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Integration of Research Planning of the Farming Systems Research Program with the Rwandan National Agricultural Research Plans

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OBJECTIVES

The activities of this proposed study will focus on developing methods for integrating the FSR and commodity research approaches.

Specific objectives:

1. Determine and evaluate alternative solutions to Rwandan agricultural production and consumption that can reconcile regional (Buberuka Highlands) objectives and constraints with national agricultural policies and research activities.
2. Describe, quantify and summarize the contribution (strengths and constraints) of agricultural research and farming systems research, specifically, to the national research planning process and production goals.
3. Develop recommendations for specific plans and methods that can be applied for an improved agricultural research system in Rwanda, i.e. how to integrate farming systems research with the national research system.

JUSTIFICATION

Institutionalizing the farming systems approach in Rwanda requires that the project adhere to, test the approach of and train Rwandans in the FSR methods. Perhaps most unique to the FSR approach is the focus on farmers as a source of information for research planning. However, because farming systems research projects are usually focused on a particular region in the country, the research needs of the farmers in that region may not be consistent with the role perceived for that region in contributing to broader national goals. This is potentially true for the FSRP project at Rwerere.

In following the FSR methodology by designing research plans according to the expressed needs of local farmers, there is the potential that the research plans may not be consistent with the national agricultural research plans and policies. This is especially true when the region is producing primarily for its own needs, at a self-sufficient level. As the national research plans call for increased production within the region beyond its own consumption, or production based on specialization of certain commodities, the FSR research activities based on local research needs may become inconsistent with the national plan for that region's contribution.

For example, Buberuka Highland farm households produce and consume on a self-sufficient basis. Their diet consists primarily of beans and potatoes (white and sweet). Yet the region is alleged to have potential for producing wheat with a comparative advantage over other regions in the country. The question for research planning for the Rwerere research station is how to integrate the objectives of the local farmers with those of national food plans and policies.

PREVIOUS ACTIVITIES

The evaluation of the FSRP in 1986/87 led to the conclusion that the FSRP and ISAR should fully integrate so that FSRP would reinforce the strengths of the national agricultural research programs. Further the project must bring about the involvement of the faculty and students from UNR.

The project evaluation summary (PES) statement endorsed the idea that the project should develop a research process that is capable of integrating farming research systems with the commodity research approaches typical of the national planning process. In response, work plan activities and budgets for the FSRP project were integrated into the ISAR national plans for 1988.

The Farming Systems Research Program continues to conduct surveys in the Rwerere area to collect information from the local farmers regarding production problems and prospects of research activities. Similarly, the main research station of ISAR at Rubonna coordinates and develops national agricultural plans with the assistance of the ISNAR. As the effort for integrating the farming systems approach into the national agricultural research framework evolves, the challenge is to develop methods that can best help organize the information necessary for an effective national research planning process.

METHODOLOGY

In order to satisfy the research objectives of this project, it is proposed that the Special Studies activities of the FSRP project be used as a coordinating mechanism for the collaboration among researchers from the UNR (Butare), ISAR (Rubonna and Rwerere) and UofA (Rwerere and Fayetteville). Research methods and activities are identified by each objective.

Objective 1

Develop a spatial equilibrium programming model of the agricultural economy of Rwanda and the project area. The initial development of this model will be at a national level. However, a part of this model will be more detailed in order to analyze the Buberuka Highlands. Therefore, the model will have at least two regions, the Buberuka Highlands and the rest of the nation. The model will have the objective of minimizing the cost of producing and distributing agricultural products in Rwanda, subject to a set of constraints on resources, food requirements and technical relationships. Variations of the standard linear programming model can be used for this research framework. Data requirements include information on 1) land, labor and capital constraints by crop, 2) food or nutrient requirements of the population and 3) production, marketing and transportation costs by crop. Results from this objective will provide a basis for evaluating the competitive position of the Buberuka Highlands in producing crops for the national agricultural economy.

The model will be used to identify alternative solutions to meeting Rwandan production and consumption goals subject to constraints associated with resources, food requirements and technical relationships These alternatives will include the addition of constraints and activities in the objective function, which will identify the particular role of the Buberuka Highlands.

Objective 2

a) Determine the yield gap (difference between potential technological limit and actual farmer yields) in Rwanda and the project area for major commodities and by agro-ecological zone, with a particular focus on those in the Buberuka Highlands.

The determination of the yield gaps will be based on summaries and evaluations of results for major crops from agronomic experimental trials conducted previously by ISAR and FSRP to determine the difference between yields obtained by the farmer and those obtained by the application of test factors such as variety, fertilizer, pest control and other cultural practices.

This activity will be based on a modification of the procedures in *A Handbook on the Methodology for an Integrated Experiment-Survey on Rice Yield Constraints*, S.K. DeDatta et al., IRRI, 1978.

The results of this research will provide the basis for determining which factors constrain farmers from attaining higher levels of productivity. Thus priority in research and extension activities can be given to factors on the basis of their potential contribution. A clearer understanding of the factors that constrain yields on farmers fields can suggest modifications to be made in developing adaptive technologies and how to make these technologies easier for the farmer to adopt.

This evaluation will be conducted in consultation with the primary agronomic commodity researchers at ISAR, Rubonna.

b) Estimate yield response surfaces.

Collect cross-sectional and time-series of yield, input use, input and product price data for estimation of yield response functions to evaluate relative contribution of inputs across commodity.

Estimate of yield response surfaces is an alternative method for quantifying the contribution of factors

to increased productivity. Estimates of coefficients for these equations are useful in identifying the rate of return to inputs, including agricultural research expenditures.

This analysis can be done at two levels:

1) at the farm micro level, based on research trials that systematically vary inputs or technological package levels, measuring the effect on yields;

2) at the national level, based on input, weather, research expenditures and data, measuring the relationships between yield variation.

Objective 3

Quantify and describe the parameters of research planning at the national and FSR project level in Rwanda. At the national level, this will focus on the research planning process at ISAR, Rubonna, with the assistance of ISNAR. At the project level, research planning procedures will be described in terms of the FSR approach and the attempt to integrate the project activities and budget into the ISAR national plan.

This objective will require the results generated from objectives 1 and 2. Based on the alternative solutions to Rwandan production and consumption in terms of resource allocation and crop mix for Rwanda and the Buberuka Highlands, this information will be used to develop a decision model to determine the allocation of research resources and activities in Rwanda by commodities and location. This will require the development of a goal-programming model that has the capability to solve problems with multiple goals. The problem involves the reconciliation of national food policy goals and local, rural farm household food goals in terms of how the agricultural research should be organized.

BUDGET

Category	Unit	Quantity	Cost (000FRW)	Cost $US
Personnel				
Senior Researchers	Man-months	6	290	3,625
Junior Researchers	Man-months	12	160	2,000
Per Diem				
Technical Personnel				
In-country	days	300	600	7,500
Foreign travel	days	60	400	4,000
Chauffeurs	days	300	100	1,250
Transportation				
Auto	km	6,000	180	2,250
Airplane	trips	4	1,100	13,750
Inputs and other charges				
Computer Hardware (UNR and ISAR			640	8,000
Computer Software			80	1,000
Publications			200	2,500
Miscellaneous			100	1,250
Sub-Total Rwandan Researchers and Materials			3,850	48,125
Technical Assistance				
Senior Researchers	Man-months	6	1,680	21,000
Junior Researchers	Man-months	3	286	3,575
Per Diem	Days	120	800	10,000
Airplane	Trips	4	1,000	13,750
Sub-Total Technical Assistance			3,766	47,075
Total			7,616	95,200

RESEARCH ORGANIZATION

The project will be funded under the Special Studies activity of the Farming Systems Research Program. The research will be conducted with the supervision of the faculty of the UNR and UofA as well as the FSR Project Directors and Research Directors at ISAR. The studies will be completed in the form of memoirs and M.S. theses at UNR and UofA. At least three specific thesis topics will be developed in this study:

1. Yield Gaps and Productivity of Agricultural Research in Rwanda;

2. A Spatial Equilibrium Model of the Rwandan Agricultural Economy;

3. A Goal Programming Model of Agricultural Research in Rwanda.

The first two thesis topics will be written by Rwandan students from the UNR. The third thesis topic will be written by a M.S. student from UofA. Dr. Eric Wailes and Dr. Donald Voth will be the principal faculty members for the UofA. Faculty members from the UNR will be provided with the opportunity to travel to ISNAR and the U.S. to participate in training workshops on yield gap analysis, agricultural research evaluation and math programming.

SUMMARY OF PROPOSED SPECIAL STUDIES

- The FSRP evaluation summary states that the FSRP and ISAR should fully integrate.
- The FSRP project must bring about the involvement of the Faculty and students from UNR.
- The Special Projects activity of the project budget is the appropriate source for funding these integrative activities.
- Reconciliation of the farmer-oriented FSR approach with the national commodity approach to research planning and organization needs to be done through a set of research activities that integrate the two approaches.
- The proposed framework will be based on yield gap analysis, production (yield) response surface analysis, spatial equilibrium models and goal programming models.
- The University of Arkansas will provide leadership in developing this activity through thesis and memoir research conducted at UNR and UofA.

ILLUSTRATIVE TIME TABLE FOR THE RESEARCH

Dec 1987	Approval of the special study by FSRP, UNR and ISAR.
Jan 1988	Rwandan faculty and students identified for assignment of research topics.
March 1988	Develop logistics for coordination of research.
May-Aug 1988	Data collection and model development by UofA and Rwandan students.
Sept-Dec 1988	Students return to Universities. Model computerization and verification in Rwanda at ISAR.
Jan-May 1989	Completion of studies and publication of reports.
June-Dec 1989	Follow-up studies and refinement of models for research planning.