AN INTEGRATED WORK PLAN
FOR THE FINAL TWO YEARS
OF THE MIXED FARMING PROJECT

by
The Project Team

Special Administrative Report
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MIXED FARMING AND RESOURCE MANAGEMENT PROJECT SPECIAL ADMINISTRATIVE REPORT

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An Integrated Work Plan
for the Final Two Years of the
Mixed Farming Project

Overview

The Gambian Mixed Farming and Resource Management Project (MFP) began its field phase in May 1981 and will continue in the field until March 31, 1986. Problems with the initial design and funding of the project have led to three mid-project exercises to coalesce and direct the overall effort. The first, requested by the Project Director, was to define where MFP was headed somewhat more clearly than was achieved in the original Project Paper. An initial prioritization of activities and outputs occurred at that time, some five months into the field phase.

The second such effort occurred in March and April 1983 when, at the joint initiative of USAID and CID, an early mid-project evaluation was undertaken followed by a partial re-design. Significant steps were taken to direct each of the separate MFP components toward an integrated whole. Some non-viable outputs were deleted from the scope of work. An enhanced schedule of inputs was developed which included increased technical assistance, additional commodities and recurrent cost support and additional participant training. Funding was expanded to cover the strengthened program through a PACD of 3-31-86.

The project has, at this writing, two full years remaining in the field. It is time to clearly focus in on the end-of-project status of each of the many activities being pursued and to make necessary adjustments to maximize our long-term contribution to Gambia. Thus, a third round of intensive examinations of the Mixed Farming Project has occurred over the period of roughly November 1983 to March 1984.

These discussions have been largely in-house within and between the contractor's field team and U.S. based personnel, although ample input has been received from GOTG and USAID. This document concludes the process and should set the stage for the balance of the field phase.

Two issues have dominated this most recent series of discussions. First has been the perceived need to complete the process of integrating the several professionals on the field team. Second was to structure and prioritize a set of activities that will complete the last two years of the project. These two issues were resolved simultaneously. The result, an integrated work plan for our final two years, is presented below.

The Project Environment

Several considerations form the framework within which the project must now operate. The following were among "environmental" factors considered while developing the work plan.
Consolidation

As the project enters its last two years, it is important that work be focussed on activities which can now be seen as having the highest pay off. This will necessitate a narrowing of the list of topics addressed by project professionals. In effect the last two years must be seen as a period of consolidation in which tangential activities are phased out and few, if any, new thrusts are begun. For this reason the project will not be able to become involved in such topics as soil fertility, contour terracing, active collaboration with forestry personnel and other items that have been recently suggested. While these activities may be logical extensions of the MFP, given the limited time remaining for MFP, they are most appropriately considered as parts of subsequent agricultural program efforts.

Institutional Limitations

It is recognized that the Ministry of Agriculture has constraints to its present capacity to implement intensive programs in the field. Furthermore, these limits (inadequate budgets, poor incentives in the civil service, shortage of trained staff) are likely to prevail for an extended period. Thus, it would be unrealistic to expect GOTG to absorb the full range of Mixed Farming Project activities in their present form.

The project will continue to strengthen governmental institutions through formal training, on-the-job collaboration, providing data and policy analysis, but we do not expect to effect any significant institutional reform during the life of the project. Therefore, the technologies designed must be those that can be extended easily through a combination of modest governmental support and strong farmer acceptance. By concentrating much of our effort on Livestock Owners Associations (LOAs), and rural women's societies, and by stressing the concept of appropriate technology, we hope to develop programs that will be largely sustained by the farmers themselves.

Follow-On Continuity

Several of the activities of MFP will lead to recommended technologies by the end of the project. However, clear termination in early 1986 will prevent us from carrying several of these into full field implementation. Range management strategies, in particular, because of their longer gestation time will be among the last of our outputs. Rather than let the support lapse after the technologies have been defined, it seems logical to flag a series of "Phase II" support activities to be supported by USAID and other agencies. The thrust of this support will likely be field application on a large scale and further institutional strengthening so that the GOTG can ultimately sustain these efforts without donor support. A list of probable needs for follow-on activities appears as Appendix A.
The Project Goal

The goal of the project as stated in the project paper is "to increase the economic well-being of the rural people through more intensified integration of crop and livestock production within existing Gambian farming systems". At this point in the project we are de-emphasizing the word "economic" in that statement since many of our outputs will impact the rural people's lives in areas that are not now monetized and/or are hard to value economically. Greater dietary diversity, stability in livestock husbandry systems and increased consumption of animal proteins are examples of expected benefits which are not best described in economic terms. We are, however, emphasizing the integration of crop and livestock systems. Much of our work focuses on enhancing the systems linkages between crop husbandry and livestock enterprises. And, we interpret the phrase "within existing Gambian farming systems" as focussing our attention on appropriate incremental changes rather than wholesale replacement with modern technology.

Accomplishments to Date

Initially, the team met with members of the Livestock Owners Associations to determine what they thought were the most serious problems in providing the forage requirements for their livestock and how they could best be resolved. With the information gathered, and in conformance with the original project description for each activity, the program proceeded with socio-economic studies, research, livestock feeding trials, maize trials, demonstrations, training, forage introduction trials, forage inventory and seed multiplication. There was a need for the physical scientists to determine what was physically feasible in The Gambia through various agronomic research trials. The results could then be evaluated to see if economically feasible and practical modifications could be used in Gambian farming systems.

To date the sociologist and the research agricultural economist have been almost totally occupied in selecting and training enumerators, completing the baseline study, conducting a market survey, and carrying out an intensive farm management study. These activities were mandated in the original project paper. Data gathering was completed March 31, 1984, and analysis of the data and completion of reports should be accomplished by the end of July. With the micro-computers now in The Gambia, data analysis has been expedited. The social scientists are presently in position to work more closely with the physical scientists in an effort to pull all the activities into an integrated effort at the village level as we proceed into the final two years of the project.

The forage agronomist found that there had been very little research on forage development and production in The Gambia. Work started with trials of imported and local cultivars, expansion of seed multiplication and the search for the most promising legume to introduce into the fallow lands for both increased forage production and improved soil fertility. In addition, livestock feeding trials were conducted at Yundum using maize stover, sorghum stover, rice straw, groundnut haulms, gamba grass hay and
maize and sorghum ensilage. Livestock owners and farmers were brought to Yundum to view the feeding trials. This created interest in the use of farm crop residues, and farmers wanted to try it in their area. As a result the forage agronomist, in conjunction with LOA members, the range ecologist and maize agronomist, started in April 1983 to conduct a feeding trial in the village of Boiram. The intent was to test whether a year-round forage supply could be obtained using farm crop residues and deferred range forage. A check group of animals were fed in the conventional method and animals weighed every fortnight to determine weight differences and apparent condition. This was strictly a feeding trial to physically evaluate whether the system was feasible. No attempt was made at this stage to carry out the trial in the most economical or practical way. The next effort will be an integrated team approach using the most practical and economical methods of harvesting and feeding residues in the field and protecting deferred range areas through herding rather than fencing. Socio-economic studies will be conducted and farmer acceptability of the technology will be carefully evaluated. Again, the objective of the combined effort will be to improve the well-being of agricultural households through improvements in maize production and improved management of range and forage resources.

The most successful component of the project to date has been the maize program. Fortunately, upon arrival in The Gambia, it was found that the physical testing of maize varieties had been an ongoing program and a good variety (NC-B) was available to promote as part of a technological package. Once it was taken off the experiment stations and tested under farm conditions, farmers were quick to realize that this was a good alternative crop. Fortunately, the project was able to provide funding for training of extension personnel, transportation for farmer demonstrations, supplies and logistical support for maize food demonstrations, motorcycles and mileage allowances for key extension personnel and timely technical guidance in keeping the program on track. All this has been accomplished with the active cooperation of several existing institutions, especially the Department of Agriculture Extension and Research Services.

The maize program has had a pronounced effect on farmers. In 1983 they had planned to plant over 4,000 hectares of maize under the (NC-B) technological package. Various problems of credit, fertilizer delivery and drought conditions reduced the amount planted to around 2,500 hectares. But many of the farmers in the U.R.D. and M.I.D. still stated this was their best crop in 1983, despite the drought. They said they planned to plant as much or more maize in 1984. It is evident that if the Mixed Farming Project were discontinued today, the farmers of The Gambia would continue to raise large amounts of maize. In other words, the target group has been strongly influenced by the project and in their own opinion have been helped toward improved well being.

The range ecologist and his counterpart were faced with the most difficult task of working toward improved management of the native range lands. They concentrated their effort in the Upper River and McCarthy Island Divisions where the largest percentage of cattle are located. Working with the Livestock Owners Associations 18 range demonstration plots were established to demonstrate effects of deferred use and the potential improvement from seeding. Seed multiplication plots were
expanded, training of pasture assistants was initiated, a ten hectare pasture was fenced for the feeding trial at Boiram, the river was surveyed for access ways for cattle to water, one access way is under construction and four more are planned, a large portion of the forage inventory has been completed and plant specimens for the herbarium have been collected. Good working relationships have been developed with LOAs and all physical work in fencing, water accessway construction, seeding and root planting is provided by LOA members. The range ecologist is cooperating closely with the maize and forage agronomists in the Boiram feeding trials and is active in support for the planned integrated village trials for the remainder of the project.

Although the marketing specialist has only recently joined the project, an initial maize marketing survey has been completed, and the data are being processed and analyzed on the microcomputer. The specialist is working closely with PPMU and will spend at least half time in their Banjul office.

The Program for the Last Two Years

Evolution

Initially MFP was predominantly focussed on cattle with most activities conceived for their impact on cattle husbandry. However, an evolution of emphasis has occurred as a result of field findings and the inputs of Gambian farmers and Ministry of Agriculture personnel. An early shift occurred in the perceived role of maize. The project paper called for a maize agronomist for three years to develop maize grain as cattle feed. This was soon recognized as a non-viable strategy from the farmers' perspective. However, maize production for human food was judged viable as a primary strategy with the stover by-product providing an important link to a year-long feeding program. Given this new conception, the maize agronomist position was extended to the life of the project and reinforced with a Peace Corps Volunteer working on maize agronomy with women's societies and on the utilization and popularization of maize as a household foodstuff.

Early attempts to cultivate legume forages on fallow lands experienced a direct conflict with other crops in terms of labor demand. Farmers, generally, will not divert peak season labor from cereals and cash crops to cultivated animal feed. Thus, this thrust has been partially de-emphasized and a new activity surfaced; that being intercropping legumes with maize. Hypothetically this should have a dual impact of additional livestock feed and higher maize yields.

Project specialists have come to recognize that concentrating solely on cattle may be too narrow a focus, given the realities of rural Gambia. We are moving toward devoting some attention to small ruminants due to their more direct contributions to human well-being and to the fact that a small ruminant program will directly benefit female clienteles.
Finally, the prospects of a successful impact on maize and livestock at the production level raised questions of disposition of an expanded output. It was quickly realized that both programs could potentially founder if there was no improvement in the cereals and livestock markets. Consequently, a marketing specialist was added to the long-term field team.

Present Balance

Thus, as we enter the final two years, the project offers an approximately equal balance of activities between livestock and cropping. The range ecologist and the forage agronomist have lead responsibility in maturing a livestock nutrition program, and that program, while concentrated on cattle, will embrace small ruminants as well.

The maize agronomist has the lead responsibility for the full development of commercial maize production. He has been assisted by a Peace Corps Volunteer agronomist who will, hopefully, join the team as a regular member concentrating on bringing both production and utilization technologies to village women. Short-term agricultural engineering skills will be directed toward field testing an improved ox-drawn cultivator and village level maize grinders, again impacting both production and utilization of maize. The forage agronomist will collaborate with the maize program to the extent of the intercropping trials and the emerging technologies for crop residue management as a feed source.

Both technical dimensions are supported by the services of a sociologist, an agricultural economist specialized in analysis and program design for small farm agriculture and a second agricultural economist specialized in agricultural marketing. We anticipate the addition of a Peace Corps Volunteer agricultural economist with special skills in rural/farm data collection and analysis to complete the internal support services.

This mix of field team activities and skills will be augmented substantially over coming months by short-term technical assistance in the following fields, among others:

1) animal science/animal nutrition,
2) small ruminants,
3) women in development,
4) agricultural engineering,
5) range plant taxonomy,
6) marketing training.

A tentative list of expected short-term consultancies is included as Appendix B.
Internal Consistency

In order to articulate the internal linkages between program components and activities, we present the three major project activity areas in outline form below. The outlines are built around the basic concepts embodied in USAID's Logical Framework (LOGFRAME) programming tool. The description of each activity area begins with the project goal which all have in common. Parenthetical numbers following items listed at the strategy or output level indicate the purpose or strategy respectively to which each is most directly targeted. For example, in the maize program description Output #3 (25 extensionists trained in maize processing and utilization) is targeted at Strategy #3 (educating village women in the kitchen use of maize) which contributes to reaching Purpose #3 (diversifying the Gambian diet) which is one of several means of achieving the goal of increasing well being for rural residents.

Specific assignments of responsibility appear as Appendix C.

Three Core Activity Areas

Maize Production and Utilization

Goal: Increase the well-being of the Gambian rural people.

Purposes: P-1 Generate cash incomes.
            P-2 Increase the level of cereals self-sufficiency in Gambian rural households.
            P-3 Diversify the Gambian diet.
            P-4 Reduce labor demands on the household.
            P-5 Release labor for other farm activities.
            P-6 Increase output of palatable fodders for animal feeding.

Strategies: S-1 Develop and extend an economically viable high yielding maize technology (P-1 thru P-6).
            S-2 Field test and recommend suitable maize processing technologies (P-1 thru P-5).
            S-3 Educate village women on additional nutritional uses of maize as an integral part of compound diets (P-3).
            S-4 Design needed improvements in the maize marketing system as well as a strategy for getting them implemented (P-1, P-3).
            S-5 Extend maize production technology to Women's Societies (P-1 thru P-6).
**Outputs:**

0-1 Maize technology package in use by 7,000 farmers in The Gambia (S-1, S-5).

0-2 Forty Agricultural Assistants and 150 Agricultural Demonstrators trained in MFP maize production technology (S-1).

0-3 Twenty-five female Agricultural Demonstrators (Home Economics) trained in maize processing and cookery (S-2, S-3).

0-4 Major study of maize marketing system; including structure, performance, evaluation of alternative institutional forms, recommended short and long term strategies for market development (S-4).

0-5 Recurrent analyses of maize price and policy questions as required by GOTG (S-1, S-4).

0-6 Technical/economic/social evaluation of alternative maize processing technologies with recommendations and an implementation plan (S-2).

0-7 Thorough economic/technical/social evaluation of MFP cultivator strategy followed by recommending a strategy for its widespread introduction to The Gambia (S-1, S-4).

0-8 Sixty to seventy-five Women's Societies trained in maize production agronomy (S-5).

0-9 A program of certified seed production utilizing Maize Growers Associations and Seed Multiplication Officer (S-1, S-4).

0-10 Full soci-economic evaluation of maize production technologies to be recommended by MFP (S-1).

**Implementation:**

- Continue current Maize Agronomist for ± three months with change of assignment to testing cultivation equipment.

- Replace Maize Agronomist on or about July 1 to ensure 60 days overlap with incumbent.

- Direct hire a field operator with joint responsibilities in maize agronomy and nutrition extension to continue with Women's Societies for one year. Obtain female counterpart for this position.

- Allocate ± 30 percent of anticipated Peace Corps Volunteer (Agricultural Economist) to work with MFP marketing economist on maize system study.
- MFP Marketing Economist to provide lead in maize marketing work as one of his major responsibilities.

- Augment existing team with TDY agricultural economist services during February-June 1984, to ensure adequate design of economic components of 0-1, 0-6, 0-7, 0-10.

**Issues:**

- Success with the maize program will offer a significant new alternative in Gambian cropping patterns. The crop will likely have two roles, cash crop and dietary staple, which is a unique combination in The Gambia. It is likely that farmers will, over time, allocate significant acreage to maize production. Some of this acreage shift could be at the expense of crops presently grown for export thus leading to perceived threats to Gambia's export earnings and government revenues.

  MFP Position: Continue full support to expanded maize cultivation on the ground that cereals self-sufficiency is as high a priority as any in the nation and that reduced foodgrain imports have the same net effect on balance of payments problems as increased export earnings.

- There is an immediate need for an economic evaluation of the MFP maize technology. Questions such as benefit:cost ratios, viability under alternative price and climatic scenarios and probable adoption patterns are important as the emphasis shifts from technology testing to extension.

  MFP Position: This analysis will be conducted during the 1984 growing season, requiring that the need for economic data be considered when planning 1984 field trials. The analyses will be repeated as refinements in the technology occur.

- As we address maize marketing, we have three options with respect to project emphasis: a) the inter-village domestic market; b) the rural to urban domestic market; and c) the export market.

  MFP Position: The potential export of maize is not of direct concern to the project and our marketing efforts will concentrate on a) and b) above in that order of priority. The rationale is that the need for local utilization, trade and sale is sufficient at present within maize growing regions to support further expansion in production. Stimulating inter-regional trade of any significant magnitude thus receives second priority due to high marketing costs which currently prevail.
- NC-B, the current maize variety being extended by MFP, is now approximately 12 years old. From a genetic standpoint one has to ask whether the country should continue to expand its reliance on this single cultivar.

MFP Position: That the project, together with the Department of Agriculture, move toward identifying one or two back-up varieties during the next few months and that a reasonable supply of seed for at least one of these be grown and stored.

- Two maize related technologies, the MFP cultivator and a village level maize grinding technology will have been field tested and refined by the end of the project. There will remain a need to assist with the nation-wide extension of these technologies for perhaps 2-3 years after MFP.

MFP Position: That USAID develop a modest support program to assist in popularizing and marketing these two technologies.

Range Management and Forage Production

Goal: Increase the well-being of the Gambian rural people.

Purposes:

P-1 To increase the potential of cash incomes from livestock without increasing livestock numbers.

P-2 To reduce environmental pressures through more efficient use and management of Gambia's natural resources.

P-3 To reduce risks in livestock husbandry.

P-4 To increase human consumption of animal proteins.

P-5 To increase the capacity of local level institutions to manage their livestock and their communal range resources.

P-6 To improve small ruminant husbandry.

P-7 To develop a sustained role for legumes in Gambian farming systems.

Strategies:

S-1 Improve the year-long nutritional status of cattle with particular emphasis on nutritional strategies for the late dry season (P-1 thru P-4).

S-2 Improve the carrying capacity of communal range resources (P-1 thru P-4, esp. P-2).
S-3 Assist where appropriate in developing water resource availability for livestock utilization (P-3).

S-4 Increase the skill levels of extension personnel responsible for livestock and range husbandry programs (P-1 thru P-6).

S-5 Train selected LOAs in range and livestock husbandry practices (P-2, P-5).

S-6 Strategies and outputs in the area of small ruminants to be defined by short term TDY inputs (P-6).

S-7 Select ecologically adapted legume species for use either as a pasture crop or an intercrop (P-7).

S-8 Improve the livestock marketing system (P-1, P-4).

**Outputs:**

0-1 Recommended program of supplemental feeding and grazing management to provide a year-long adequate nutrition level for livestock (S-1).

0-2 Feeding trials at village level and on station (0-1, S-1, S-6).

0-3 Study of grazing preference among forages by various livestock species (S-1, S-6).

0-4 Organizational and/or technical advice to rural groups initiating self-help water development (S-3).

0-5 Eighteen dual purpose (demonstration/research) exclosures located in selected rural areas (S-2, S-5).

0-6 Range reseeding trials with both grass and legume species (S-2, S-7).

0-7 Seven field trained, full time Pasture Assistants with an additional five Livestock Inspectors receiving formal classroom instruction only (S-4).

0-8 Range resource inventories developed for each district in two divisions (S-2).

0-9 Major study of livestock marketing system, including structure, performance, alternative institutional forms and recommended short and long term strategies for market development (S-8).

0-10 Recommended set of crop residue management practices for fodder and hay production (S-1).
A cost-benefit study of deferred grazing and supplemental feeding practices being developed (S-1, O-1, O-2).

Consultant study on role of small ruminants in Gambian agriculture and possible points for MFP interventions (S-6).

Study of decision making and managerial capacity of LOAs (S-5).

**Implementation:**
- Provide an animal scientist with skills in animal nutrition via TDYs beginning this growing season to assist in crystalizing the year-long feeding program.
- Provide TDY small ruminant specialist during Summer 1984.

**Issues:**
- MFP will have made a significant start at laying a foundation for land use planning in The Gambia. Aerial photographs are in hand, new maps are forthcoming from a separate USAID contract, resource inventories will be completed by MFP in two divisions and a herbarium collection properly started. Considerable additional materials are available from other on-going efforts in The Gambia. What is now missing is the integration of all these materials and their use in a national land use and natural resource planning effort. The institutional basis of such an effort is lacking as are trained Gambian personnel.

  MFP Position: That USAID develop a modest program of support targeted at leaving an effective land use and resource planning capacity in The Gambia by 1990.

- Experimentation and in-village testing of an integrated animal nutrition package will be essentially completed by 3/31/86. A significant task will then lie ahead, that being the extension and adoption of recommended practices. This will not be easy. Effective adoption requires that LOAs work together, manage their communal range, defer grazing, jointly manage crop residues and legume fallows.

  MFP Position: That at least five years of follow-on support to this effort be undertaken by USAID as a significant component of their future agricultural assistance program.
Agricultural Development Support Services

Goal: Increase the well-being of the Gambian rural people.

Purposes:

P-1 To strengthen agricultural planning, policy formation, and program design processes in The Gambia.

P-2 To support the technical thrusts of the Mixed Farming Project through the application of social sciences where needed in the technology design and technology diffusion processes and in input and product marketing.

P-3 To strengthen selected institutional subcomponents of the GOTG.

Strategies:

S-1 Establish a data base of baseline and other statistics on the agricultural sector (P-1).

S-2 Provide an enhanced computational capability for data processing and analysis in the Ministry of Agriculture (P-1, P-3).

S-3 Build a basis for land use planning (P-1).

S-4 Economic and social evaluation of technology packages (P-2).

S-5 Economic and social analysis as part of overall analysis of village agricultural systems (P-2).

S-6 Establish a capacity for recurrent collection of field data within the Ministry (P-1 thru P-3).

S-7 Develop recommendations for selected institutional changes in areas impacting MFP's scope of work (P-3).

S-8 Train selected portions of the MOA and other agencies impacted by MFP (P-1 thru P-3).

S-9 Provide an increased awareness of the role of women in Gambian agriculture and an increased ability to reach them with development interventions (P-1, P-2).

Outputs:

O-1 Baseline study of rural sector and intensive study of farm management practices. Project will provide full initial analysis and make raw data available to MOA for subsequent studies (S-1).
0-2 Market reporting system providing a routine flow of data on rural market conditions to market analysts in GOTG and to a market news service under Extension (S-1, S-6).

0-3 Selected policy studies to be conducted jointly with PPMU (S-8).

0-4 Two major market evaluations, one for maize and one for livestock (S-7 plus S-4/Maize and S-8/Pasture and Forage).

0-5 Micro computer equipment and Gambian staff trained in its use incorporated in GOTG with planning and policy analysis functions (S-2, S-8).

0-6 Economic and social studies (S-4, S-5): a) evaluation of maize technology package; b) evaluation of cultivator technology; c) analysis of management capacity of LOAs; and d) selected market policy analyses.

0-7 Active social sciences participation in village reconnaissance studies and in entire integrated village program (S-5).

0-8 Aerial photos, resource inventories and a herbarium collection (S-3).

0-9 Trained individuals on Gambian establishment (S-2, S-6, S-8).

0-10 Short course on agricultural marketing for Gambians with marketing responsibilities (S-8).

0-11 Short-term technical assistance on women-in-development to explore ways in which current project activities can increase their impact on rural women (S-9).

Implementation:

- Marketing Economist position added to field team for final 25 months.

- Short term agricultural production economist with special skills in small farm agriculture (TDY services 2/84-6/85) to ensure adequate preparation for 1984 cropping season measurements.

- Incumbent agricultural economist and sociologist to concentrate on analysis of baseline and farm management data from April-July 1984.
• Replace agricultural economist (research) o/a June 1 to begin work with start of 1984 cropping season.

• Add agricultural economics PCV as early in the summer of 1984 as possible.

• Present International Marketing School in The Gambia in January 1985 after development of relevant local case materials.

• Develop two graduate theses on intensive farm management data utilizing students in USA.

Issues:

• Ensuring the smooth transition of the MFP survey capacity to PPMU is important if these highly trained individuals are not to be lost.

  MFP Position: We will work with PPMU to assist in getting the requisite number of posts established (two years lead time) and 2) getting them funded (one year lead time).

• The Government of The Gambia and the donors working with them stand to benefit immeasurably by a consolidation of all MFP analysis of the baseline and intensive farm management studies. The best such work will likely result from the forthcoming (1986) Ph.D. dissertation of the current Agricultural Economist (Research). Two other M.S. theses are planned to appear in 1985/86 plus a number of special studies to be done in The Gambia by the MFP team. These analyses should fit together nicely into a major technical monograph on mixed farming systems in The Gambia but our capacity to generate such a monograph will be better during the 6-10 months immediately following the end of the project.

  MFP Position: If the project terminates with unexpended funds, a portion of these funds should be utilized to prepare a final descriptive analysis of Gambian agriculture and transmit, say 500, copies to USAID/Banjul for nationwide distribution.
Integrating the Activity Areas

The outlines developed above illustrate vertical relationships within activity areas. The outputs within each activity are each designed to contribute to one or more strategy. Strategies, in turn, are the means by which MFP seeks to accomplish a set of purposes. All stated purposes relate directly or indirectly to the common overall project goal. The 34 outputs given above are considered reasonable and accomplishable by the end of the project.

By combining the many activities of the project into aggregate activity areas, we seek to emphasize interdisciplinary collaboration in contrast to the discipline-specific work plans set out in the original project paper. Appendix C illustrates this point. For most outputs the collaborative interaction of several individuals is specified. In many cases, joint leadership responsibility is assigned. In many others, persons with lead roles are associated with others for whom a supporting role is identified.

Social science activities are grouped under Agricultural Development Support Services to emphasize that their primary role is to collaboratively support the technology development, testing and extension role. The ADSS terminology is explicitly substituted for the former "Socio-Economic Unit", a term which emphasized a relatively separate work agenda. By far the bulk of the ADSS work for the remainder of the project centers on field evaluation of technology packages, developing marketing strategies for the outputs of MFP technical thrusts, collaboration in the design of on-farm trials and characterizing and analyzing the various mixed farming systems in The Gambia. All of these activities must be done with biological and social scientists interacting closely together.

The work of the biological scientists fits well together also. While its primary source of village support is the need for cereals, the maize program produces a valuable by-product of stover. The maize and forage agronomists are working together to develop crop residue management practices that will enhance feed supplies including the utilization of maize stover. Feeds from crop residues combine with legume fallows being tested by the forage agronomist and range management practices being developed by the range ecologist to produce, ultimately, a year-long program of greatly improved animal nutrition. Livestock marketing skills are then brought to bear to provide economic outlets for livestock and livestock products. And, specialized skills in small ruminant management will be added to see that the animal nutrition program reaches this class of stock and the rural women that control them as well.

Yet another central thread of relationships can be traced leading to human nutrition. The senior maize agronomist is now rapidly extending what appears to be a very viable improved maize technology. The forage agronomist will work with him to develop legume intercropping with the
possible dual output of increased maize yields and increased fodder production. A second maize agronomist has the dual role of introducing cultivation techniques to women's maize growing societies and developing an extension program aimed at household level maize processing and cooking techniques. Although maize demand is strong this effort should reinforce it. Again, marketing economics skills are being applied to strengthen and regularize domestic cereals markets, permitting maize to flow from producing to consuming areas and establishing maize as a cash cropping option for many farmers. Finally, agricultural engineering skills are being applied through the development of a significantly improved ox-drawn cultivator and testing of village and household level maize grinders.

In the cases of both MFP central technology thrusts (maize and animal nutrition), social science skills are being brought to bear at the definition stage to ensure that the final package is "appropriate" to small farmers with respect to economic returns, risk minimization, low cash outlay, etc. and where group resource management is required, that the package lies within the abilities of the groups concerned.

One final integrative mechanism requires mention. Two villages are being used to test the entire package as an overall strategy. The villages of Boiram and Piniai have been selected and the full package will be tested in both during 1984 and again in 1985. A tentative description of this effort is included as Appendix D. Final definition of the integrated village trials will be developed collaboratively with villagers shortly after an interdisciplinary rapid reconnaissance study is conducted in each area.
APPENDIX A

Ideas for Continued Donor Support
After the Termination of MFP

Sketched out below in very brief fashion are several topics which flow naturally from the expected end-of-project status of the Mixed Farming Project. In a brief five years no project can completely address all of the interrelated issues which an active program faces. Thus, while the project will complete a full agenda, several second generation opportunities exist for continued assistance to the Gambian agricultural sector.

The full list of potential interventions is lengthy and without a comprehensive sector analysis of the Gambia's agriculture, it would be presumptuous to attempt such a listing. Therefore, most of what follows is restricted to suggestions flowing directly out of Mixed Farming activities.

1. Agricultural Diversification

Gambia's agricultural production base is relatively limited in its variety, even for a small country. There are several rationales that support a diversification thrust, including a) spreading the financial and nutritional risks of agriculture, b) closing seasonal gaps in food or cash supplies, c) increasing incomes, d) increasing household supplies of proteins, fruits and vegetables, e) more efficient utilization of soil, labor and other resources. Fortunately, USAID is addressing diversification needs in a major project activity.

Specific research needs that can be derived from MFP experience include the following:

a. Improved production technology in sorghum and millet. MFP has confined its activities to maize and discovered a highly responsive farmer environment for new technologies in a familiar crop. Suggested interventions in sorghum and/or millet include both higher yielding germ plasm (adapted from elsewhere, not bred locally) and improved agronomic practices.

b. Greater genetic diversity in existing seeds. Micro-climatic differences within The Gambia may justify the use of regionally specific variety recommendations. In addition, genetic variation in terms of disease resistance will be important as The Gambia moves toward higher production levels.

c. Two important areas of diversification with largely nutritional justifications are the production of vegetables and cereal legumes. The latter is treated later in this appendix. There is vast potential for increased vegetable production in The
Gambia and a significant need for larger and more varied vegetable content in diets. Critically missing program elements at the present time are supplies of seed and pesticides plus an effective technology transfer process specializing in household vegetable production.

d. Considerable diversification could be achieved in livestock production that would contribute to higher incomes, higher protein consumption and probably reduced pressures on the natural resource base. Options include poultry, small ruminants and milk. An important reason for shifting emphasis to these types of enterprises is to facilitate a transition of the livestock sector from one that meets primarily social objectives to one that more adequately meets economic and nutritional priorities.

2. Multiple Cropping Systems

MFP survey research has shown that a high proportion of Gambian fields are intercropped, that is having more than one crop growing simultaneously. Thus, the technique is not new to farmers. However, there has been almost no research in Gambia on crop combinations in an intercropped or relay multiple cropped situation. Plant interactions, utilization of resources or total output under these potential systems are unknown under Gambian conditions. Yet field observations clearly indicate that such information could lead to more systematically planned crop mixes that could increase total output per hectare substantially.

Perhaps the most significant near-term need is in the area of cereal legumes, primarily as a vegetable protein source for humans but with plant residues contributing to animal feed and/or soil fertility. The logical intercrop association is with maize in the form of a maize-legume crop mix. By promulgating the two as a package, the current enthusiasm for commercial maize would possibly carry the cereal legumes through the initial adoption phase. Possible synergism between the two in terms of increased maize output is also worth exploration.

3. Seed Multiplication

The rapid growth of commercial maize has raised questions concerning the adequacy of the supply of certified seed. While the current varieties are open pollinated and can be replanted, it is strongly advisable to replace seed every 4-5 years. With the rapid recent growth of maize hectarage, there is not enough certified seed production in the country to come close to meeting this need. Yet if progress made to date in the maize program is to be sustained, this bottleneck must be alleviated.
Similarly, a national forage production program will necessitate a 
seed supply system. Currently, quantities of forage seed of suit­
able varieties are not available in the country, nor elsewhere in 
West Africa. And, relying on Australian or American sources is 
prohibitively expensive and time consuming. Farmer scale seed 
production technologies for forage legumes have been developed 
elsewhere in the world (notably in S.E. Asia). It would certainly 
serve a national need if such a program could emerge in The Gambia.

4. Sustained Forage Program

The MFP will close having completed a considerable amount of research 
on forage production and utilization. It will remain for subsequent 
efforts to mount a sustained forage program aimed at village 
adoption. Developing a priority for forages in a country that is 
desperately food deficit will be difficult unless tied to a food 
crop like maize or incorporated into a larger project. This con­ 
sideration reinforces the potential need for "maize-based cropping 
systems" including legumes and forages or for consideration of 
foraSs within a soil-water-forestry conservation project.

5. Soil and Water Conservation

Mixed Farming has concentrated on the use of crop residues for 
livestock feed. This necessitates removing residues from the field 
and, while some nutrients return to the soil via manure, urea and 
trampled plant material, the contribution to soil improvement is 
not nearly as high as if crop residues were incorporated into the 
soil directly. Given the low organic matter content of Gambian soils 
their moisture holding potential must be well below potential. And, 
given the droughty conditions prevailing, increasing the moisture 
holding capacity of cropped soils might well have a very signifi­ 
cant payoff in terms of crop yields. One must ask, therefore, 
whether crop residues used as cattle feed or as soil amendments 
has the higher potential contribution to rural well being.

This is but one research question, raised by MFP which should be 
addressed by whatever soil-water conservation program continues 
after MFP expires. Another is the effects of maintaining a cover 
crop (preferably a legume) on soil erosion and soil fertility and 
moisture retention. A third area in which much will remain to 
be done after MFP is multiple use agroforestry.

6. Plant-Soil-Water Relationships

Closely related but highly specific is a research topic of ap­
parently great importance to The Gambia. Little is known (and 
less is available in Extension messages) about the agronomic 
practices that would enable Gambian farmers to grow their major 
crops in a more drought resistant method. Among the mechanisms
that can be used by farmers are varying dates of planting, variety, seed depth, plant and row spacing, weed control, soil surface texture and other factors. The short mid-season drought which wiped out a considerable area of maize in MID emphasizes the need for developing some of this information in the form of recommendations to farmers. While this need does not suggest a separate project, it certainly requires explicit attention within one of the existing, longer term technical assistance efforts.

7. Range Management Plan

By the end of MFP, nearly all the necessary components will be available on which national or regional range management plans could be based. Range resource inventories will be completed, the basis for carrying capacity estimates available, maps from aerial photographs should be complete. Yet designing and implementing a comprehensive range management plan will require several more years of work, sustained by a vigorous Ministry of Agriculture emphasis. Active participation of stock owners and herders as well as village decision making groups will be required. Since the technical basis for range resource management will largely be at hand, it is strongly suggested that the implementation step be taken, supported by donor assistance as necessary.

8. Institutional Development-Marketing

MFP will, by the end of the contract, present a comprehensive set of recommendations for needed reform and institutional growth in marketing. Some progress toward these recommendations will have been achieved. Yet bringing The Gambia's agricultural markets into the modern era will require perhaps a decade of sustained effort. The problem is currently complicated by fractionation of marketing authorities in The Gambia, and by the multiple donors involved. It is beyond the scope of this report to suggest remedial strategies. These will be forthcoming as an MFP output. It is sufficient here to reemphasize the importance of this development as a concommitant of newly programmed efforts to build agricultural research institutions.
APPENDIX B

List of Anticipated Short-Term Technical Assistance Inputs

This list is developed in March 1984 and represents our best approximation of future needs at this time. Some modifications in timing or substance may occur as the project progresses through its last two years. It is also possible that additional needs will be identified before the project ends.

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<tr>
<th>Approximate Date Required</th>
<th>Specialty and Assignment</th>
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<tr>
<td>6/1 - 7/1/84</td>
<td>Small Ruminants: Examine role of small ruminants in Gambian farming systems and recommend appropriate MFP emphasis and/or interventions.</td>
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<td>8-9-10/84</td>
<td>Communications Specialist: Train EAU in video technology for Extension use, prepare video report on MFP, develop special Extension videos on selected MFP technologies, other general communications needs.</td>
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<td>1/5 - 1/25/85</td>
<td>Agricultural Economist (Marketing): Assist with final preparations and delivery of International Marketing School short course training in Banjul.</td>
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<td>Spring 1985</td>
<td>Farmers Organizations: Recommend legal and organizational improvements for strengthened associations of farmers, e.g. LOAs and maize growers associations. Requires a lawyer skilled in small farm organizational requirements in LDCs.</td>
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<td>Spring 1985</td>
<td>Video Communications Specialist: Obtain dry season footage to complete video presentations needed by MFP and EAU. Further training at EAU. Ensure that EAU has functional set of video equipment.</td>
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<td>1985</td>
<td>Agricultural Engineer: Evaluate experience during 84/85 with maize grinders, develop strategy for their rapid dissemination.</td>
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<td>5/15 - 6/15/85</td>
<td><strong>Farming Systems:</strong> Assist in design of integrated village program for final growing and feeding season.</td>
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<td>1985 (before 6/15)</td>
<td><strong>Extension Specialist:</strong> Develop mechanisms for closer linkages between MFP and GOTG Extension agencies to enhance the flow of MFP technologies into the Extension message.</td>
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<td>3/86</td>
<td><strong>CSU Staff Assistant:</strong> To assist in closing out all MFP accounts, sub-accounts, revolving funds, disposition of commodities and other matters relating to project close out.</td>
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### APPENDIX C

Action Responsibilities for Outputs of MFP Activities

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**L = Lead Responsibility**  
**S = Supporting Responsibility**  
**JtL = Joint Lead Responsibility**  
**CP = Contact Person for TDY's**

Note: Where roles are listed for given positions, this implies that the American and Gambian counterpart associated with this position will jointly share these roles.
## Appendix C -- continued

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<th>Area and Output</th>
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APPENDIX D

Integrated Village Trials 1984/85

I. PURPOSE

Integrate all MFP field activities through a common objective.

II. BACKGROUND

A. The MFP developed several interventions relative to increased productivity of agriculture in The Gambia. These are increased cereal and livestock productivity and better use of resources (especially range) already present.

B. Selected aspects of research have been on-going at Boiram for the past few years.

C. There has been no research conducted which involves a fully integrated program of activities.

D. USAID, CSU and the MFP scientists wish to test these interventions in an integrated manner under closely monitored but traditional management.

E. The Boiram and Piniai areas have been selected as sites in which to conduct this integrated test.

III. OBJECTIVE

A. To improve the economic well-being of agricultural households in The Gambia through improvements in maize production and improved management of range and forage resources.

B. Measures of "economic well-being" will be developed by social scientists in consultation with biological scientists.

IV. ASPECTS OF AN INTEGRATED PROGRAM

A. Farmers will plant a portion of their cropland to maize using the maize production package. Balance of cropland will be planted to traditional crops, primarily groundnuts (as a cash crop).

B. Several farmers will be identified to plant forage legumes into an anticipated fallow plot; the legume would be used as hay or pasture during the dry season.
C. At least one hectare in the proposed 10-hectare protected range area will be used as a forage bank (Stylosanthis hamata).

D. Corn stover, legume hay and groundnut top hay will be harvested and stored for use as dry season feed.

E. Corn grain will be harvested to be used as a food crop or sold to local markets.

F. Livestock will be handled in traditional manner during the rainy season.

G. An attempt will be made to introduce an unfenced deferred grazing area where local livestock owners achieve the deferrment of grazing through group action.

H. After harvest, crop residues will either be stored in the field (maize stover, sorghum stover, groundnut hay) or near the compound (groundnut hay). These residues and the rangeland are traditionally to feed the livestock over the dry season; the intervention to be introduced is time of feeding to best maximize nutritive value of the feeds.

I. Socio-economic studies will be conducted of a reconnaissance type and also in relation to the farmers acceptability of technology.