PD-ABC-609
70017

Rwanda Farming Systems Research Program
Technical Paper Series

USAID Contract #696-0110

between

The University of Arkansas, Fayetteville
(International Agricultural Programs)

and

The Rwandan Ministry of Agriculture
Rwandan Institute for Agricultural Sciences (ISAR)

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Rwanda Farming Systems Research Program
Technical Paper Series

Farming Systems Research Project
1988 Work Plan

FSRP Team

Report # 2

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The Rwandan Ministry of Agriculture
Rwandan Institute for Agricultural Sciences (ISAR)

FARMING SYSTEMS RESEARCH PROJECT
1988 WORK PLAN AND BUDGET

Institut des Sciences Agronomiques du Rwanda
and University of Arkansas, Fayetteville

at Rwerere, Rwanda

31 March 1987

Team: Ntambabazi, Callixte - Station Director
Rawson, Edward - Chief of Party/Socio-economist
Rubaduka, Enoch - Crop Scientist/Legume Program
Bizimana, Ignace - Crop Scientist/Plant Pathology
Murekezi, Louis-Marie - Socio-economist
Paul, K.B. - Crop Scientist/Technical Assistance
Yamoah, Charles - Soil Scientist/Technical Assistance

INTRODUCTION

As a result of a major evaluation in November 1986, one year and three months into project execution, the 1988 FSRP work plan reflects project re-orientation toward a farming systems research program with direct linkages to national commodity research programs and full integration in ISAR. The program focuses on research and development of extendable technologies to increase food production and improve incomes of farm families.

The program agenda focuses on wheat, potatoes, peas, beans, soil fertility/management, national research priorities for the region and related problems typical of the highlands. This includes study of the contribution of livestock to the farming systems. Limited research will continue on sweet potatoes, beans and soil fertility/management for the Central Plateau portion of the project area.

The FSR diagnostic process and on-farm trials remain the basic tools to link the researcher to the farmer and his problems and to improve the relevancy of the national research agenda. The farmer continues to be intimately involved in the research process, including evaluation of results. Farmer priorities and constraints continue to influence research themes.

The matrix (see Report 2A, appendix table 1) illustrates the proposed integration of research activities in ISAR, the responsibility for coordination of activities and the contribution of team members at the project, station and national level.[1] ISAR/ Rwerere station chief, Callixte Ntambabazi, heads the national wheat program and coordinates all high-altitude research emanating from the station, including the FSRP program. Enoch Rubaduka, in charge of regional legume crop research, also assists with the planning and implementation of FSRP bean and pea research.

The FSRP research program has direct links with all the national commodity programs for technical input and coordination. Through these commodity programs, FSRP research has important technical linkages with regional and international research programs and institutions as well.

The work plan is organized by activity according to the EMSP Department research classifications. A detailed budget is available in Report 2A.

[1]ISAR Direction needs to clearly establish roles and responsibilities of each researcher and administrator to make the above integration a reality.

EMSP ELEMENT 1.2: FSRP SOIL FERTILITY RESEARCH

This section outlines all on-station and multilocational researcher-managed soil fertility trials. These include a trial for wheat response to fertilizer and manure applications and screening trials of a wide range of leguminous cover crops, shrubs and trees for biological feasibility in major eco-zones. A detailed methodology is found in Annex B. [??]

ACTIVITY 1: Wheat Response to Manure and Fertilizer

Responsibility: Callixte Ntambabazi, K.B. Paul

Problem Addressed: To date, ISAR's primary emphasis in wheat research has been on varietal introduction and selection. Research on the impact of fertilization of wheat has been limited. More information is needed to develop wheat production response curves and to determine economic levels of fertilizer and manure application.

Objective: To determine the effects of barnyard manure and chemical fertilizers on the morphological and yield characteristics of wheat.

Methodology:

1. One ISAR-selected variety used
2. Manure applied at 0, 10 and 20 tons/ha
3. Complete fertilizer (17:17:17) at 0, 200, 400, 600 kg/ha
4. Split plot with 4 replications

Expected Outputs:

1. Wheat production response curves to applications of manure and fertilizer.
2. Determination of economic levels of fertilizer application
3. Report of findings

When Completed: Both seasons 1987/88

ACTIVITY 2: Crop Response to Sesbania Prunings and Fertilizer

Responsibility: Charles Yamoah

Problem Addressed: There is need to generate appropriate techniques that combine biological nitrogen fixing systems (BNF) with more traditional soil fertility management techniques to help farmers improve soil fertility.

Objective: To determine the effects of prunings of Sesbania and moderate applications of nitrogen and phosphorus on crop yields and soil fertility status.

Methodology:

1. Sites at Rugezi (Buberuka Highlands) and Nemba (Central Plateau)
2. Split-split plot used at Rugezi:
   - main plots: spacing alleys at 2, 4, 6 and 8 m
   - sub plots: phosphorus at 0, 30, 60 kg/ha

- sub-sub plots: nitrogen at 0, 30, 60 kg/ha
- 2 replications
- test crop: climbing bean variety recommended by ISAR

3. Split plot design used at Nemba
   - main plots: lime at 0 and 2 tons/ha
   - sub plots: manure at 0, 2.5, 5.0 and 10.0 tons/ha
   - 2 to 3 replications
   - test crop: climbing beans (wish to demonstrate to farmers the use of stakes from alley crop)

Expected Outputs:

1. Information on crop yields
2. Data on soil changes
3. Report including economic analysis

When Completed: Continuing study. Results at end of each season.

ACTIVITY 3: Alley Shrubs as Nutrient Sources for Crop Production

Responsibility: Charles Yamoah

Problem Addressed: Need for alley shrubs adapted to high altitude to use in BNF systems

Objective: To assess potential of Sesbania, Calliandra, Leucaena and Markhamia as low-nutrient sources for crop production.

Methodology:

1. Researcher-managed trial at Kirambo on a Histosol
2. Split-split plot:
   - main plots: tree/shrub species, namely Sesbania, Calliandra, Leucaena and Markhamia
   - sub-plots: manure at 0 and 5 tons/ha (based on first season's results).
   - sub-sub plots: food crops: wheat: potatoes and beans
3. Two replications

Expected Outputs:

1 Crop yield information
2. Data on soil fertility changes
3. Recommendations of species appropriate for high-altitude zone

When completed: end of 1988

ACTIVITY 4: Characterization of Soils in FSRP Area

Responsibility: Ndoreyaho (UNR), Mulindabyuma, Sebahutu, Rutunga (ISAR/Rubona), Yamoah (ISAR/FSRP)

Problem Addressed: Need to understand the characteristics of soils in the project area and to generate information useful to on-farm soil fertility management research.

Objectives:

1. To develop an understanding of the characteristics of project area soils and to generate information useful to soil fertility improvement on farms.
2. To provide opportunity for University of Rwanda students majoring in science and agronomy along with their professors to collaborate in research activities with ISAR under special studies program.

Methodology:

1. ISAR Rubona's soil association map used as a base for soil sampling
2. Sampling points developed from permutations of the base soil associations, altitude, temperature and rainfall
3. Histosol studies oriented toward management aspects
4. Soils analyzed for aluminum, iron, pH, phosphorus, organic carbon, base saturation and effective cation exchange capacity (ECEC).
5. Observations combined with those generated from on-farm crop adaptation trial sites
6. Information of No. 5 above used to develop a soil capability classification (SFCC) map.

Expected Outputs:

1. Classification of area soils according to major agro-ecological zones
2. At least 2 memoirs and other research papers with UNR professors and students
3. Research reports of information useful in formulating appropriate technologies

When Completed: end of 1987/88 research year

EMSP ELEMENT 2.1: FSRP SOIL CONSERVATION RESEARCH

The agroforestry and cover crops research previously proposed confer the benefits both soil conservation and soil improvement. The conservation research outlined in this section applies to the use of terraces. Experiments to compare the efficiency of radical terraces with biological methods (alley cropping) were initiated in October 1986 and will continue in accordance with a nationally coordinated protocol.

ACTIVITY 5: Mechanical Versus Biological Method of Erosion Control

Responsibility: Yamoah, Rutunga, Habimana

Problem Addressed: Need methods to control erosion that are practicable on a massive scale among the farm population.

Objective: To test the effectiveness of radical terracing and biological method (alley cropping reinforced with grasses) along contours for erosion control.

Methodology:

1. Sites in Butaro, Cyeru and Nyamugali communes
2. Treatments: radical terracing with Leucaena along the edges; radical terracing alone; alley cropping with Leucaena; a control
3. First season emphasized establishment of shrubs
4. Data for subsequent seasons will include soil organic matter, soil phosphorus, nitrogen, pH, ECEC, crop growth and yield.
5. Soil erosion and runoff measurement studies in collaboration with ISAR, MINAGRI, UNR and RRAM. This is a national erosion research network.

Expected Outputs: alternative soil conservation methods to recommend to the farm family and to local administrators

When completed: 1989

EMSP ELEMENT 4.2: REGIONAL SWEET POTATO SCREENING TRIALS

ACTIVITY 6: Sweet Potato Screening Trials

Responsibility: Ndamage, Bizimana (cooperation with national tuber program)

Problem Addressed: Need improved sweet potato varieties suited to the Nyamugali and Nyarutovu portion of the Central Plateau

Objective: To select new improved sweet potato varieties suited to the northern portion of the Central Plateau

Methodology: Install screening trials for 30 selected varieties near Base.

Output: More productive varieties suitable to the region

When Completed: On-going

EMSP ELEMENT 4.3: FSRP ON-FARM RESEARCH

ACTIVITY 7: Wheat Adaptability to On-Farm Conditions

Responsibility: Callixte Ntambabazi, K.B. Paul

Problems Addressed: Need to understand the constraints to increased production and productivity of wheat. Need for improved varieties and management practices for wheat that are appropriate for farm conditions.

Objectives:

1. To test the performance of a few of ISAR's promising wheat varieties under farmers' production conditions, with and without application of manure
2. To learn as much as possible of existing wheat production systems through interactions with farmer collaborators and non-wheat-producing neighbors.

Methodology:

1. Informal surveys of farmers conducted to determine constraints to producing wheat and to better understand existing wheat production systems.
2. Five varieties used (including farmers' own with seed rate of 100 kg/ha
3. Two manure rates used (0 and 20 tons/ha)
4. Split-plot with one replication per farm on 20 farms. Main plots to manure and sub-plots to varieties, with plots 3m x 5m.
5. Researcher will install and monitor trials; farmers will manage.

Expected Outputs:

1. Selection of high-performing wheat varieties under on-farm conditions to be further tested on farmer-managed trials.
2. Improved understanding of constraints to wheat production and systems.

When Completed: two seasons in 1988

ACTIVITY 8: Potato Fungicide and Rotation Trial

Responsible: Ignace Bizimana, ISAR researchers at PNAP

Problem Addressed: December/January and April/May typically are chronic food shortage periods for Highland farmers. Heavy rainfall and high humidity with resulting heavy mildew infestations constrain potato production during this period. The team hypothesizes that potato production is on the decline due to diminished soil fertility and other economic factors. Potato production on highland slopes increases soil erosion problems.

Objectives:

1. To increase potato production during food deficit periods through control of potato mildew.
2. To maintain soil fertility through a combination of rotations and alley cropping

Methodology:

1. Two PNAP-recommended varieties used; planting programmed to provide potatoes during food deficit periods.
2. Farmers selected who were willing to cooperate for two years.
3. Split plot with two replications, plot size of 40 m^2.
4. Ridomil and Dithane M45 combined for uniform treatment on all parcels
5. Rotated with potatoes, fallow improved with vetch, wheat, natural fallow, peas, potatoes.

Expected Outputs:

1. Increase potato production during food deficit period by 50%
2. A rotation system for potatoes that maintains soil fertility and conserves soil
3. Reports

When Completed: Two rotations over two-year period.

ACTIVITY 9: Peas Variety Trials and Commercialization Studies

Responsibility: Enoch Rubaduka, Ignace Bizimana

Problem Addressed: Peas represent an important source of protein for highland farmers. The existing system of production has low input requirements and fits well in the existing farming system. Pea production seems to be declining, perhaps because of competition from other, more profitable crops.

Objective: To study the possibility and feasibility of making peas a commercially profitable crop for highland farmers.

Methodology:

1. The research is divided into two major components: (a) on-farm research and (b) market study. This section describes protocol for the on-farm research aspect of the work. (See socio-economic section below.)
2. Same basic protocol as for potatoes with two ISAR-recommended varieties and a split plot design.
3. Pea research combined in the potato, wheat, pea and soil improvement rotation.
4. Study use of training poles from alley crops trial.

Expected Outputs:

1. Selected pea varieties with improved performance to local material.
2. Information on productivity and profitability of improved pea varieties in rotation with wheat and potatoes.
3. Improved knowledge of the existing pea production system including constraints to increasing production.

When Completed: Initial findings end of 1988.

ACTIVITY 10: Sweet Potato Variety/Apical Cutting Trial

Responsibility: Bizimana

Problem Addressed: Need for shorter season varieties with increased production potential. Also need more efficient means of vegetative reproduction than existing system.

Objective: To increase productivity and profitability of sweet potatoes on Central Plateau farms through introduction of ISAR-recommended, improved varieties and through the use of apical cuttings for vegetative propagation.

Methodology: Split plot design with four ISAR-recommended varieties compared to farmer's variety and apical cutting technique compared to farmer's own method of vegetative propagation.

Expected Outputs:

1. At least three improved varieties accepted by farmers for further testing in farmer-managed trials
2. Thirty farmers willing to test apical cutting technique in farmer-managed trials

When Completed: Season 1988 B

ACTIVITY 11: Bean Variety Trials

Responsibility: Rubaduka, Paul

Problem Addressed: Need to identify bean varieties capable of high yields under farmer conditions in the highland region. The team has already identified a number of promising varieties over three seasons of on-farm testing. In addition, mixtures tested by the team have shown promise as well.

Objectives: To test under farmer-managed conditions: (1) several varieties that have performed well during 1987 B season; (2) a few new ISAR/CIAT introductions; (3) one dwarf and one climbing type FSRP mixture

Methodology:

1. The number of varieties to be tested will be limited to 6 dwarf and 6 climbing types. The selection shall be made in consultation with ISAR/CIAT researchers.
2. Randomized complete block design used with one replication per farm on 24 farms. Plot size 2m x 5m.
3. Researchers will help install and monitor trials. Farmers will provide labor and manage the trials.
4. Data to be collected are plant density, disease scoring, yield and farmer evaluation.

Expected Outputs:

1. At the end of Season 1988 B, at least 2 climbing bean varieties, 2 dwarf bean varieties and 2 bean mixtures ready for diffusion.
2. Reports findings
3. At least two new varieties ready for farmer-managed trials
4. Reports of findings

When Completed: Season 1988 B

ACTIVITY 12: Bean Seed Multiplication

Responsibility: Rubaduka, Paul

Problem Addressed: At the end of season 1987 B, ISAR/FSRP will have at least 2 climbing bean varieties, 2 dwarf varieties and 2 FSRP mixtures ready for diffusion. These will have been adequately tested under farmer conditions for productivity, disease resistance and acceptability. Their performance will have been analyzed for economic viability as well. Diffusion of these varieties is hindered by lack of quality seed.

Objective: To develop a low-cost, farmer-based system of seed multiplication for improved bean varieties.

Methodology: Work with 12 progressive farmers to develop a system of seed multiplication and distribution for improved seed varieties. Details to be worked out with ISAR/CIAT researchers, MINAGRI/SSS and local agricultural cadre.

Expected Output: A farmer-based system of seed multiplication and distribution.

When Completed: 1988

ACTIVITY 13: Bean Seed Treatment

Responsibility: Paul

Problem Addressed: FSRP research shows that from 20 to 40% of bean plants are lost between planting and harvest due to disease, insects and mechanical damage. This results in substantial reduction in bean yield. Some fungicide/insecticide treatments have already shown promise in 1987 A season, but the treatments need further testing.

Objective:

1. To study under farmer conditions the effectiveness of some selected fungicides and insecticides as seed treatments in reducing bean yield losses.
2. To study socio-economic aspects of seed treatments, including cost-benefit analysis, farmer aptitude to adopt a simple technology.
3. If objectives one and two are positive, to work out a system to make chemicals available to the farmer.

Methodology:

1. Field layout, design, management and data to be collected shall be the same as described for the bean variety trial. These trials shall be placed on 10 farms with two replications per farm.
2. Farmers' own dwarf bean mixture will be treated with the following chemicals just prior to planting:
   a. benomyl (50% a.i.), 30 g/kg plus Thiram (80% a.i.), 3 g/kg.
   b. Diasart (a mixture of Thiodan, captan and Diazinon), 3 ml/kg.
   c. Control (no treatment)
   d. Other treatment as may be suggested by CIAT/ISAR plant pathologist
3. Assessment of root damage caused by both disease and insects.

Expected Output: At least one low-cost seed treatment that will increase bean stands by 30% with farmer acceptance of 90% and 30 farmers ready to try technique on their own bean seed.

When Completed: Season 1988 B

ACTIVITY 14: Herbaceous Legumes as Source of Livestock Feed and Manure

Responsibility: Charles Yamoah

Problem Addressed: Combined need of feed for livestock and manure for soil improvement

Objectives:

1. To investigate the use of Desmodium spp., alfalfa, clover and Stylosanthus spp. as supplementary feed for livestock.
2. To determine the quantity and quality of manure produced by livestock and its effects on crop production.

Methodology: Researcher-managed trials on 5 farms using 4 cover crops. Details to be finalized with ISAR/Rubona animal scientist and ISAR/Karama forage agronomist.

Expected Outputs:

1. Yield of forage crops
2. Growth response of livestock
3. Food crop yields
4. Soil changes
5. Five farmers using legumes for cover crop and livestock feed
6. Information on quantity and quality of manure
7. Report of findings

When Completed: Assessment end of each season to end of 1989

ACTIVITY 15: Herbaceous Cover Crops

Responsibility: Yamoah

Problem Addressed: Need to develop on-farm management systems for adapted cover crops selected during screening trials.

Objective: To investigate the potential of leguminous cover crops used as green manure and living mulches on crop production and soil fertility maintenance.

Methodology:

1. Farmer managed with 3 treatments:
   a. cover crop no. 1 plus farmer practice;
   b. cover crop no. 2 plus farmer practice;
   c. farmer practice.
2. Cover crops will be relay cropped with either maize or sorghum 8 weeks after planting maize and 10 weeks after planting sorghum.
3. Conducted on approximately 50 farms (50 replications)
4. Test crops: wheat, potatoes, beans and peas either in association or in rotation.
5. Conducted in conjunction with crop adaptability trials (below)

Expected Outputs:

1. At least three cover crops and management systems ready for dissemination on a wider scale
2. Reports

When Completed: 1989 conducted through at least three seasons.

ACTIVITY 16: Alley Cropping Under Farmers' Conditions

Responsibility: Yamoah

Problems Addressed: Need to test on-farm biological systems that combine soil improvement and soil conservation. These systems have already been tested on-station, in multi-locational trials and on progressive farmers' fields.

Objective: To assess agronomic and economic benefits of alley cropping under farmers' conditions.

Methodology:

1. Each of 10 progressive farmers already cooperating with alley cropping trials will work with 5 neighbors to install and manage alley cropping trials on 50 sites.
2. Agronomists will cooperate to establish the crops to be grown in the alleys in conjunction with the adaptability trials.
3. Treatments will be alley cropping plus farmer's practice and farmer's practice alone.

Expected Outputs:

1. Reports of crop yields, soil fertility changes and farmer evaluation.
2. Socio-economic assessment of trials
3. A technology to improve soil fertility and to control erosion tested and ready for dissemination.

When Completed: Some results end of 1988 season. Data collection continuous. Technology ready for dissemination no later than end of 1989 research year.

EMSP ELEMENT 4.4: SOCIO-ECONOMIC STUDIES

ACTIVITY 17: Socio-Economic Studies

Responsibility: Murekezi, Rawson

Problems Addressed: A limited proportion of Highland farmers currently produce crops designated by national policy as priority for the region. To increase production of these crops, there is need to understand farmer priorities, circumstances and constraints to production, especially the economic and social aspects.

Objectives:

1. To identify farmer circumstances that constrain crop production
2. To provide typologies of highland farming systems
3. To screen proposed technologies to be tested for economic viability
4. To conduct socio-economic analysis of technologies tested with priority for those tested on-farm.
5. To study markets and prices to identify the constraints to increased production.

Methodology:

1. Diagnostic and verification studies conducted of wheat, potatoes, peas and maize involving both social scientists and agronomists.
2. A random sample survey of 200 farm families conducted to provide data on farm size, cropping systems, available labor, livestock numbers and types and other resources available to establish typologies.
3. Data collected and analyzed on costs and returns of cooperating farmers and other target group farmers.
4. Input and output markets studied to determine bottlenecks and potential.
5. Analysis of variance, partial budgeting, confidence intervals and measures of farmer acceptance used to analyze on-farm trials.

Expected Outputs:

1. Enterprise budgets for wheat, peas, potatoes and the most important association.
2. Production and marketing reports on each major commodity.
3. Typologies for major target groups and systems.
4. Technologies tested on-farm and analyzed for socio-economic factors.

When Completed: Above outputs expected for 1988.

EMSP ELEMENT 4.5 FSRP TRAINING AND SEMINAR PROGRAM

The purpose of the training program is to improve the capacity of Rwandan scientists to work with extension agents and farmers to conduct effective agricultural research and extension.

Responsibility: FSRP team members in cooperation with persons from ISAR, MINAGRI and the National University of Rwanda.

ACTIVITY 18: Training leading to a degree in agricultural science

During 1987/88 7 bachelors candidates and 2 PhD candidates will continue the second year of their programs at selected U.S. universities. Ten masters candidates will complete their English language training and begin their degree programs. The two PhD candidates will initiate their thesis research in Rwanda.

ACTIVITY 19: Workshops, Short-Courses and Conferences

1. At least two Rwandans from ISAR and MINAGRI and two FSRP technical assistants will attend the 1987 Farming Systems Symposium at the University of Arkansas, October 18 to 21. The delegation will prepare professional papers for presentation at the symposium. They will follow the symposium with visits to Winrock International and the National Center for Soil Conservation at the University of Minnesota.
2. At least 3 workshops and/or short courses will be held for ISAR and MINAGRI researchers and extension personnel and UNR faculty. Subjects yet to be determined will emphasize relevant research topics.
3. At least 3 conferences of ISAR scientists, MINAGRI personnel and staff from other projects for professional interaction on agricultural development and research topics.
4. At least 2 Rwandans will be sent to short courses at International Research Centers.

ACTIVITY 20: Farmer Training and Extension

1. The emphasis of the FSRP research program is development of extendable technologies. Workshops, field days, on-farm demonstrations of simple research techniques and informal interactions will serve to train both farmers and extension agents to become effective participants in the FSR research process from problem identification to on-farm testing of plausible solutions.
2. At least 16 innovative (progressive) farmers and existing agricultural extension staff who reside in the 3 to 4 (yet to be determined) research zones will be trained to assist with installing, monitoring and evaluating on-farm trials. The paraprofessional farmers will form the nucleus of research clusters of cooperating farmers within the research zones. They will provide the means of extending on-farm research activities to approximately 120 farm families.

ACTIVITY 21: Team Building

A major purpose of the FSRP program is to mold the multidisciplinary group of eight scientists at Rwerere into a unit effective in conducting on-station and on-farm research with a farming systems perspective. Team building will include the following components:

1. Weekly staff meetings for planning, coordination and professional exchange.
2. Bi-weekly training sessions on some aspect of the on-going research program.

3. Clear definition of roles and responsibilities of each researcher and administrator on the Rwerere station.
4. Use of regular evaluation of progress on the work plan based on criteria established.
5. More team involvement in decision-making.

EMSP ELEMENT 4.6: FSRP SPECIAL STUDIES

ACTIVITY 22: Special Studies

The project will finance at least 4 special studies by cooperating faculty and students of Rwanda National University, College of Agriculture. At least two special studies will be conducted by faculty and students of U.S. universities participating in the project. Special studies topics will concentrate on research problems appropriate to highland agriculture as jointly determined by ISAR researchers in cooperation with the faculty and deans of the respective universities. A long-range plan for special studies will be developed during the April-May period.

EMSP ELEMENT 4.7: FSRP SHORT-TERM TECHNICAL ASSISTANCE

ACTIVITY 23: Short-Term Technical Assistance

A plan for short-term technical assistance for 1988 to the end of the project will be developed during the April to May period. The types and duration of needed assistance will be jointly determined by the Director of ISAR, representatives of the University of Arkansas and FSRP team members. A tentative plan currently calls for the following technical assistance:

1. Eight weeks training on use of computers for design and analysis of agricultural research. Training would include researchers at Rwerere and selected researchers from other stations. To be provided by faculty of the University of Arkansas.
2. Study of Rwanda's Land Tenure System.
3. Consultancy on soil conservation.
4. Consultancy on small ruminants research in farming systems.

NOTE:

For detailed budget information, see Report 2A.