,891	52
Upper Wuli	UR	'82	26	1,340	52
Lower Wuli	UR	'82	31	1,510	49
Sandu	UR	'84	53	2,330	44
Fulladu East	UR	83- 84	14	730	52
Kantora	UR	83	16	835	52
-	UR	-	140	6,745	48

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RANGE INVENTORY PLANT LIST

Key:

FWTA No. - Flora of West Tropical Africa reference identification number
00/nn/nn....Family
nn/00/nn....Genus
nn/nn/00....specie

*FWTA No. - Indicates plant specimen found in Range Unit Herbarium, Abuko

ID - Identification Code
column 1 2 3

- 0 n n.....Crops
- 1 n n.....Grasses/Grass-like
- 3 n n.....Forbs
- 4 n n.....Forbs
- 5 n n.....Sub-shrubs
- 6 n n.....Variable habit
- 7 n n.....Shrubs/small trees/woody climber
- 9 n n.....Trees
- n 0 0.....Family unknown
- n 5 n.....Suffrutex or parasite
- n 9 9.....Family unknown

GP - Grazing Preference Code
0.....Preference unknown
1.....Desirable
2.....Undesirable

DM - Dry Matter Code
1 through 34 (see Appendix 27)

SpOc - Specie Occurence in Land-Use Class

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Genus	Species	FWTA No.	ID			GP	DM	SpDc																			
			1	2	3			1	2	3	4	5/6	7	8/9	10	11	12	13	14								
CROPS																											
Agave	sisalana	192/(1)/(1)	0	0	1	2	24	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	X
"Sisal"		192/(1)/(1)	0	0	1	2	24	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	X
Arachis	hypogea	91/66	0	0	2	1	3	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
"Groundnuts"		91/66	0	0	2	1	3	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
Avigna	ungulata	91/52	0	0	3	1	21	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	X
"Cowpeas"		91/52	0	0	3	1	21	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	X
"Cotton"		77/11	0	0	4	1	18	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
Gossypium	sp.	77/11	0	0	4	1	18	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
Hibiscus	sabdariffa	77/10/19	0	0	5	0	21	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	X
"Sorrel"		77/10/19	0	0	5	0	21	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	X
"Calabash"		59/2	0	0	6	1	21	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	X
Lagenaria	siceraria	59/2	0	0	6	1	21	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	X
"Manioc"		86/53/5	0	0	7	0	33	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	X
Manihot	esculentia	86/53/5	0	0	7	0	33	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	X
Oryza	sativa	202/9/1	0	0	8	1	2	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
"Rice"		202/9/1	0	0	8	1	2	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
Pennisetum	americanum	202/101/19	0	0	9	1	8	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	X
"Millet"		202/101/19	0	0	9	1	1	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	X
Phaseolus	sp.	91/52	0	1	0	1	21	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	X
"Beans"		91/52	0	1	0	1	21	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	X
Saccharum	officinarum	202/104/2	0	1	1	1	10	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	X
"Sugarcane"		202/104/2	0	1	1	1	10	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	X
"Sorghum"		202/106/3	0	1	2	1	1	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
Sorghum	bicolor	202/106/3	0	1	2	1	1	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
Zea	mays	202/146	0	1	3	1	1	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	X
"Maize"		202/146	0	1	3	1	1	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	X
"Banana"		178/(1)/(1)	0	1	4	0	33	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	X
Musa	sp.	178/(1)/(1)	0	1	4	0	33	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	X
GRASSES/GRASS-LIKE																											
Unknown	grass	202/	1	0	0	0	9	-	-	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-
Andropogon	sp.	202/124	1	0	1	1	10	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
Andropogonae	sp.	202/	1	0	2	1	8	-	-	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-
Brach./Pasp	sp.	202/	1	0	3	1	6	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-
Brachiaria	sp.	202/88	1	0	4	1	6	-	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyperus	sp.	202/1	1	0	5	0	13	X	X	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-
Eragrostis	sp.	202/37	1	0	6	1	6	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-
Junc-/Cyperac	sp.	- - -	1	0	7	0	15	X	X	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	X
Loudetia	sp.	202/67	1	0	8	0	8	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-
Oryza	sp.	202/9	1	0	9	1	11	-	-	-	-	-	-	-	-	-	X	X	X	-	-	-	-	-	-	-	-

Genus	Species	FWTA No.	ID			GP	DM	SpOc																			
			1	2	3			1	2	3	4	5/6	7	8/9	10	11	12	13	14								
Commelina	sp.	172/12	3	0	5	1	17	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Compositae	sp.	37/	3	0	6	0	19	-	-	X	X	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-
Crotalaria	sp.	91/29	3	0	7	0	19	-	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cucurbitaceae	sp.	59/	3	0	8	0	21	-	-	-	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-	-	X
Euphorbia	sp.	86/64	3	0	9	2	24	-	-	-	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-
Hibiscus	sp.	77/10	3	1	0	0	21	-	-	-	-	-	X	X	X	X	X	-	-	-	-	-	-	-	-	-	X
Indigofera	sp.	91/26	3	1	1	1	17	-	-	-	-	X	X	X	X	X	-	-	-	-	-	-	-	-	-	-	X
Ipomoea	sp.	152/16	3	1	2	1	21	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-
Labiatae	sp.	162/	3	1	3	0	13	-	-	-	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-
Leguminosae	sp.	- - -	3	1	4	0	19	-	-	-	X	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-
Ludwigia	octovalvis	43/2/7	3	1	5	2	17	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-
Marsilea	sp.	- - -	3	1	6	0	16	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-
Oxalis	sp.	39/40/1	3	1	6	0	16	-	-	-	X	X	X	X	X	X	X	-	-	-	-	-	-	-	-	-	-
Pandiaka	sp.	37/9	3	1	7	1	16	-	-	-	X	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Sesbania	sp.	91/24	3	1	8	0	24	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Striga	sp.	153/30	3	1	9	2	18	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
"Sapu	gineh"	- - -	3	2	0	0	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acalypha	segatalis	* 86/48/13	3	2	1	2	18	-	-	-	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-
Acalypha	ciliata	* 86/48/10	3	2	2	2	18	-	-	-	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-
Acanthospermum	hispidum	*139/17/1	3	2	3	0	17	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Aframomum	melegueta	179/3/19	3	2	4	2	22	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Ageratum	conyzoides	139/70	3	2	5	0	18	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-
Alysicarpus	rugosus	* 91/78/4	3	2	7	1	18	-	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Amaranthus	hybridus	* 37/2/2	3	2	8	2	17	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-
Aspilia	helianthoides	*139/13/11	3	2	9	1	18	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-
Bergia	capensis	* 28/1/3	3	3	0	2	23	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-
Blepharis	linariifolia	*159/20/3	3	3	1	2	17	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boerhavia	erecta	* 47/3/1	3	3	2	2	17	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Borreria	stachydea	*137/87/6	3	3	3	1	20	-	-	X	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Borreria	scabra	*137/87/5	3	3	4	1	20	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Celosia	trigyna	37/1/2	3	3	5	2	17	-	-	-	-	-	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-
Ceratotheca	sesamoides	*158/5	3	3	6	1	26	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Commelina	erecta	172/12/21	3	3	7	1	17	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	X
Corchorus	tridens	* 74/6/4	3	3	8	0	17	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	X
Crotalaria	calycina	* 91/29/1	3	3	9	1	19	-	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Crotalaria	graminicola	* 91/29/21	3	4	0	2	19	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cucumis	melo	* 59/16/1	3	4	1	1	21	-	-	-	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-	-	X
Cynanchum	longipes	*136/5/2	3	4	2	1	21	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Discorea	lecardii	191/-/19	3	4	3	1	21	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Euphorbia	hirta	* 86/64/2	3	4	4	2	17	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Glycine	javanica	91/47/2	3	4	5	0	21	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"Kutcha"		* 77/10/20	3	4	6	1	21	-	-	-	X	X	X	X	X	X	X	-	-	-	-	-	-	-	-	-	X
Hibiscus	cannabinus	* 77/10/20	3	4	6	1	21	-	-	-	X	X	X	X	X	X	X	-	-	-	-	-	-	-	-	-	X
Hibiscus	suratensis	77/10/5	3	4	7	0	21	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	X

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Genus	Species	FWTA No.	ID			GP	DM	SpOc													
			1	2	3			1	2	3	4	5/6	7	8/9	10	11	12	13	14		
Hydrophila	senegalensis	*159/1/9	3	4	8	0	20	-	-	-	-	-	-	-	-	X	X	-	-	-	
Hyptis	suaveolens	*162/21/3	3	4	9	2	24	-	-	X	X	X	X	X	X	X	X	X	-	X	
Hyptis	spicigera	162/21/1	3	6	0	2	24	-	-	X	X	-	-	-	-	-	-	-	-	-	
Indigofera	hirsuta	* 91/26/2	3	6	1	0	17	-	-	-	-	X	X	-	X	X	X	-	-	-	
Ipomoea	eriocarpa	*152/16/25	3	6	2	1	21	-	-	-	X	-	X	X	-	-	-	-	-	-	
Ipomoea	vagens	*152/16/20	3	6	3	1	21	-	-	-	X	X	X	X	-	-	-	-	-	-	
Ipomoea	pileata	*152/16/9	3	6	4	1	21	-	-	-	X	X	X	-	-	-	-	-	-	-	
Ipomoea	heterotricha	*152/16/6	3	6	5	1	21	-	-	-	X	X	X	X	-	-	-	-	-	-	
Justicia	insularis	*159/43/2	3	6	6	1	17	-	-	-	X	X	X	-	-	-	-	-	-	-	
Leucas	martinicensis	*162/27/1	3	6	7	2	20	-	-	-	X	X	X	-	-	-	-	-	-	-	
Luffa	aegyptiaca	59/5/2	3	6	8	0	21	-	-	-	-	-	-	X	-	-	-	-	-	X	
Melliniella	micrantha	* 91/79	3	6	9	1	17	-	-	X	X	-	-	-	-	-	-	-	-	-	
Melothria	maderaspatana	* 59/10/5	3	7	0	2	21	-	-	-	-	-	-	X	X	-	-	-	-	-	
Merrimia	pinnata	*152/11/1	3	7	1	1	21	-	-	-	X	X	X	X	-	-	-	-	-	-	
Merrimia	Kentrocaulos	*152/11/7	3	7	2	1	21	-	-	-	X	X	X	X	-	-	-	-	-	-	
Mitracarpus	villosus	*137/88/(1)	3	7	4	1	17	-	-	-	-	-	-	X	-	-	-	-	-	-	
Mitracarpus	scaber	*137/88	3	7	5	1	17	-	-	-	-	-	-	X	-	-	-	-	-	-	
Monochoria	brevipetiolata	184/1	3	7	6	2	22	-	-	-	-	-	-	-	X	X	-	-	-	-	
Nicotiana	tabacum	*151/2/1	3	7	7	2	28	-	-	-	-	-	-	X	-	-	-	-	-	-	
Ocimum	canum	*162/1/6	3	7	8	2	18	-	-	-	-	-	-	X	-	-	-	-	-	X	
Pandiakia	heudelotii	* 37/9/2	3	7	9	1	16	-	-	-	-	X	-	-	-	-	-	-	-	-	
Passiflora	foetida	* 58/1	3	8	0	2	21	-	-	-	-	-	-	-	X	X	X	-	-	-	
Philoxerus	vermicularis	* 37/12	3	8	1	0	21	X	X	-	-	-	-	-	X	X	-	-	-	-	
"Singindo" (M)		* 37/12	3	8	1	0	21	X	X	-	-	-	-	-	X	X	-	-	-	-	
Phyllanthus	amarus	* 86/16/11	3	8	2	1	19	-	-	-	-	-	-	X	-	-	-	-	-	-	
Physalis	micrantha	*151/6/1	3	8	3	0	17	-	-	-	-	-	-	-	X	X	-	-	-	-	
Physalis	angulata	*151/6/2	3	8	4	0	17	-	-	-	-	-	-	-	X	X	-	-	-	-	
Polycarpaea	tenuifolia	* 29/8/3	3	8	5	2	26	-	-	X	X	-	-	-	-	-	-	-	-	-	
Polycarpaea	corymbosa	* 29/8/6	3	8	6	2	26	-	-	-	-	X	X	-	-	-	-	-	-	-	
"Tomato"		151/8/(1)	3	8	7	2	17	-	-	-	-	-	-	X	X	-	-	-	-	X	
Solanum	lycopersicum	151/8/(1)	3	8	7	2	17	-	-	-	-	-	-	X	X	-	-	-	-	X	
Sphenoclea	zeylanica	*145/1	3	8	8	0	17	-	-	-	-	-	-	X	X	-	-	-	-	-	
Spilanthes	uliginosa	*139/9/2	3	8	9	0	18	-	-	-	-	-	-	X	X	-	-	-	-	-	
Striga	hermontheca	153/30/13	3	9	0	2	16	-	-	-	-	-	-	X	-	-	-	-	-	-	
Striga	aspera	*153/30/11	3	9	1	2	18	-	-	-	-	-	-	X	-	-	-	-	-	-	
Tribulus	terrestris	* 85/2	3	9	2	0	16	-	-	-	X	X	X	X	-	-	-	-	-	-	
Tridax	procumbens	*139/3	3	9	3	2	17	-	-	-	-	-	-	X	-	-	-	-	-	-	
Vernonia	sp.	139/62	3	9	4	2	28	-	-	X	X	-	-	X	-	-	-	-	-	-	
Vicoa	leptoclada	*139/44	3	9	5	0	17	-	-	-	-	-	-	X	-	-	-	-	-	-	
Zornia	glochidiata	* 91/66/1	3	9	6	2	16	-	-	-	-	X	X	X	-	-	-	-	-	-	
"Kunturo" (M)		137/87	3	9	7	1	20	-	-	X	X	X	X	X	X	X	X	-	-	X	
Borreria	sp.	137/87	3	9	7	1	20	-	-	X	X	X	X	X	X	X	X	-	-	X	
Nymphaea	micrantha	11/-/1	3	9	8	0	15	-	-	-	-	-	-	-	X	X	-	-	-	-	
Unknown	forb 2	- - -	3	9	9	0	20	-	-	X	X	-	X	X	-	-	-	-	-	-	
Unknown	forb 3	- - -	4	0	0	0	20	-	-	X	X	-	X	X	-	-	-	-	-	-	

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Genus	Species	FWTA No.	ID			GP	DM	SpOc													
			1	2	3			1	2	3	4	5/6	7	8/9	10	11	12	13	14		
Bacopa	decumbens	153/14/5	4	0	1	0	17	-	-	-	-	-	-	-	-	-	X	X	-	-	-
"Water Lily"		11/-/4	4	0	2	0	17	X	X	-	-	-	-	-	-	-	X	X	-	-	-
Nymphaea	lotus	11/-/4	4	0	2	0	17	X	X	-	-	-	-	-	-	-	X	X	-	-	-
Blepharis	sp.	159/20	4	0	3	2	17	-	-	-	-	X	X	-	-	-	-	-	-	-	-
Cassia	nigricans	* 89/12/3	4	0	4	1	24	-	-	-	-	X	X	-	-	-	-	-	-	-	-
Borreria	verticillata	137/87/9	4	0	5	0	20	-	-	-	-	X	X	X	-	-	-	-	-	-	-
Merrinia	trident. v.ag.	152/11/2a	4	0	6	1	21	-	-	-	-	-	-	-	-	X	X	-	-	-	-
"Julung Dingo"		- - -	4	0	7	1	21	-	-	-	X	X	X	X	-	-	-	-	-	-	X
Corchorus	olitorius	74/6/5	4	0	8	0	17	-	-	-	-	-	-	X	X	-	-	-	-	-	-
Tephrosia	pedicellata	91/23/5	4	2	1	1	18	-	-	-	X	X	X	X	-	-	-	-	-	-	-
Unknown	forb 4	- - -	4	9	9	0	20	-	-	-	-	-	X	X	X	X	-	-	-	-	-

SUB-SHRUBS

Unknown	sub-shrub	- - -	5	0	0	0	29	-	-	-	-	X	X	-	-	-	-	-	-	-	-
Asparagus	sp.	182/2	5	0	1	2	25	-	-	-	-	X	X	-	-	-	-	-	-	-	-
Euphorbia	sp.	86/64	5	0	2	2	17	-	-	-	-	-	-	X	-	-	-	-	-	-	-
Sesbania	sp.	91/24	5	0	3	0	24	-	-	-	-	-	-	X	-	-	-	-	-	-	-
Sida	sp.	77/3	5	0	4	1	17	-	-	-	-	-	X	X	X	-	-	-	-	-	X
Stylosanthes	sp.	91/65	5	0	5	1	17	-	-	X	X	X	X	X	-	-	-	-	-	-	-
Achyranthes	aspera	37/10/3	5	0	6	0	17	-	-	X	X	-	-	-	-	-	-	-	-	-	-
Asparagus	flagellaris	182/2/6	5	0	7	2	25	-	-	-	-	X	-	-	-	-	-	-	-	-	-
Cassia	absus	* 89/12/15	5	0	8	0	24	-	-	-	-	-	X	X	X	X	-	-	-	-	X
Cassia	tora	89/12/19	5	0	9	0	25	-	-	X	X	X	X	X	X	X	-	-	-	-	X
Indigofera	colutea	* 91/26/47	5	1	0	0	17	-	-	-	X	X	-	-	-	-	-	-	-	-	-
Indigofera	stenophylla	* 91/26/32	5	1	1	0	17	-	-	-	X	X	-	-	-	-	-	-	-	-	-
Indigofera	pulchra	* 91/26/18	5	1	2	1	17	-	-	-	X	X	-	-	-	-	-	-	-	-	-
Indigofera	prieureana	* 91/26/31	5	1	3	0	17	-	-	-	X	X	-	-	-	-	-	-	-	-	-
Iponoea	aquatica	152/16/18	5	1	4	1	23	-	-	-	-	-	-	-	X	X	-	-	-	-	-
Lippia	chevalieri	160/6/3	5	1	5	2	26	-	-	-	X	X	X	-	-	-	-	-	-	-	-
Oxystelma	bornouense	*136/6	5	1	6	1	21	-	-	X	X	-	-	-	-	-	-	-	-	-	-
Sida	alba	77/3/5	5	1	7	1	17	-	-	-	-	-	X	X	-	-	-	-	-	-	-
Sida	acuta	* 77/3/9	5	1	8	1	17	-	-	-	-	-	X	X	-	-	-	-	-	-	-
Stylosanthes	nucronata	* 91/65/2	5	1	9	1	17	-	-	X	X	-	-	-	-	-	-	-	-	-	-
Stylosanthes	hamata	91/65/(1)	5	2	0	1	17	-	-	-	-	-	X	X	-	-	-	-	-	-	-
Tephrosia	pedicellata	* 91/23/5	5	2	1	1	18	-	-	-	X	X	X	X	-	-	-	-	-	-	-
Triumfetta	rhomboidea	74/7/5	5	2	2	2	24	-	-	X	X	-	-	-	-	-	-	-	-	-	-
"Dagilo"		77/4	5	2	3	2	18	-	-	X	X	X	X	X	X	X	X	X	X	-	X
Urena	lobata	* 77/4	5	2	3	2	18	-	-	X	X	X	X	X	X	X	X	X	X	-	X
Waltheria	indica	* 75/11/2	5	2	4	2	24	-	-	X	X	X	X	-	-	-	-	-	-	-	-
Cassia	occidentalis	89/12/21	5	2	5	0	24	-	-	-	-	-	X	X	-	-	-	-	-	-	X
"Tribo" (M)		* 52/-/1	5	5	1	2	16	-	-	-	X	X	X	-	-	-	-	-	-	-	-
Cochlospermum	tinctorum	* 52/-/1	5	5	1	2	16	-	-	-	X	X	X	-	-	-	-	-	-	-	-
Datura	innoxia	*151/1/3	5	5	2	2	27	-	-	-	-	X	X	-	-	-	-	-	-	-	-

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Genus	Species	FWTA No.	ID			GP	DM	SpOc													
			1	2	3			1	2	3	4	5/6	7	8/9	10	11	12	13	14		

Englerina	lecardii	*109/3/1	5	5	3	2	28	-	-	-	-	X	X	-	-	-	-	-	-
Icacina	senegalensis	102/6/1	5	5	4	2	27	-	-	-	-	-	-	X	-	-	-	-	-

SHRUBS, SMALL TREES, WOODY CLIMBERS

Unknown	shrub	- - -	7	0	0	0	29	-	-	X	X	X	X	-	-	-	-	-	-
Acacia	sp.	90/20	7	0	1	0	30	-	-	-	-	-	-	-	X	X	-	-	-
Cassia	sp.	89/12	7	0	2	0	24	-	-	-	-	-	-	X	-	-	-	-	-
Combretaceae	sp.	69/	7	0	3	0	32	-	-	-	-	X	X	-	-	-	-	-	-
Combretum	sp.	69/2	7	0	4	1	32	-	-	-	-	X	X	-	-	-	-	-	-
Abrus	prectorius	* 91/64/1	7	0	5	2	29	-	-	X	X	-	-	-	-	-	-	X	-
Acacia	macrostachya	* 90/20/7	7	0	6	1	28	-	-	-	-	X	X	-	-	-	-	-	-
Annona	senegalensis	* 4/22/3	7	0	7	0	33	-	-	-	X	X	X	-	-	-	-	-	-
Annona	glabra	* 4/22/4	7	0	8	0	33	-	-	-	X	X	X	-	-	-	-	-	-
Baissea	multiflora	*134/35/7	7	0	9	1	29	-	-	-	X	X	X	-	-	-	-	-	-
Balanites	aegyptiaca	85/6/2	7	1	0	1	30	-	-	-	X	-	-	-	-	-	-	-	-
Bauhinia	rufescens	* 89/1	7	1	1	1	30	-	-	-	-	-	-	X	-	-	-	-	-
Caesalpinia	pulcherrima	* 89/52/(1)	7	1	2	0	28	-	-	X	X	-	-	-	-	-	-	-	-
Calotropis	procera	*136/10	7	1	3	2	27	-	-	-	-	-	X	X	X	X	-	-	-
Capparis	tonentosa	* 17/4/8	7	1	4	1	30	-	-	X	-	-	-	-	-	-	X	-	-
Cassia	mimosoides	* 89/12/5	7	1	5	1	24	-	-	-	-	-	X	X	-	-	-	-	X
Cassia	alata	* 89/12/10	7	1	7	0	24	-	-	X	X	-	-	-	X	X	-	-	-
Combretum	micranthum	69/2/16	7	1	8	0	32	-	-	-	-	X	X	-	-	-	-	-	-
Dialium	guineense	* 89/10/2	7	1	9	0	29	-	-	X	X	-	-	-	-	-	-	-	-
Dichrostachys	glomerata	* 90/14	7	2	0	1	30	-	-	-	X	X	X	X	-	-	-	-	-
Drepanocarpus	lunatus	* 91/14	7	2	1	0	30	-	-	X	-	-	-	-	-	-	-	-	-
Ectadiopsis	oblongifolia	*135/8	7	2	2	0	28	-	-	-	-	X	-	-	-	-	-	-	-
Gardenia	erubescens	*137/18/7	7	2	4	2	30	-	-	-	X	X	X	-	-	-	-	-	-
Grewia	flavescens	* 74/2/15	7	2	5	0	29	-	-	X	X	-	X	-	-	-	-	-	-
Grewia	carpinifolia	* 74/2/14	7	2	6	0	29	-	-	X	X	-	X	-	-	-	-	-	-
Guiera	senegalensis	* 69/5	7	2	7	1	28	-	-	-	-	-	X	X	-	-	X	-	-
Heeria	insignis	*121/13/2	7	2	8	2	30	-	-	-	-	X	X	X	-	-	-	-	-
Hymenocardia	acida	* 86/14/3	7	2	9	2	29	-	-	-	-	X	-	-	-	-	-	-	-
Lannea	velutina	121/9/5	7	3	0	0	7	-	-	X	X	X	X	X	-	-	-	-	-
Lannea	acida	121/9/7	7	3	1	0	7	-	-	X	X	X	X	X	-	-	-	-	-
Lantana	canara	*160/4/1	7	3	2	0	30	-	-	-	-	-	X	X	-	-	-	-	-
Leptadenia	hastata	*136/29/2	7	3	3	1	30	-	-	X	X	X	X	X	X	-	X	-	-
Mimosa	pigra	* 90/18/2	7	3	4	1	30	-	-	-	-	-	-	-	X	X	-	-	-
Mitragyna	inermis	*137/43/1	7	3	5	2	31	-	-	-	-	-	-	-	X	X	-	-	-
Naucllea	latifolia	*137/46/1	7	3	6	2	30	-	-	X	X	-	-	-	-	-	-	-	-
Ocimum	gratissimum	*162/1/3	7	3	7	2	18	-	-	X	X	-	X	-	-	-	-	-	X
Parinari	macrophylla	* 87/7/8	7	3	8	0	29	-	-	X	X	-	-	-	-	-	-	-	X
Pavetta	corymbosa	*137/29/2	7	3	9	0	33	-	-	-	X	X	X	-	-	-	-	-	-

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Genus	Species	FWTA No.	ID			GP	DM	SpOc													
			1	2	3			1	2	3	4	5/6	7	8/9	10	11	12	13	14		
Piliostigma	thonningii	* 89/2/2	7	4	0	0	30	-	-	X	X	X	X	X	X	-	-	-	-	-	X
Sclerocarya	birrea	121/7	7	4	1	0	30	-	-	-	-	X	X	X	-	-	-	-	-	-	-
Securidaca	longepeduncul.	* 22/3/2	7	4	2	2	33	-	-	-	X	X	X	X	-	-	-	-	-	-	-
Sesbania	sudanica	* 91/24/(1)	7	4	3	0	24	-	-	-	-	-	X	X	-	-	-	-	-	-	-
Strychnos	spinosa	*132/2/1	7	4	4	0	28	-	-	-	-	X	X	-	-	-	-	-	-	-	-
Terminalia	macroptera	* 69/6/4	7	4	5	0	33	-	-	X	X	X	X	X	-	-	-	-	-	-	-
Ziziphus	mucronata	*112/1/4	7	4	6	2	30	-	-	X	X	X	X	X	-	-	-	-	-	-	-
Ziziphus	mauritiana	*112/1/2	7	4	7	1	30	-	-	X	X	X	X	X	-	-	-	-	-	-	-
Lanea	sp.	121/9	7	4	9	0	7	-	-	X	X	X	X	X	-	-	-	-	-	-	-
Grewia	sp.	74/2	7	6	0	0	29	-	-	X	X	-	X	-	-	-	-	-	-	-	-
Combretum	glutinosum	69/2/9	7	6	1	1	29	-	-	X	X	X	X	-	-	-	-	-	-	-	-
"Yiri Kundango" (M)		139/62/19	7	6	2	2	28	-	-	-	-	-	-	-	X	X	X	-	-	-	-
Vernonia	colorata	139/62/19	7	6	2	2	28	-	-	-	-	-	-	-	X	X	X	-	-	-	-
Avicennia	africans	161/	7	6	3	0	33	X	X	-	-	-	-	-	X	X	X	-	-	-	-
"Mangrove" (black)		161/	7	6	3	0	33	X	X	-	-	-	-	-	X	X	X	-	-	-	-
"Jubukungo" (M)		161/	7	6	3	0	33	X	X	-	-	-	-	-	X	X	X	-	-	-	-
Rhizophora	racemosa	70/4/3	7	6	4	0	33	X	X	-	-	-	-	-	-	-	-	-	-	-	-
"Mangrove" (red)		70/4/3	7	6	4	0	33	X	X	-	-	-	-	-	-	-	-	-	-	-	-
"Mankwo" (M)		70/4/3	7	6	4	0	33	X	X	-	-	-	-	-	-	-	-	-	-	-	-
Combretum	fusum	69/2/27	7	6	5	0	32	-	-	X	X	-	-	-	-	-	-	-	-	-	-
Vitex	doniana	*160/10/6	7	6	6	2	28	-	-	-	X	X	X	X	-	-	-	-	-	-	-
Chrysobalanus	orbicularis	87/5/1	7	6	7	0	30	-	-	X	X	-	-	-	-	-	-	-	-	-	-
"Voratch" (M)		87/5/1	7	6	7	0	30	-	-	X	X	-	-	-	-	-	-	-	-	-	-
Desmodium	velutinum	91/75/3	7	6	8	0	30	-	-	X	X	X	-	-	-	-	-	-	-	-	-

TREES

Unknown	tree	- - -	9	0	0	0	31	-	-	X	X	-	-	-	-	-	-	-	-	-	-
Acacia	sp.	90/20	9	0	1	0	30	-	-	-	-	-	-	-	X	X	-	-	-	-	-
Combretum	sp.	69/2	9	0	2	0	32	-	-	-	-	X	X	-	-	-	-	-	-	-	-
Ficus	sp.	202/6	9	0	3	0	29	-	-	-	-	-	-	X	-	-	-	-	-	-	-
Sterculia	sp.	75/14	9	0	4	0	25	-	-	-	X	X	X	-	-	-	-	-	-	-	-
Acacia	nilotica	* 90/20/12	9	0	5	1	30	-	-	-	-	-	-	X	-	-	-	-	-	-	X
Acacia	polyacantha	* 90/20/5	9	0	6	1	30	-	-	X	-	-	-	-	X	X	X	-	-	-	-
Acacia	albida	* 90/20/6	9	0	7	1	30	-	-	-	-	-	X	X	-	-	-	-	-	-	-
Acacia	sieberiana	* 90/20/10	9	0	8	1	30	-	-	X	-	X	X	-	X	X	X	-	-	-	-
Albizia	adianthifolia	* 90/21/8	9	1	0	0	30	-	-	-	-	-	-	X	-	-	-	-	-	-	X
Anogeissus	leiocarpus	* 69/8	9	1	1	0	33	-	-	X	X	X	-	X	-	-	-	-	-	-	X
"Neem"		118/12	9	1	2	0	33	-	-	X	X	X	X	X	-	-	-	-	-	-	X
Azadirachta	indica(Neem)	118/12	9	1	2	0	33	-	-	X	X	X	X	X	-	-	-	-	-	-	X
"Kaitupa" (W)		76/2/1	9	1	3	0	25	-	-	-	-	X	X	X	-	-	-	-	-	-	X
Bombax	buonopozense	76/2/1	9	1	3	0	25	-	-	-	-	X	X	X	-	-	-	-	-	-	X
Bombax	costatum	96/2/2	9	1	4	0	25	-	-	-	-	X	X	-	-	-	-	-	-	-	-

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Genus	Species	FWTA No.	ID			GP	DM	Sp0c													
			1	2	3			1	2	3	4	5/6	7	8/9	10	11	12	13	14		
Borassus	aethiopum	193/10	9	1	5	0	33	-	-	X	X	-	-	X	X	X	-	-	X		
Cassia	sieberiana	* 89/12/8	9	1	6	1	24	-	-	-	X	X	X	X	-	-	-	-	X		
Ceiba	pentandra	76/3	9	1	7	0	32	-	-	-	-	-	-	X	-	-	-	-	X		
Cola	cordifolia	75/15/42	9	1	8	0	33	-	-	-	-	-	-	X	-	-	-	-	X		
Adansonia	digitata	76/1	9	1	9	0	32	-	-	-	X	X	X	X	-	-	-	-	X		
Cordyla	pinnata	89/6/1	9	2	1	0	32	-	-	-	X	X	X	X	-	-	-	-	X		
Detarium	microcarpum	* 89/19/1	9	2	2	0	29	-	-	X	X	-	-	-	-	-	-	-	-		
Detarium	senegalensis	* 89/19/2	9	2	3	0	29	-	-	X	X	-	-	-	-	-	-	-	-		
Diospyros	mespiliformis	*127/-/21	9	2	4	1	33	-	-	X	X	-	X	X	-	-	-	-	X		
Elaeis	guinensis	193/3	9	2	5	0	33	-	-	-	-	-	-	-	X	X	-	-	-		
Entada	africana	* 90/9/4	9	2	6	0	32	-	-	-	X	X	X	X	-	-	-	-	X		
Erythrina	senegalensis	* 91/43/3	9	2	7	0	29	-	-	-	-	X	X	-	-	-	-	-	-		
Gnelina	arborea	160/(1)/(1)	9	2	8	1	33	-	-	-	-	-	-	X	-	-	-	-	X		
Hannoa	undulata	*115/4/3	9	2	9	0	25	-	-	-	-	X	X	-	-	-	-	-	-		
Khaya	senegalensis	118/1/1	9	3	0	0	29	-	-	X	X	-	-	X	-	-	-	-	X		
Magifera	indica	121/1	9	3	1	0	29	-	-	-	-	-	-	X	X	X	-	-	X		
"Mango"		121/1	9	3	1	0	29	-	-	-	-	-	-	X	X	X	-	-	X		
Moringa	oleifera	18/	9	3	2	0	33	-	-	-	-	-	-	X	-	-	-	-	-		
Newbouldia	laevis	*157/6	9	3	3	0	28	-	-	-	X	-	X	-	-	-	-	-	-		
Parkia	biglobosa	90/2/1	9	3	4	0	33	-	-	X	X	-	-	X	-	-	-	-	X		
Peltophorum	pterocarpum	* 89/(1)/(1)	9	3	5	0	33	-	-	X	X	-	-	-	X	X	-	-	-		
Piliostigma	reticulatum	* 89/2/1	9	3	6	0	30	-	-	X	X	-	X	X	-	-	-	-	X		
Prosopis	africana	* 90/11	9	3	7	0	30	-	-	X	X	X	X	X	-	-	-	-	-		
Psidium	guajava	* 66/(1)/(1)	9	3	8	0	29	-	-	X	X	-	-	-	-	-	-	-	-		
Pterocarpus	lucens	* 91/12/1	9	3	9	0	31	-	-	-	-	X	X	-	-	-	-	-	-		
Sterculia	setigera	75/14/1	9	4	0	0	27	-	-	-	X	X	X	-	-	-	-	-	-		
Tamarindus	indica	* 89/46	9	4	1	0	30	-	-	-	-	-	-	-	X	X	X	-	-		
Terminalia	avicennoides	* 69/6/10	9	4	2	0	33	-	-	X	X	X	X	X	-	-	-	-	X		
Celtis	integrifolia	95/1/3	9	4	4	0	33	-	-	X	X	X	-	-	-	-	-	-	-		
"Buleyi" (F)		95/1/3	9	4	4	0	33	-	-	X	X	X	-	-	-	-	-	-	-		
"Kamanyango" (M)		95/1/3	9	4	4	0	33	-	-	X	X	X	-	-	-	-	-	-	-		
Hyphaene	thebaica	193/11	9	4	5	0	33	-	-	X	X	-	X	X	X	X	X	-	X		
"Dune Palm"		193/11	9	4	5	0	33	-	-	X	X	-	X	X	X	X	X	-	X		
Citrus	spp.	144/(1)/(1)	9	4	6	0	30	-	-	-	-	-	-	X	-	-	X	-	X		
Erythrophleum	guineense	89/57/1	9	4	7	0	33	-	-	X	X	-	-	-	-	-	-	-	-		
Pterocarpus	erinaceus	91/12/5	9	4	9	0	33	-	-	X	X	X	X	X	-	-	-	-	X		
Daniellia	oliveri	89/26/1	9	5	0	0	33	-	-	X	X	X	X	X	-	-	-	-	-		
Phoenix	reclinata	193/12/2	9	6	0	0	33	-	-	-	-	-	-	-	X	X	-	-	-		
Spondias	monbin	121/4/1	9	6	1	0	30	-	-	X	X	-	-	-	-	-	-	-	-		
Tapinanthus	bangwensis	109/6/4	9	6	2	0	30	-	-	X	X	-	-	-	-	-	-	-	-		

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Genus	Species	FWTA No.	ID			GP	DM	SpOc													
			1	2	3			1	2	3	4	5/6	7	8/9	10	11	12	13	14		
MISCELLANEOUS																					
Litter	--	--	6	0	0	0	5	-	-	X	X	X	X	X	X	X	-	-			
Acacia	sp.	90/20	6	0	1	0	30	-	-	-	-	-	-	-	X	X	X	-	-		
Achyranthes	sp.	37/10	6	0	2	0	17	-	-	X	X	-	-	-	-	-	-	-	-		
Baissea	sp.	134/35	6	0	3	1	29	-	-	-	-	X	X	-	-	-	-	-	-		
Cassia	sp.	89/12	6	0	4	0	24	-	-	-	-	-	X	X	-	-	-	-	-		
Clerodendrum	sp.	160/9	6	0	5	0	28	-	-	-	X	X	X	-	-	-	-	-	-		
Combretaceae	sp.	69/	6	0	6	0	32	-	-	-	-	X	X	X	-	-	-	-	-		
Combretum	sp.	69/2	6	0	7	1	32	-	-	-	-	X	X	X	-	-	-	-	-		
Compositae	sp.	37/	6	0	8	0	19	-	-	-	-	-	-	X	X	X	-	-	-		
Euphorbia	sp.	86/64	6	0	9	2	17	-	-	-	-	-	-	X	X	X	-	-	-		
Hibiscus	sp.	77/10	6	1	1	0	21	-	-	-	X	X	X	X	-	X	-	-	X		
Indigofera	sp.	91/26	6	1	2	2	17	-	-	-	X	X	X	X	-	-	-	-	-		
Jussiaea	sp.	43/2	6	1	4	1	16	-	-	-	-	-	-	-	X	X	-	-	-		
Leguminosae	sp.	--	6	1	5	0	19	-	-	-	-	-	-	X	-	-	-	-	-		
Sesbania	sp.	91/24	6	1	6	0	24	-	-	-	-	-	X	X	-	-	-	-	-		

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