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Report of GARD Consultancy

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Agricultural Economist

June 14-July 14, 1986

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CONSULTANCY REPORT

JUNE 14 - JULY 14, 1986

Dr. Neil A. Patrick
Agricultural Economist

INTRODUCTION:

One of the major accomplishments during the final 2 1/2 years of The Mixed Farming and Resource Management Project was the development and field testing of The Gambia Agricultural Data System (GADS). The system is capable of producing input-output/cost-returns budgets for crops, livestock and whole farms using micro-computers available in The Gambia.[1] These budgets can be utilized as basic data for purposes of monitoring and evaluation, planning and policy development within the agricultural sector.

In May, 1986, the consultant was contacted by Christine Elias of the GARD Project and Duncan Boughton, ODA Farm Management Economist at Sapu, regarding the possibilities of using GADS as an evaluation tool for research to be implemented during the 1986, crop season. As a result of these discussions the one month consultancy was developed and implemented from June 14-July 14, 1986. See "Terms of Reference" in Appendix A. All activities were accomplished with the exception of two which were only partially completed. A complete review of activities is to be found in subsequent sections of this report.

[1]See "The Gambia Agricultural Data System: Users Manual" by Neil Patrick, Paul Jakus and Lamin Jabang, a ixed Farming and Resource Management Project Technical Report to be published August, 1986.

SCHEDULE OF ACTIVITIES:

Prior to the beginning of the consultancy, the following activities were conducted:

1. Several meetings were held with the principle investigators, Dr. Duncan Boughton and Ms. Christine Elias to discuss capabilities of GADS, develop revised data collection instruments and develop software and coding revisions.
2. Presented 2 workshops to train in data collection procedures.
3. Consulted with Ms. Patty O'Neil regarding the establishment of GARD computer facilities and the requirements for data input and analysis of the two proposed research activities.

The consultancy was divided into four "task periods" of approximately one week each. The tasks accomplished were as follows:

Task 1 - Visit each Divisional Extension Office and conduct a refresher training session regarding GADS data collection procedures for Training Officers, Subject Matter Specialists, and District Extension Supervisors. Six meetings were held at Jenoi, Sapu, Basse, Kuntaur, Kerewan, and Yundum. The duration of the meetings were 4-5 hours each.

Task 2 - Visit each of the six villages, where the DWR study was being implemented, and meet with the individuals assigned the data collection responsibilities to review data collected, check coding, answer questions, and evaluate progress to date. Villages visited were Faraba, Dankunku, Sintet, Bwiam, Bitah, and Bulock. Visits lasted from 1-3 hours each.

Task 3 - Revisit each Divisional Extension Office to review collected and coded data, answer questions, conduct training in area measurement, and evaluate progress to date. Again meeting with Training Officers, Subject Matter Specialists, and District Extension Supervisors. The meetings were 3-4 hours in length.

Task 4 - Attend meetings with GARD staff and FSR/E committees, meet with principle investigators and prepare this written report.

It is noted that several of the above tasks were revised, from original plans, due to problems encountered in the field. These revisions will be discussed in following sections.

DEPARTMENT OF AGRICULTURE STUDY

The Department of Agriculture (DOA) study, under the direction of Duncan Boughton, DOA, is designed to quantify the differences between on-farm demonstrations and farmer's own fields in terms of inputs utilized, yields and cost-returns, and to identify the reasons for these differences. The research design calls for collection of input-output data from a field managed by the same farmer and planted to the same crop, or combination of crops, as an adjacent on-farm demonstration. The data will be analyzed by GADS to develop individual and aggregate crop budgets which will be used to make the necessary comparisons. In addition to this a series of six surveys will be conducted at field days to gather more subjective information.

Discussions, between the principal investigator and the consultant, began in April, 1986. These discussions focused on the usefulness of GADS in attaining the goals of the study and modifications needed to effectively use the system.

In its original form GADS requires an intensive data collection and coding process best handled by full-time enumerators who have been well trained and have the time to thoroughly learn the system. It also provides a high degree of specificity of data in regard to such items as: source of inputs, types of labor, use of hand tools, and others.

The DOA study design indicated that the data would be collected by Village Extension Workers (VEW) on only one field and only as a minor portion of their work load. Also the information needed from the developed crop budgets was of a less specific nature. These factors allowed for a simplification of the data collection process. The instrument shown in Figure 1 was developed for this purpose.

In May a one-day training program was conducted by the consultant at Yundum for the Subject Matter Specialists/Training Officers. The system was reviewed and data collection procedures were discussed at length. The notes prepared by the principle investigator, shown in Appendix B, were distributed at this time. The plan was that the SMS/TO would train the District Extension Supervisors (DES) at the Divisional level who would in turn train the VEW to collect the data. A system of verification checks was established to improve the accuracy of the collected data.

Also during May and early June consultations were held with Ms. Patty O'Neil, Peace Corps Volunteer assigned to GARD, regarding organization of a computer facility and estimating time requirements for data input and analysis of the DOA study.

Therefore, by the start of the consultancy in mid-June, the process of data collection by VEW's was intended to be well under way. Two visits were planned for each Divisional Extension Office for meetings with the SMS, TO,

and DES. The first meetings, during the week of June 16-23, were intended to be used to review collected data, answer questions and clarify problems, and make field visits to VEW's who were reported to be having trouble with the process. The second series of meetings, during the week of June 30 - July 7 was to again review collected data, pick up completed forms for delivery to Banjul, and conduct training in field measurements. A letter was sent from the Director of Agriculture at Cape, dated June 4, 1986, to organize the first series of meeting (see Appendix C).

First Series of Meetings:

The first series of meetings took place June 16-20 at Jenoi, Sapu, Basse, Kuntaur, and Kerewan. The meeting at Yundum was postponed to June 28 due to schedule conflicts. Accompanying the consultant at these meetings were Nyada Baldeh, Training Unit/DOA, and Ms. Patty O'Neil, PCV. A total of 29 DES's attended the six meetings.

Several factors became rapidly evident during the first series of meetings at the Divisional Extension Offices. First, most had reviewed the June 4, 1986, letter only one or two days prior to our arrival. Second, few of the participants had been informed of the purpose for the meetings and had not brought the required materials with them. Third, the DES's in general, were ill informed and quite confused regarding the data collection and thus little actual data had been collected by VEW's. Fourth, fuel shortages would preclude our travel to visit VEW's.

Thus the program was revised, from that discussed above, to concentrate on training in data collection procedures similar to that presented at Yundum in

May. Fortunately, an overhead projector and a portable generator had been taken along which proved to be very useful in this exercise. Unfortunately, the need for this type of training had not been anticipated and no materials had been prepared. This was corrected upon returning to Banjul where a handout, shown in Appendix D, was prepared and distributed during the second series of meetings.

This training was well received by the DES's and was considered a good investment of time by all. Most performed very well on the sample problem (see last few pages of Appendix D).

Second Series of Meetings:

The second series of meetings occurred June 30-July 4 at Jenoi, Sapu, Basse, Kuntaur, and Kerewan and on July 13 at Yundum. The consultant was accompanied by Nyala Baldeh, Training Unit, and Mohammed Kabay, Agricultural Economist/DOA. A total of 30 DES's attended the six meetings.

Due to the change in program of the first series of meetings, the second series program required changes also. The DES's had been instructed to bring any and all data that had been collected and transferred to the data forms for checking. Approximately half of the VEW's had submitted completed data forms. Of these about half were found to be correctly done.

Of those requiring corrections the following problems were found:

1. Incorrect date code.
2. Inconsistent data i.e.: planting activity but no seed quantity indicated, animal power being used but no machines, no labor indicated, machine time different from animal time, etc.

3. Use of a column to indicate two activities.

4. Failure of DES to sign and date after checking data.

Of those not submitting completed data forms the following reasons were given:

1. DES not attending meeting.

2. VEW "not mobile" so can't contact farmer participants.

3. DES "not mobile" so can't contact VEW's.

4. Data not transferred from notebooks to data forms yet.

5. No work accomplished on field at this time.

6. VEW or DES not posted or recently posted.

A system was established at each Divisional Extension Office to identify a TO who will be responsible for the exercise. He will be responsible for supplying blank forms to the DES's, data verification, collection of completed forms, and their delivery to Banjul. At each location a supply of blank data forms was left.

Many questions and problems were expressed during the meetings and most were answered. The greatest concern centered around lack of mobility by the DES's and payments for transport costs and night allowances involved in attending the meetings.

Training was provided regarding a method of measuring the fields and included a practical exercise in a nearby field. Appendix E is a handout prepared for distribution to DES's, SMS's and TO's for reference. Programmable calculators were not available so the actual computation of field size and closing error was not accomplished. This was probably not necessary since these calculations will most likely be done by computer.

Aspects to Watch:

The data collection exercise has began with a somewhat late and uncertain start. At the time of writing this report approximately a fourth of the 160 VEW's are progressing satisfactorily. This is a questionable figure for at least two reasons. First, many of the farmers have completed only land preparation activities which are very easily enumerated. Other subsequent activities are more complicated and more likely to involve errors in reporting. Second, it is hoped that some of the VEW's whose data was not seen, are also making satisfactory progress.

The success of the exercise, in terms of collecting complete and accurate data, rests with the DES's and their desire and ability to train and supervise the VEW's. Most of the DES's encountered at the two meetings appeared to have the right attitude; however, there were a few who must be watched closely. It was unfortunate that a training session with the VEW's could not have been arranged. Training is always more effective if it is direct.

Although few problems were brought up regarding the selection of fields from which data is to be collected, subsequent questions and/or statements by DES's tended to indicate that this needs a close check. Although it would be time consuming it is felt that a visit to each demonstration site to verify this aspect, meet the VEW and farmer, and check data collection would be a good investment if done in the next few weeks. A method must be devised and passed on to the DES's and VEW's to accurately measure yield on the fields under study. It is the opinion of the consultant that total production should be measured rather than some type of sampling procedure. Training should be

conducted regarding this in September to prepare for this important exercise. Certain materials will probably be needed that are not available at Divisional Extension Offices. These should be ordered very soon.

Data Analysis:

It has been agreed that the data collected from two on-farm demonstrations would constitute the primary data base for this study. These two demonstrations are as follows:

- Yellow maize varieties and levels of fertilizer - 30 sites.
- Groundnut varieties and fertilizer material - 50 sites.

Assuming that a major portion of these demonstrations yield useable data the sample size and geographic distribution (see below) should produce meaningful results.

Number of Demonstrations

Division	Yellow Maize	Goundnuts
Western	5	6
North Bank	6	10
Lower River	3	14
MacCarthy Is. So.	3	3
MacCarthy Is. No.	8	12
Upper River	5	5
Total	30	50

The first step in the analysis/interpretation process will be to run individual farmer/field budgets and to closely examine each for data consistency. Many of the budgets found to have problems can be corrected by examining the data file from which it was developed. Common problems are as follows:

1. Incorrect code number input into computer.

   - Farmer Code
   - Village Code
   - Division Code
   - Field Code
   - Crop Code
   - Activity Code
   - Input/output Code

2. Incorrect number input into computer. Usually a decimal misplaced.

3. Columns or pages of data missed.

These problems can be corrected and the budgets run again. This will increase the number of useable budgets. The remaining "bad" budgets should be discarded.

The second step is to decide on what aggregations will produce the type of comparative data desired for interpretation. At the time of writing this report it is difficult to state what these will be. Experience throughout the crop season and the examination of the budgets (discussed above) and results from the demonstrations will make this determination easier.

One can anticipate that the following will be of interest:

1. Quantities of fertilizer applied - Aggregations can be made of low, medium, and high rates of fertilizer applications to compare input costs with achieved yields. This is easy with groundnuts where the

1. (cont.)

fertilizer is mostly a single element but is more difficult with maize where three elements from several fertilizer types are involved.

2. Amount and timing of labor input - Aggregations can be made of low, medium, and high rates of labor inputs; labor inputs into certain activities, i.e.: weeding; the timing of labor inputs to compare labor requirements with achieved yields.

3. Geographic differences - Aggregations can be made by political or agri-climatic zones to determine differences resulting from spacial variations.

4. Methodologies - Aggregations can be made grouping fields according to methodologies used, i.e.: broadcast or band placement of fertilizer, earthing-up vs. flat cultivation, etc. It is noted that most of these type of factors cannot be identified by an examination of the individual farmer/field budgets but must be identified by supplemental questionnaires or observations of those collecting data.

Once these differences are identified and quantified the final step will be to determine why. For example: Why did the farmers apply only a fourth of the recommended fertilizer? Why did the farmers weed only once? etc. Such answers can probably be best answered by direct interviews with the farmers by senior staff.

It is the opinion of the consultant that this study is attempting to obtain answers to the most important question facing Gambian agriculture. This study should therefore receive high priority.

DEPARTMENT OF WATER RESOURCES STUDY:

The Department of Water Resources (DWR) is conducting a study to assess the feasibility of and to develop alternative design options for water-controlled agriculture. A major portion of this study involves an "interactive study of existing water-control interventions in The Gambia." This study has the following objectives:

1. To assess the impacts and experiences of existing projects;
2. to identify the project components which show promise for future development; and
3. to explore new ways and means of improving the other components in light of experience gained.

One of the specific tasks is: "production data collection in two compounds in each rice project area for use as case studies and as supportive data for reconnaissance surveys".[2]

In early May, 1986, the consultant was contacted by Ms. Christine Elias, the principle investigator, regarding the use of GADS to accomplish this task. Subsequent discussions led to several minor revisions in the GADS code book and a redesigned data collection instrument (see Appendix F) both in an effort to meet the objectives of the study.

In late May, 1986, a four-day training workshop was held at the PPMU office in Banjul, primarily for PPMU enumerators but including the field teams for the DWR study also. Discussions were held with Ms. Patty O'Neil, PCV, regarding estimates of computer time required by the DWR study.

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[2]Taken from "Research and Design Studies on Water-Controlled Agriculture" Annual Work Plan (May 1986 - April 1987), Dept. of Water REsources and GARD Project.

At the start of the consultancy in mid-June, 1986 the two farmer participants in each of the six villages had been selected, compound inventories completed, and twice weekly responsibility was to visit each village, review the data collection process, answer questions and in general get the study off to a good start.

Field Visits:

The visits were made during the period of June 24 - 27, 1986. The consultant was accompanied by Musa Suso, and Falankoi Janneh, supervisors. In spite of serious vehicle troubles all visits were made during the four-day period. Each visit will be briefly discussed below:

- Faraba - Met with PCV, his counterpart, a PPMU enumerator was not available. All data forms were in possession of PPMU enumerator so were not seen for checking. PCV indicated that all inventories were complete and that two field activity interviews had been completed. This meeting was conducted one day late due to vehicle problems.
- Dankunku - Met with ADP II enumerator. All inventories were complete and coded and he had completed three field activity interviews. This meeting was also one day late.
- Sintet - Met with PVC and VEW. All inventories were complete but not all coded. No field activity interviews had been conducted. All work to date was accomplished by VEW.
- Bwiam - Met with ADP II enumerator. Inventories were complete and coded. Only one field activity interview had been held.

- Bitah - Met with PCV, the VEW counterpart was not available. Inventories were completed and coded. Two field activity interviews had been completed but not coded due to questions regarding field identification. One compound contains over 70 people and over 60 fields. All work here has been accomplished by PCV.
- Bulock - Agricultural Superintendent could not be found even after making a specific appointment. Data was reviewed in his absence. All inventories were complete and coded (done by supervisors) and two field activity interviews complete and coded.

In general the data that had been collected was in good shape. Many questions were asked and in most cases answers provided. Some questions involved design or policy issues which will be discussed with the principal investigator and/or data had been collected on the worksheets none had been transferred to the GADS data forms such that none was ready for computer input.

The two supervisors were found to be hard working and conscientious individuals. Both have a good feel for the data being collected and coding. In fact in two locations this study would be in serious trouble without their efforts.

Aspects to Watch:

The VEW's have been told by their supervisors that the DWR study is a low priority exercise. This could create problems as the season progresses. The VEW at Sintet (actually Kalagi) seems to have taken a personal interest but may not be able to sustain it. The VEW at Bitah has done nothing and can probably be expected to continue. There is also some confusion by the VEW's

regarding this data collection effort and that for DOA (discussed in a previous section of this report). These two individuals are involved in both.

The PCV at Sintet is heavily involved in work for the Soil and Water Management Unit and had not had time to participate in the DWR study. This places an overworked PCV with a VEW who has been instructed to place low priority on the DWR study. This village could be in serious trouble.

The PCV at Bitah (actually living in Somita) is also teamed with a VEW who has shown no interest in the DWR study. In addition, one of her compounds is extremely large creating a great deal of work. In fact this one compound is as large as the total of six compounds handled by some of The Mixed Farming Project enumerators during 1985-86. The PCV indicates that the people in the compound are very patient and helpful but it may be more than one person can accommodate.

The Agricultural Superintendent collecting data at Bulock lives in Brikama, almost 30 Km away. As indicated above, he did not participate in taking the compound inventories and was in Banjul to pick up his salary on the day of our visit. His ability and desire to conduct the necessary work is questionable.

The transfer of data from the worksheets to the GADS data forms may prove to be a bottleneck. The two forms are quite similar and the transfer of data could be considered as busy-work. It might be appropriate to turn this job over to the supervisors.

The code book being used by enumerators and supervisors is the original GADS Code Book with a number of revisions penciled in. To reduce confusion,

and thus errors, it is advised that the revisions be typed into the code book and a clean copy be provided to each member of the team. The original Code Book is available on a diskette, in a word processing format, either from GARD or PPMU, and making the necessary revisions would be a simple task.

Past experience with GADS data collection has indicated the following common problem areas:

Use of incorrect codes:

- The same combination of Subject Group Code and Parcel/Field Code must be used for every entry concerning a particular Parcel/Field.
- Activity code.
- Input/output code.
- Date Code.

Note: The use of incorrect codes often results from an unwarranted feeling that the code numbers are known and referring to The Code Book is not necessary.

- Lack of legibility in writing codes such that they are not easily read and understood by the computer operators.
- Placing numbers in the wrong spaces such that they are misread by a factor of 10 or 100.
- Waiting too long between farmer visits thus activities become vague in the farmer's mind.
- Obtaining accurate measurements of physical inputs, such as seed, fertilizer, etc. This usually results from;
  1. Farmer and/or enumerator reporting recommended rates rather than actual utilization.

2. Improper weighing (or guessing) of measurement units.
3. Failure of farmer to keep count of units used. This usually results from a lack of proper explanation by enumerator.
4. Obtaining accurate measurements of outputs.

Data Analysis:

The analysis of the DWR data should follow standard GADS procedures as outlined in the User's Manual. It must be remembered that this data collection and analysis exercise was designed to look at only a few case studies and that the information generated has little statistical significance. The compounds were selected using a different criteria in each location and were hand-picked with no randomness.

This, in no way, is to be implied that the information generated is of little value. The individual field/crop budgets and whole farm analysis (which will include crop activities only) can be utilized as is information from any other case study. It is anticipated that aggregations of data across compounds will not be necessary.

COMPUTER REQUIREMENTS:

As indicated in previous sections as of mid-July no data has been forwarded to Banjul for computer entry. This is just as well since the GARD computer facility is not ready for data at this time. This situation cannot be allowed to continue for long however. The GADS software has data verification programs built in that are only effective if problems can be identified early.

It is the opinion of the consultant that data entry should begin no later than August 1, 1986. Besides getting the computer facility operational (to be discussed below) for the DOA study, visits should be made by the principal investigator to each Divisional Extension Office to check the collected data and to pick up completed data forms. For the DWR study all data must be transferred from the worksheets to the GADS data forms and collected for delivery to Banjul.

At present the GARC computer capabilities include one IBM/PC and one IBM Portable. The PC is fully employed with word processing and accounting and the Portable has a disk drive problem which precludes its use for GADS. It is understood that a third machine is due to arrive on July 11 and a fourth is being ordered. A computer room has been established at Mile 7 and authority has been granted to hire two computer operators. Thus it should be possible to get the facility operational before the end of July.

Previous experience with GADS data entry, verification, and analysis indicates that the DOA and DWR studies will require the use of one machine full-time (36-40 hours per week) over the next 5-6 months. From August through approximately November (4 months) this will be made up of data entry, 75%; and data analyses will require about 60%, data entry 15%, and data verification about 25% of the time. It should be clearly understood that one operator cannot keep a machine fully employed. The visual and mental fatigue factor requires about one-third of the time for rest or other work. Thus to keep one machine busy full time will require one and one-half persons. We found, at the Mixed Farming Project, that a schedule of 2 hours on the machine and one hour off would minimize input errors.

The DWR study requires that no new programs be written for data input or analysis. Some very minor revisions in the analysis programs may be necessary but should be no trouble for Ms. O'Neil. The DOA study requires a revised data entry program which has been written but not tested as of this date. The analysis programs will require only the addition of one or two new fertilizer types.

OTHER RECOMMENDATIONS:

It is understood that consideration is being given to placing one computer at Sapu and one at Yundum for use by MOA staff. The consultant wishes to take this opportunity to express serious concerns with this plan and to propose an alternative.

To be of maximum usefulness over a long life span computers must be placed in the following conditions:

1. A continuous and fluctuation free supply of electricity,
2. a climate controlled environment,
3. operated only by trained operators under the supervision of a knowledgeable manager, and
4. adequately supported by monies for operation and maintenance.

Without going into great detail only the fourth condition can be met at Yundum and Sapu without high cost. Even the fourth condition will create some problems in terms of maintenance. Besides these factors it can be anticipated that computers located at Yundum and Sapu will receive heavy utilization for a month or two following the crop harvest doing analysis of trial data, but almost no use the balance of the year.

It is suggested that the computer facility be established in the Banjul area to handle all the DOA work. The advantages include:

1. Electrical supply is better in the Banjul area tnan any other area of the country.
2. A single voltage regulation system could be purchased to handle all machines.
3. A single climate controlled room can be constructed to house all machines.
4. A group of well-trained operators can be maintained under the supervision of a single manager.
5. Machine use would be much more efficient.

It would appear to be easier and more efficient to bring data to a central facility than to attempt to establish several facilities under current Gambian conditions.

Since training and meetings are of such importance in both the T and V system and FSR/E it is proposed that a small investment be made at each Divisional Headquarters to establish and furnish a meeting room that promotes learning. Some of the places where meetings were held over the past month were dismal places which promoted neither attendance or learning. Some had no chairs, no tables, or no chalkboard. One was painted a dark color making it more like a dungeon than a classroom.

The investment would not have to be large but would probably produce significant results.

APPENDIX A:

Terms of Reference for Dr. Neil Patrick
FARMING SYSTEMS ECONOMIST
June 14 to July 14, 1986

Background:

The independent socio-economic data collection efforts will be undertaken during the 1986 cropping season, both of which will utilize modified versions of The Gambia Agricultural Data System (GADS) developed by The Mixed Farming Project and The PPMU.

The Department of Agriculture (DOA) intends to implement a country-wide program of 220 on-farm demonstrations for groundnuts, maize, cotton, sorghum, and millet. The main content of these demonstrations, which will be carried out by village extension workers (VEW), consists of new varieties and levels of fertilizer application. Socio-economic assessment of this program is envisaged to have two components:

1. A questionnaire to be administered by the VEW to groups of farmers, during the course of six field days, to assess their understanding of, evaluation of, and ability to implement demonstrated practices.
2. Detailed input-output data collection on the cooperating farmer's field where the demonstration is located.

The objectives of the second component are to quantify the yield gap between the cooperating farmer's field and demonstrations, identify the main factors responsible, and compare costs and returns achieved. In order to achieve these objectives a simplified version of The Gambia Agricultural Data System has been developed in collaboration with the authors to be administered through the VEW's. By the start of the consultancy it is anticipated that the first month's data collection will have been completed.

The Department of Water Resources (DWR) has initiated a series of studies on water-controlled agriculture. Under one component of these studies, 12 compounds have been selected as case studies for the assessment of the impact of ongoing rice development projects. Detailed production data will be collected in these compounds utilizing a modified version of The Gambia Agricultural Data System. The field staff of the various projects -- Soil and Water Management Unit, FFHC, Dept. of Water Resources/GTZ, and the Jabally Patcharr Project -- with assistance from the ADP II Monitoring & Evaluation Unit, will collect the data.

Services Required:

DOA Studies:

Dr. Patrick will report to the GARD COP and the Assistant Director of Agriculture (Research). He will maintain contact with PPMU and work closely with the Department of Agriculture's Training Unit personnel, Divisional Agricultural Coordinators and Subject Matter Specialists (SMS), and Ms. Patty O'Neil (PCV data processing specialist attached to GARD) in monitoring and evaluating input-output data collection by VEW's. Specific tasks will include:

1. Evaluate field level data collection and supervision activities in each division with subject matter specialists and district extension supervisors in order to identify weaknesses and problems at each stage (field notebook recording, transcription onto pre-coded sheets, checking at fortnightly training, and collection).
2. Advise on supervision procedures and conduct additional training for subject supervisors as necessary in the light of problems identified.

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3. Conduct practical exercises on field area measurement using tape line and compass, and computation using programmable calculator for subject matter specialists in each division.
4. Prepare a report for the Assistant Director of Agriculture (Research) providing details of problems identified and modifications recommended in data collection and supervision procedures, and detailed guidelines for further monitoring by regional FSR/E team economists.

DWR Studies:

Dr. Patrick will work closely with the Principal Researcher, the two field supervisors assigned to the studies, and Ms. Patty O'Neil. Specific tasks include:

1. Preparation of notes on problem areas of questionnaire coding. These notes will be a compilation of problem solutions based on consultant's past experience using the GADS system.
2. Conduct training workshop for field enumerators on the GADS system.
3. Work with the two field supervisors to trouble shoot initial phase of data collection. This will include visits to study villages as well as being accessible to the supervisors for consultation as necessary.

For both study groups, the consultant will assist the PCV data processing specialist to initiate data entry and validation procedures, and clarify any issues arising from the evaluation of data collection activities at field level.

Qualifications of Consultant:

Dr. Neil Patrick is primary author of The Gambia Agricultural Data System and has overseen its successful implementation under the auspices of MFP and PPMU. Well acquainted with data collection in support of FSR activities, Dr. Patrick is uniquely qualified to undertake the aforementioned tasks.

APPENDIX B:

DETAILED DATA COLLECTION FOR DEMONSTRATION FARMERS OWN FIELDS (Notes for Trainers)

Background and Justification

Each year country-wide demonstrations provide very useful information for farmers and extension workers on the yield and profit obtained from using new varieties and different levels or types of fertilizer application. It is also important to know how far these technologies are adopted by farmers, and the yield and profit obtained on their own fields. This information will provide a measure of progress achieved by extension and research over time, and help identify the main causes preventing farmers achieving higher production.

Objectives:

1. To quantify the difference in yield between demonstration/trials and the cooperating farmers' field of the same crop.
2. To identify the reasons for any differences observed.
3. To compare the costs, returns, and profit achieved by farmers on their own fields with results from the demonstration/trial.

Method:

In order to achieve these objectives accurate information must be collected regularly on all activities carried out, and inputs used, on one field for each demonstration farmer, together with an estimate of yield. The information is to be collected by AY's. Although at first it may seem a complex task with practice and care it becomes very simple.

The AY must first visit the farmer on whose field the demonstration is to be carried out, and explain the objectives of collecting information on the farmer's own field as well. This is essential to ensuring good cooperation.

Usually a demonstration is located in, or next to, one of the farmer's fields on which he is growing the same crop. This is the field for which information is to be collected - only one field for each demonstration farmer and the same crop as the demonstration. If for some reason the field where the demonstration is located is not the same crop as the demonstration then another nearby field with the same crop belonging to the farmer should be used. If the farmer's field has an intercrop added, that is acceptable, even if the demonstration is for a sole crop. Each farmer for whom information is successfully collected will be informed of the area of his field, the yield achieved, the profit and amount earned per day of labor, in order to compare with the result with the demonstration/trial result.

Once the objectives have been explained, and the field for which information is to be collected has been identified, the AY should visit the farmer twice a week. The AY and the farmer should agree on the days and time (e.g., Monday and Thursday or Wednesday and Saturday each week) which fit in well with the AY's program of "T + V" visits. Once chosen the visits should always be made on the <u>same days</u> each week so that the farmer and AY have a regular routine.

At each visit the AY must record in his notebook, for <u>each day</u> since his last visit, all activities carried out by the farmer and the resources used. The AY will require the notebook for each demonstration. This record must include the following information:

1. Day and date (e.g., Monday 2nd June).
2. Activity or activities (e.g., fertilizer application).
3. Labor use (name, sex, and age of <u>each</u> person working and for how many hours they worked).

4. Animal use (number and type of animals used and for how many hours they worked).
5. Machine use (number and type of machines used and for how many hours they were used).
6. Physical input (quantity of each type of input used).
7. Money costs of any of the above resources (e.g., cost of hired labor or animals, cost of each physical input used).

An example might read as follows:

Monday 2nd June

Lamin (the farmer), and his son Kebba (age 10), went to the field with his donkey and seeder. They spent one hour applying one bag of SSP and four hours planting before stopping for lunch. After resting they went to another field. The bag of SSP cost Lamin D48.25 from the co-op. They planted 4 1/2 hoppers of seed which Lamin had kept from last year's crop.

Tuesday 3rd June

No work was done on the field today.

After each visit the AY must transfer the information collected onto a coded record sheet. First fill in the information at the top of the form (farmer's name, village, district, etc.). Next enter the date on which an activity took place. If more than one activity took place on the same day (e.g., fertilizer application and planting), then two columns will be required--one for the resources used in fertilizer application and one for those used in planting. Having entered the date at the top of the column tick the activity performed. Only one activity box should be ticked for each column. Remember that clearing is considered part of land preparation and

incorporation part of fertilization, even though a weeding is accomplished. Proceed to note the quantity of each type of input used and any money cost attached. For example if one adult man and two boys under thirteen worked 5 hours write 5 in the "hrs" box for "Male (13-59 yrs)," and 10 in the "hrs" box for "Male (child/old)" because there were 2 boys x 5 hours each. If the boys each received a dalasi, enter 2.00 in the "D" box. For physical inputs, the quantity (whether bags, hoppers, kandis) must be converted into kilos. The subject matter specialists at divisional agricultural headquarters will provide a list of conversion factors for measures used by farmers in the area. (not now but now now!)

In the example above we would use two columns each with the same date "2nd June" (see attached sample form). The first would have a tick against Fertilization. For labor input 1 hour is recorded for Male (13-59 yrs) and 1 for Male (child/old). Since there was no money cost the "D" box is left blank. Fifty (50) kg is recorded in the box opposite SSP and 48-25 in the "D" box. The second column, with the same date, would have a tick against planting. For labor input 4 hours are recorded for the Male (13-59 yrs) and 4 hours for the Male (child/old). Note that 5 hours are recorded for the donkey and seeder - 4 hours spent planting and 1 hour waiting while fertilizer was applied. In preparing your list of conversion factors you may find that a full hopper of decorticated groundnut seed weighs 5 kg and therefore 4 1/2 x 5 = 22.5 kg is recorded against Seed (crops). None of these inputs had a money cost as they were all provided by the farmer.

The AY must bring his notebook (both notebooks if he has two demonstrations) and resource use forms to every fortnightly training. DES and

SMS must check each AY's notebook entries, making sure that all details are complete, and compare them with the resource use form to make sure all information has been transferred correctly. Errors should be corrected on the spot if possible. In some cases the AY may need to go back to the farmer for more details. When checking is complete, sign both the resource use form and notebook, together with remarks on any further details the AY must obtain. All mistakes made must then be discussed with the AYs as a group to help avoid them in the future. Avoid saying who made a particular error, deal thoroughly with any questions raised, and encourage the group to continue doing their best. Completed data collection forms to be brought to the station by SMS. Regular supervision, training, and encouragement is the key to success.

By the time AYs have identified demonstration farmers, selected fields, and arranged regular visit days, some activities (e.g., clearing) may already have taken place. The first and urgent task is to record all the resources used in these activities. In this case the month will suffice, e.g., "the field was cleared in May and took the farmer and his friend Modu (age 30) four mornings of 5 hours. The farmer gave Modu kola costing D8.00 and agreed to help weed Modu's field later in the season." (Note: total labor = 2 x 4 x 5 = 40 hours with a money cost of D8.00).

Any questions or problems that subject matter specialists cannot resolve should be referred urgently to the training unit. Dr. Neil Patrick and Patty O'Neil will visit each division in the second half of June to review progress and assist you in any way. Good Luck!

Farm Name: Lawina Jehe | FEW Name: Mo. Jamse

Village: Hwadinaering | DEC: Yundum

District: Kombo S | Crop: Maize

Division: Western Division | Intercrop: —

ACTIVITY	DATE	072186		072286		081086		082086		100186	
Land Preparation	011										
Planting	021										
Fertilisation	031										
Thinning/Tpl.	071										
Weeding	061	✓		✓							
Crop Protection	041					✓					
Harvesting	081							✓			
Threshing	101										
Transport	091										✓
LABOUR INPUT		Hrs	D	Hrs	D	Hrs	D	Hrs	D	Hrs	D
Male (13-59 yrs)	7141			7	–			14	5.0	6	–
Male (child/old)	7111	6	–	10	–	7	–	14	–	12	–
Female (13-59 yrs)	7241			5	–			7	–		
Female (child/old)	7211										
ANIMAL INPUT		Hrs	D	Hrs	D	Hrs	D	Hrs	D	Hrs	D
Oxen	6200										
Horse	6600										
Donkey	6500	3	–							6	–
MACHINE INPUT		Hrs	D	Hrs	D	Hrs	D	Hrs	D	Hrs	D
Ridger	8230										
Sine hoe plough	8220										
Seeder	8310										
Sine hoe weeder	8210	3	–								
Occ. hoe weeder	8240										
Sine hoe lifter	8320										
Cart	8350									6	–
Other:	8360										
PHYSICAL INPUT		Kg	D	Kg	D	Kg	D	Kg	D	Kg	D
Seed (Crop 1)	1111										
Seed (Crop 2)	1121										
Seed Dressing	1311	xxx		xxx		xxx		xxx		xxx	
15-15-15	1211										
8-18-27+5S	1241										
SSP	1231										
UREA	1221										
Herbicide	1321										
Insecticide	1311										
Other:											
CHECKED BY:											
Date:											

Farmer Name: | Village: | District: | Division:

Farm Name: | DEC: | Crop: | Intercrop:

ACTIVITY	DATE									
Land Preparation	011									
Planting	021									
Fertilisation	031									
Thinning/Tbl.	071									
Weeding	061									
Crop Protection	041									
Harvesting	081									
Threshing	101									
Transport	091									
LABOUR INPUT		Hrs	D	Hrs	D	Hrs	D	Hrs	D	Hrs	D
Male (13-59 yrs)	7141										
Male (child/old)	7111										
Female (13-59 yrs)	7241										
Female (child/old)	7211										
ANIMAL INPUT		Hrs	D	Hrs	D	Hrs	D	Hrs	D	Hrs	D
Oxen	6200										
Horse	6600										
Donkey	6500										
MACHINE INPUT		Hrs	D	Hrs	D	Hrs	D	Hrs	D	Hrs	D
Ridger	8230										
Sine hoe plough	8220										
Seeder	8310										
Sine hoe weeder	8210										
Occ. hoe weeder	8240										
Sine hoe lifter	8320										
Cart	8350										
Other:	8360										
PHYSICAL INPUT		Kg	D	Kg	D	Kg	D	Kg	D	Kg	D
Seed (Crop 1)	1111										
Seed (Crop 2)	1121										
Seed Dressing	1311	xxx		xxx		xxx		xxx		xxx	
15-15-15	1211										
8-18-27+5S	1241										
SSP	1231										
UREA	1221										
Herbicide	1321										
Insecticide	1311										
Other:											
CHECKED BY:											
DATE:											

APPENDIX C:

Department of Agriculture
Cape St. Mary
The Gambia

Ref AD/IBO 1/(106)

4th June 1986

Divisional Agricultural Coordinators

Steering Committee (GARD) - YUNDUM
(Attention of the RELO)

Steering Committee (GARD) - SAPU
(Attention of the RELO)

Agric. Officer, Training Unit - CAPE
(Attention of Nyada Yoba Baldeh)

GAMBIA AGRICULTURAL RESEARCH DIVERSIFICATION - PROJECT
DETAILED DATA COLLECTION EXERCISE 16 - 23 JUNE 1986

Neil Patrick (Consultant) and Co (Nyada Yoba Baldeh, Training Unit, Peace Corp Volunteer) will conduct follow-up discussions on the Detailed Data Collection exercise in the following places:

Jenoi	-	16.06.86
Sapu	-	17.06.86
Basse	-	18.06.86
Kuntaur	-	19.06.86
Kerewan	-	20.06.86
Yundum	-	23.06.86

Divisional Agricultural Coordinators should inform all Subject Matter Specialists, Training Officers, and District Extension Supervisors to attend the one-day exercises. DACs should assist with transport facilities since the exercise will involve practicals at village level.

Transport fare refunds will be made for District Extension Supervisors.

The two GARD steering committees should participate at least once whichever venue is appropriate.

K M BANJA
FOR: DIRECTOR OF AGRICULTURE

cc: ADA - R - CAPE
ADA (Extension and Training) - CAPE
Chief of Party - GARD - CAPE

FAO
Fertilizer Project Manager (Ag)

APPENDIX D:

Farm Management Data Collection Regarding On-Farm Demonstrations

I. Introduction

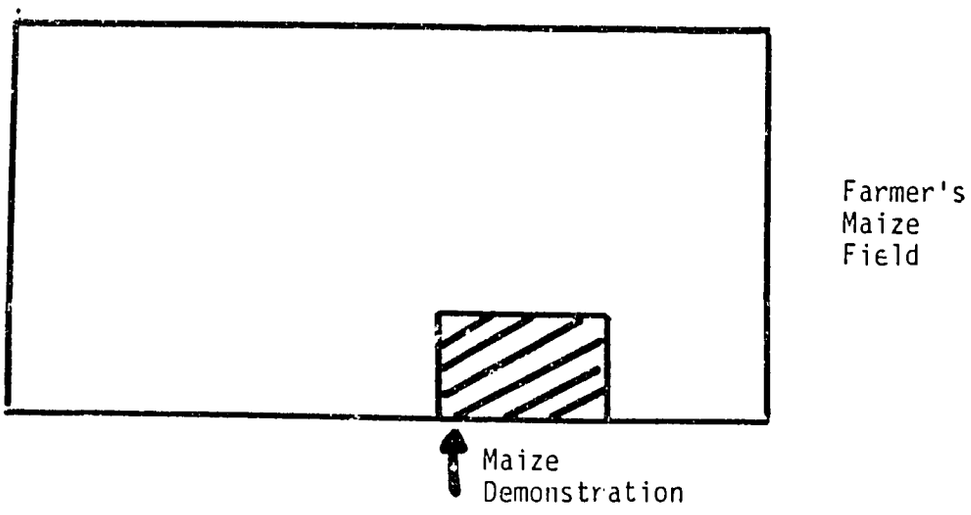
It has become obvious over the past several years that results obtained by researchers on trials and by extensionists on demonstrations are much superior to the results obtained by farmers on their own fields. If Gambian farmers received yields similar to those from trials and demonstrations the country would be a food surplus country.

Therefore a very important question to be answered is why are farmers' results so much less than those obtained from trials and demonstrations. Is it lack of inputs, inputs available at the wrong time, shortages of credit, improper management, or what? Obtaining an accurate answer to this question could have significant impacts on future agricultural productivity.

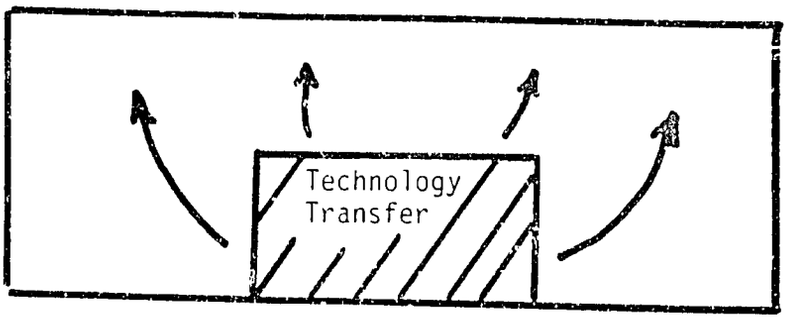
The data collection and analysis program explained in this paper is designed to assist in finding answers to this question.

The Department of Agriculture, for 1986, has planned 31 on-station trials, 50 trials on District Extension Centers, and 216 demonstrations on farmers' fields. It is this last group in which we are interested.

It was intended that the demonstration plots would be located within a larger field of the same crop. For example, a maize demonstration would be located in a larger maize field. (see sketch below).



We are interested in identifying what technology is being transferred from the demonstration plot to the rest of the field and what results are being obtained.



II. Procedure:

A. Selection of Sites:

Each AY will be conducting one or two on-farm demonstrations. Detailed data is to be collected from only one of these sites by each AY. If the AY has 2 demonstrations, one should be randomly selected.

Data is to be collected from the adjacent (or nearby) field that fits the following two criteria:

1. The same crop (or combination of crops) must be grown as in the demonstration plot.
2. The farmer in charge of the field must be the same person who is in charge of the demonstration.

If the demonstration and larger field do not fit these criteria the closest field which does fit the criteria should be selected.

B. Informing the Farmer:

The farmer should be carefully and clearly informed of the reason why the detailed data is being collected. He should be requested to remember what he does on the field so that it an be passed on to the AY accurately. As an

example, remind the farmer to be aware of the approximate time spent in the field, to count the hoppers of seed, fertilizer etc. that he uses and to save unused portions from the hopper for later measurement.

C. Collecting Data:

The AY should meet with the farmer 2 or 3 times each week to learn what activities have taken place on the field. This meeting should be at a time convenient with the farmer. The AY should keep a close watch on the field by planning activities so that he can pass by the field every day or two.
Note: Be present at important times such as planting, fertilizer application and harvesting.

Data should be taken from the farmer in the form of notes in a notebook and not directly on the data forms. The sample problem in a later section of this paper gives examples of what should be placed in the notebooks.

When things are quiet, in the evening, the data should be transferred from the notebook to the data forms.

D. Checking the Data:

The AY must make an effort to check and verify his own data. This can be done by reading through the notebook and checking that the data forms show the same things.

At each fortnightly meeting with the DEC's all completed data forms should be reviewed and approved by the DES. The DES will collect the forms at that time.

E. Delivery of Forms to Banjul:

The DES's will take the forms to their meeting with the SMS/TO's where they will be checked again and collected by the TO's for delivery to Banjul.

III. Clarifications:

1. Neatness and Legibility: Forms should always be filled in with a pencil. Erase any errors completely. Neatness and legibility cannot be overemphasized as there is little use collecting detailed data if it cannot be read and entered correctly into the computer. Be careful to write so that information is easily read. Some numbers are easily confused. For example:

0 6 zero or six

1 7 one or seven

2. Header: Be sure to fill out the header on every form. Without the header information, the data cannot be used because the farmer's field cannot be identified.

3. Crop/Intercrop: There is space in the header to indicate the field's crop and intercrop. When two or more crops are grown on the same field, the major crop is the one that occupies the most land area. The other crop is the intercrop. In the physical input section of the form, seed is listed for Crop 1 and Crop 2. When a field is planted with a single crop, the seed used should be listed under Crop 1. When the field is intercropped, the crop which occupies the most land area should be listed as Crop 1. The intercrop seed should appear in Crop 2.

4. Date Codes: The date code is the only code you need to be concerned with. It is a 6-digit code with the first two digits indicating the month, the next two digits indicating the day and the last two digits indicating the year. For example:

June 19, 1986 is 061986

October 10, 1986 is 101086

5. Use of Columns on the Data Sheet: Each new day requires a new column headed by a date code. You don't need to use a column if you have no data to enter on a given day. If two activities occur on the same day, i.e., fertilizer application and planting, each activity requires a separate column. So use a new column for each new day and each new activity. A good check for this rule is to make sure that no column has more than one check mark in the activity section.

6. Land Preparation: Any activity undertaken on a field prior to planting is considered land preparation. As an example, pre-plant weeding is considered land preparation, but weeding after planting is considered weeding. The exception to the general rule is when fertilization takes place prior to planting on the same day). In this case the time spent on fertilization should be accounted for under the fertilization activity, and planting time should be accounted for under the planting activity.

7. Transport: The transport activity should be indicated if the following situations occur:

- the farmer goes to the Coop and transports inputs to the compound.
- the farmer transports harvest from the field to the compound or from the compound to the market.

The activity should not be indicated as transport when the farmer transports inputs (including labor) from the compound to the field with the intent of doing an activity such as fertilization. In this case inputs were transported for the primary purpose of performing fertilization. Transport time should be included under the fertilization activity.

8. Crop Protection: Crop protection includes activities such as pig scaring, monkey scaring, herbicide, and pesticide application.

9. Hired Inputs: Sometimes you must use judgment to allocate costs among input groups. For example, if a donkey and a sine hoe are hired for D5.00 for the day, allocate D2.50 to the donkey, and D2.50 to the sine hoe.

10. Labor: When more than one individual can be accounted for in a given age category, the hours worked by each should be added together and the total hours should be entered in the hours column of the form. Likewise, the pay of all laborers in an age group should be entered in the dalasis column. If for instance, two men ages 35 and 40 worked for 4 hours and one man was paid D5.00, you should enter 8 hours and 5 dalasis under Male (13-59 yrs).

11. Animal and Machine Hours: If a farmer takes a donkey and a cart to the field for five hours, but for two of those hours the donkey and cart are just waiting in the field, you should still enter the entire 5 hours as being worked by the donkey and the cart if they were unavailable for any other use. Had the farmer loaned the donkey and cart to a farmer in the next field for the two hours, you would enter only three hours (the actual time the donkey and cart were occupied and unavailable for another use).

12. Oxen: A team of oxen is two animals. When a team of oxen works in the field for three hours, the total number of hours (three hours times two animals or six hours) should be entered in the form. If three oxen are taken to the field and only two work while the other one rests, then all three animal's hours should be accounted for as long as all three animals are occupied in the field.

13. Cash, Loans and In-kind Payments: Any time money changes hands or will change hands in purchasing inputs, it should be accounted for. If a farmer buys cola nuts and lunch for two laborers who helped him plant, the cost of the cola nuts and the meal should be estimated and entered next to the laborer's hours. If a farmer receives a loan to purchase seed, the amount of the loan (and the interest if known) should be entered in the cost column beside seed.

14. Seed/Fertilizer Measurements: It is important to remind the farmer that he should try to remember the number of hoppers of seed/fertilizer he uses and to save any residual from the hopper so that it can be measured later. Since seed/fertilizer amounts must be entered on the form in kgs , an accurate estimate must be made. A seed and fertilizer conversion chart is available through the SMS's which can aid in converting chumwaas to kgs.

15. Problems with Data: Clarify any problems you are having with data collection by calling them to the attention of your supervisors. If you are unsure of what category an activity or individual should fall under, don't leave the information out. Give the best estimate you can and notify your supervisors of your decisions

IV. Sample Problems:

The following are examples of the kind of data that should be entered in the AY's notebooks. Use the attached blank data form to practice transcribing the data from the notebook onto the forms. Then check your work against the answers provided on the attached completed form.

On June 10 land clearing was done in three and a half hours. A 40-year old man and two 12-year old boys worked.

On June 18 a pre-plant weeding was done using a sine hoe and a donkey. The 40-year old man and one 12-year old boy worked for five hours.

On June 30 planting was done using a donkey and a seeder. 32 kgs. of seed was used (saved from last year's crop). The 40-year old man and one 14-year old girl worked for four and a half hours.

On July 10 the first weeding was done using a sine hoe and a horse. The two 12-year old boys worked six hours. The horse was rented at D5.00.

On July 21 two bags of 15-15-15 fertilizer were applied by hand by the 50-year old man. The fertilizer cost D40.00 per bag. The job took two and a half hours.

Also on July 21 a second weeding was done by the two 12-year old boys, a donkey and sine hoe, in three hours.

On July 22 hand weeding was done by the 40-year old man, two 12-yrs. old boys and the 14-year old girl. It took five hours.

On August 10 one 12-year old boy spent seven hours scaring birds in the field.

On September 20 the field was harvested. The 40-year old man, one hired man of 35 years, two 12-year old boys and a 14-year old girl worked seven hours. The man was paid D5.00.

On October 1 the crop was transported to the compound using a donkey and cart. The 40-year old man and two 12-year old boys worked six hours.

APPENDIX E:

FIELD MEASUREMENT PROCEDURE

I. Introduction

In order for the input-output data to have meaning, the size of the field must be known. The District Extension Supervisors are responsible for the measurement of fields involved in the detailed data collection exercise.

II. Materials Needed

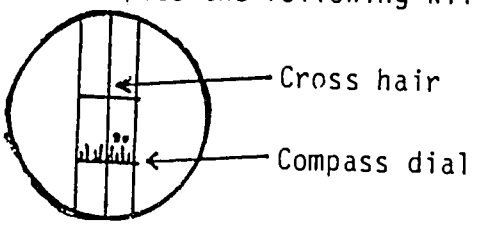
1. A compass
2. A tape measure
3. 2 range poles or straight sticks about 2 meters long
4. 2 - 3 people (3 is preferred, the DES, AY, and the farmer)

III. When to Measure

Field measurements should be made after planting but before the crop grows too tall to see over.

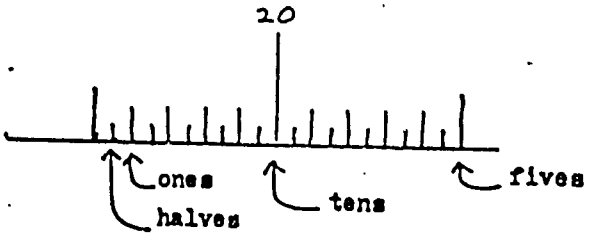
IV. Reading the Compass

When looking into the compass the following will be seen:



The cross hair can be aligned with the pole by opening both eyes such that one eye can read the compass dial and the other the pole.

Care must be taken that the compass is held in a level position such that the dial can rotate freely. Enlarged the dial looks as follows:



V. Procedure for Measurement

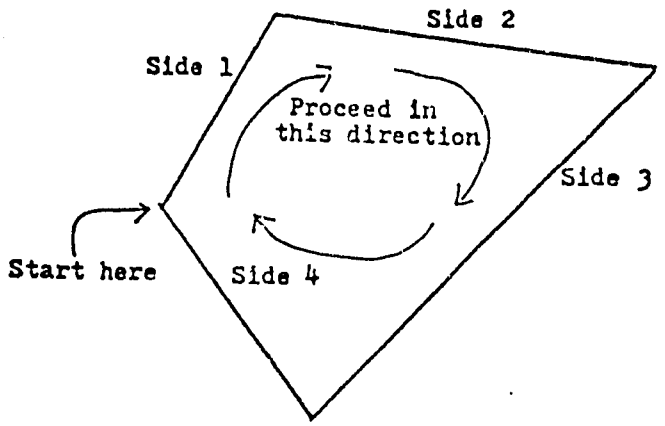
Follow these steps:

1. Start at any corner of the field.
2. Proceed around the field in a clockwise direction. As you stand at the corner looking into the field proceed to your left.
3. Send one person, with a pole, to the next corner moving in the clockwise direction.
4. Take a compass reading and record it.
5. Proceed to the second corner measuring the side as you go. This is Side 1. Record the length.
6. Take a backsight on the original corner where the third person is holding a pole. The difference between the foresight and backsight readings should be 180 degrees.

Note: Subtract the smallest of the two readings from the largest. The difference should be 180 plus or minus 2 degrees (178 - 182). If the difference is more or less than this foresight should be taken again.

THE ONLY REASON TO TAKE A BACKSIGHT IS TO CHECK THE ACCURACY OF THE FORESIGHT. DOING THIS ACCURATELY AND CONSCIENTIOUSLY WILL SAVE WORK SINCE IT MAY RELIEVE YOU FROM HAVING TO MEASURE THE FIELD AGAIN.

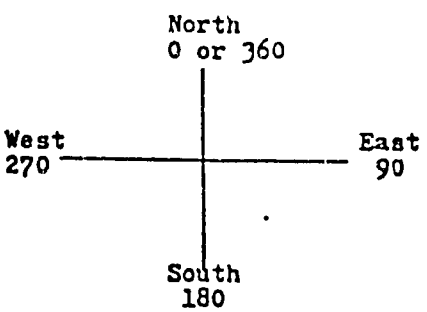
7. Repeat steps 1 through 6 on all remaining sides. The last reading and measurement should bring you back to the original point.
8. Record the information as shown on the next page.



Side	Compass Reading	Length
1	40 degrees	37.5 meters
2	100	66.42
3	220	81.75
4	315	42.4

Note: The backsight is not reported and is not used calculate area.

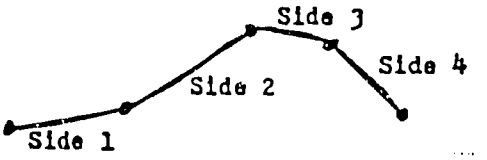
The compass reads from 0 to 360 degrees as shown below. It is well to be thinking of the direction you are reading so as to anticipate the compass reading.



VI. Irregular Shapes

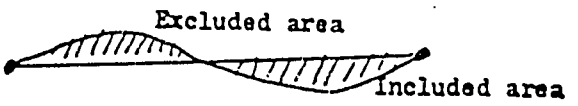
Most fields do not have straight sides but are of an irregular shape. When this occurs the judgement of the person measuring the field is

important. Often the irregular side can be divided into segments which allow for an accurate measurement. See below:



It is noted that here the side has been divided into 4 sides. Each of these sides must be measured and a compass reading taken and reported.

On some occasions a side may be of a shape that a straight line measurement is accurate. This occurs if the area excluded by the line is equal to the area included by the line. See below:



If you are not sure the previous method of dividing the side into several sides should be used.

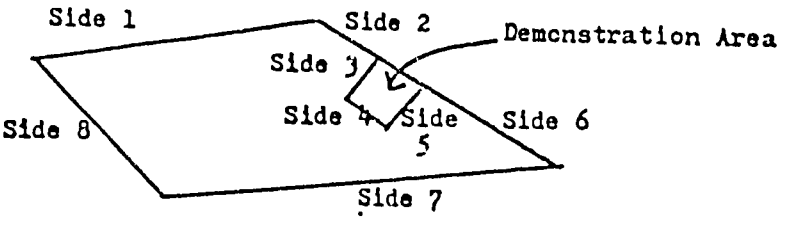
VII. Excluding the Demonstration Area

As stated in a previous handout the area of interest for the detailed data collection is the field adjacent to an on-farm demonstration. Thus the area of the demonstration itself must be excluded in the area measurement. This can be done in two ways.

If the area of the demonstration is known for certain a statement can be written on the reporting sheet indicating that this known area should be subtracted from the area. For example:

Minus 0.02 Ha. for demonstration area.

If the area is not known the field measurement must exclude the demonstration area as shown below:



VIII. Reporting the Information

Using a blank sheet of paper the following information must be reported for area calculation:

1. A full identification of the field including: farmer name, village, district, division, VEW name, and crop.
2. A sketch of the field showing north at the top and the general shape of the field with the sides numbered. (see sketch on page 3 of this handout).
3. A table showing Side Number, Compass Reading and Length. (see table on page 3 of this handout.)
4. Any statements regarding the area of the demonstration plot. (see item VII above).

This information should be turned over to the Training Officer for forwarding to Banjul.

IX. Closing Error

When the information reaches Banjul it will be fed into the computer for analysis. The computer will show the area of the field in hectares and the Closing Error. The Closing Error is a measure of accuracy in measuring the field. If the Closing Error is greater than 5 percent the field must be measured again.

You can assure that the Closing Error is less than 5 percent by taking care with the compass readings and length measurements and by using the backsight to check the accuracy of the foresight.

In the long run time can be saved by using backsights to check the foresights in that it will greatly reduce the chance of a large Closing Error requiring that the field be remeasured.

APPENDIX F

WORKSHEET
HOUSEHOLD MEMBERS
(for transfer to Labor Inventory Form)

Village code / / / / /

Farm Code / / / / /

Subject Group I.D. II	Name	Age	Relation to Compound Head	Living in Compound and available for work (yes or no)	Comments
/ / / / /					
/ / / / /					
/ / / / /					
/ / / / /					
/ / / / /					
/ / / / /					
/ / / / /					
/ / / / /					

WORKSHEET

Village Code / / / / /
Farm Code / / / / /

FIELD INVENTORY

(for transfer to Land Inventory Form)

Subject Group Code	Parcel/ Field Code	Crop 1986	Owner of Field	Principal Farmer	Soil Type	Tenure Code	Farmer's Share	Crop 3 yrs. ago '83	Crop 2 yrs. ago'84	Crop last yr. 1985	Comments
II	V	--	----	----	VIII	IX	%	---	---	-----	----
/ / / / /	/ / / / /										
/ / / / /	/ / / / /										
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WORKSHEET
MACHINERY INVENTORY
(for transfer to Machinery Inventory Form)

Machine Type	Machine Type Code	Age	Remaining Life	Purchasing Price	Ownership Status	Comments
	XVI	Yrs.	Years	Dalasis	See footnotes below	
	/ / / /				/ /	
	/ / / /				/ /	
	/ / / /				/ /	
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	/ / / /				/ /	
	/ / / /				/ /	
	/ / / /				/ /	
	/ / / /				/ /	

1=Solely Owned
2=Owned in partnership
3=Borrowed in for no payment
4=Rented in for payment

Record with or from whom. Explain terms.

WORKSHEET
DRAUGHT ANIMAL INVENTORY
(For transfer to Livestock Inventory Form)

Type Code	Type of Animal	Value Cash	Breed (For Oxen only)	Management System (1)	Purpose for Keeping	Comments
XII	See footnotes below	Dalasis	--	See footnotes below	--	-------
/ / / /				/ /	Draught /5/	
/ / / /				/ /	Draught /5/	
/ / / /				/ /	Draught /5/	
/ / / /				/ /	Draught /5/	
/ / / /				/ /	Draught /5/	
/ / / /				/ /	Draught /5/	
/ / / /				/ /	Draught /5/	

Remember: Record only draught animals

(1) 1=Extensive grazing around village
2=Extensive grazing with treking
3=Pen Fed
4=Stall fed.

WORKSHEET

FIELD ACTIVITIES AND INPUTS USED
(for transfer to Resource Utilization Form)

Village Code / / / / /
Farm Code / / / / /

Subject Group Code	Parcel/ Field Code	Date	Activity	Activity Code	Inputs Used	Input Code	No/Em-ployed	Length-Quantity Code	Cash Kind Code	Value (cash transactions) only
II	V			III		IV*	XIX	XIX	VII	Dalasis
/ / / / /	/ / / / /			/ / / /			/ / . /	/ / / . /	/ /	/ / / . / /
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*4-Digit Code

WORKSHEET

GRAIN TRANSACTIONS

Village Code / / / / /

Farm Code / / / / /

Grain Transacted	Subject Group Code (for grain transacted	Parcel/ Field Code	Date	Activity Code (see foot note)	Unit & Quantity	No. Employed (XIX)	Length/ Quantity (XIX)	Cash/ Kind Code	Dalasis Value
	/ / / / /	/ / / / /		/ / / /		/ / . /	/ / / . /	/ /	/ / / . /
	/ / / / /	/ / / / /		/ / / /		/ / . /	/ / / . /	/ /	/ / / . /
	/ / / / /	/ / / / /		/ / / /		/ / . /	/ / / . /	/ /	/ / / . /
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	/ / / / /	/ / / / /		/ / / /		/ / . /	/ / / . /	/ /	/ / / . /

107 = Purchase of grain
108 = Gift received
109 = Gift given
110 = Sale of grain
086 = Loan received
087 = Loan given
088 = Barter (grain received)
089 = Barter (grain traded away)