DIAGNOSIS, DESIGN AND ANALYSIS IN FARMING SYSTEMS RESEARCH AND EXTENSION

FSR/E TRAINING UNITS: VOLUME I, II and III
TRAINER'S MANUAL

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PREFACE

One of the major objectives of the Farming Systems Support Project is to provide training, and support for training activities, in FSR/E methodology. This collection of training units has been produced in response to an absence of available training materials which could be used in training practitioners in the skills necessary for implementing the FSR/E approach to agricultural development.

This collection of training units is not a course. Rather, it is a set of resources which supports FSR/E courses. It is an attempt to provide the trainer and practitioner trainee with a wide variety resources for teaching and learning specific content and skills needed for implementing FSR/E successfully.

Volume I, Diagnosis in FSR/E, contains nine units for introducing trainees to various diagnostic steps in the FSR/E approach. It stresses, but is not limited to, initial diagnosis. Volume One also contains units which detail on-going, or continuous, diagnosis throughout the FSR/E process. Links between social and biological science disciplines are stressed, as are considerations of intra-household and socio-cultural issues. The final unit focuses on problem identification and prioritization, a step leading toward appropriate trial design.

Volume II, Design Techniques for On-Farm Experimentation, contains five units which detail the farm trial design, layout, and management process. The links between biological and social science disciplines in on-farm research are considered, and, like Volume One, intra-household and socio-cultural issues are addressed. This volume begins by focusing on the importance of establishing clear evaluation criteria before designing a trial and culminates with a discussion of practical implications of managing on-farm experimentation.

Volume III, Analysis and Interpretation of On-Farm Experimentation, establishes a framework for analysis reinforcing the importance of the evaluation criteria established early in the design process. It also provides basic statistical and analytical techniques useful for on-farm experimentation.

A Trainer's Manual accompanies these three volumes, and provides a variety of activities for the trainers to use. One of the objectives of this series of training materials is to provide participatory activities which will involve the participant directly in the training in a "hands-on" fashion. It emphasises group discussions and role play as well as other types of activities.

This is the second edition of the training units, and the revisions which were made were based on comments from a variety of sources, including specific reviewers, participants in shortcourses, individual users of the training manuals, and others. We have tried to address the majority of the concerns voiced. Major revisions included integration of livestock issues and expansion of economic analysis material. Emphasis has also been placed

on presenting material in a "how to do" fashion.

The units have not been developed to be exhaustive texts of the the topics presented. Rather, they have been developed to convey basic information in a format as complete and concise as possible. It is our hope that both trainers and trainees will search out more information on specific topics covered in the training units. The learning objectives and key points focus on the main essence of the unit or section. A common glossary gives all the definitions in one place, since many terms are used in more than one unit or section. Many units are divided into sub-units, sections and sub-sections, each with its own set of learning objectives, key points, list of terms, and discussion. Suggested learning activities accompany the units or sections and each activity has separate instructions for trainers.

The units are not thought to be the "final word." Rather, they have been developed as the foundation of developing training units in FSR/E. Your comments, adaptations, additions, and suggested activities are welcomed and encouraged. The best measure of the usefulness of a product is given from those who use the product. The best way to improve a product is to listen to the users. At the end of this introduction you will find a one page evaluation sheet. We hope that you will use this form to send us your comments. This is not meant to limit your comments (and we encourage detailed comments) but rather to encourage you, the user, to let us know what you think and suggest.

AKNOWLEDGEMENTS

Throughout the development process of the FSR/E training units, from the planning, writing, initial editing, reviewing, testing, revising, to the final production, and second edition, many individuals have been involved. FSSP would like to acknowledge their efforts. The individuals are listed below with their affiliations at the time of their participation.

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Reviewers:

The draft edition of the Volume Two, Techniques for Design and Analysis of On-Farm Experimentation, was used for the first time in the FSSP/Gambia Agricultural Diversification workshop on On-Farm Experimentation in May, 1985. Parts of Volume One, Diagnosis in FSR/E, were used for the first time in the Jamaica Farming Systems Research Workshop, June, 1985. Feedback received during this initial testing was used, along with other feedback, in the revising effort.

Richard Bernsten, Michigan State University, presented the FSSP training units for review at the "Farming Systems Research Socio-Economics Monitoring Tour/Workshop," held September 16 - 28, 1985, at IRRI, Los Baños, Philippines, at the request of Marlin Van Der Veen, IRRI. Comments from that session, as well as detailed comments by Richard Bernsten, were very useful in revising both volumes. Susan Almy, Rockefeller Foundation, also provided very detailed comments. Additional review comments were made by Peter Hildebrand, University of Florida. Martha Gaudreau, University of Minnesota, played an important role in the revision of the Diagnostic Unit. Klaus Hinklemann, Virgina Polytechnic Institute, provided valuable consultation on some statistical aspects of the units.

Specific reviewers for the volumes included Hal McArthur (University of Hawaii), Roque de Pedro (Viscaya State College of Agriculture, The Philippines), Cornelia Flora (Kansas State University), John Lichte (University of Florida), Eric Crawford (Michigan State University). Valuable comments were also offered by Janis Jiggins and Federico Poey (AGRIDEC).

The FSSP acknowledges the above contributions and those of others who may have been inadvertently omitted. I would like to gratefully acknowledge the patience and hard work of the FSSP secretaries, especially Lana Bayles, who typed the majority of the training units.

Lisette Walecka
Coordinating Editor
October, 1987

ADDITIONAL TRAINING MATERIALS OF INTEREST

CARDI, April, 1984, "On-farm Experimentation: A Manual of Suggested Experimental Procedures.

CIMMYT, revised November, 1985, "Introduction to Economic Analysis of On-Farm Experiments", Draft Workbook, CIMMYT Economics Program, .

FSSP, 1985, "Bibliography of Readings in Farming Systems, volume 1,"

Poey, F. et. al, 1985, "Anatomy of On-Farm Trials: A Case Study From Paraguay", FSSP.

Hildebrand, P. and F. Poey, 1985, On-Farm Agronomic Trials in Farming Systems Research and Extension", Lynne Rienner Publishers, Inc., Boulder Colorado.

The FSSP has developed and initially tested a case study based on Dominican Republic data from the Las Cuevas region which gives trainees the opportunity to interview farmers and develop research priorities.

The FSSP/Population Council case study project "Intra-Household Dynamics and Farming Systemns Research and Extension" is producing eight case studies designed primarily for the training of agricultural researchers. These case studies were "envisioned as a mechanism to examine the assumptions of FSR/E with regard to intra-familial input to farming systems, including land, labor and capital and production constraints within the household" (Feldstein and Poats, 1985)

The eight cases represent on-going field projects which have reached a level of development through, at least, the first three stages of FSR/E (diagnosis, design, and on-farm experimentation and evaluation). The cases also represent a number of "issues" facing the whole state of the art of FSR/E, such as the relationship of agroforestry to FSR/E, dryland on-farm cropping methods, the tendency towards "over-surveying" and the research extension linkage (Feldstein and Poats, 1985). The cases are listed below:

1. SAFGRAD project in Burkina Faso, written by Joseph Nagy, Sibiri Sawadogo and Herbert Ohm.

2. CARDI project in St. Lucia, written by Vasantha Chase.

3. A CIAT project in Colombia, written by Jacqueline Ashby.

4. TROPSOILS project in Sitiung, Indonesia, written by Vickie Sigman and Carol Colfer.

5. Lake Balinsasayao project in the Philippines, written by Eva Wollenberg.

6. ARPT project in Zambia, written by Charles Chabala and Robert Nguiru.

7. CARE/ICRAF Project in Siaya District, Kenya, written by Diane Rocheleau.

8. ATIP project in Botswana, written by Doyle Baker.

VOLUME I, II AND III: TRAINER'S MANUAL

PREFACE

The set of materials included in the collection of FSR/E training units has been assembled by the FSSP to provide support for training in FSR/E methodology. As Farming Systems practitioners are aware, the first step in the FSR/E process is diagnosis. The same is true of developing training programs or courses. The first step is to find out what is needed by the potential trainees (audience). Performing a needs assessment should preceed all training, and a training course should be planned based on the needs assessment. Needs will vary by participants, location, familiarity with FSR/E, and a multitude of other factors. The FSSP realizes that due to the variability of needs from one short course to the next, the design of a "standard" course would not be the best approach to providing support. Instead, the development of training resources on a range of skills necessary for the implementation of the FSR/E approach was envisioned.

The training units were developed to provide flexibility in course design. By picking and choosing the relevant units or parts of units, based on the needs of the clientel, the trainer has the opportunity to provide a wide variety of short courses. The collection of training units provides an array of information on FSR/E, from diagnosis to the analysis of on-farm trials, from which a trainer can draw to develop short courses and workshops on a variety of aspects of FSR/E. It is not presented as a course outline. Each training course or workshop will differ depending on the objectives, content, trainees, trainers and other elements of a training activity.

Trainers should become familiar with the glossary of terms. Many terms are used with very specific meanings in this volume. This does not imply that other meanings are not valid in ordinary conversation. It simply means that in this volume, the terms have specific meanings to prevent confusion. This way, trainers and participants can be sure that everyone has the same understanding about the concepts and methods which the terms refer to in this volume.

For example, in general conversation, the word "intervention" can have many meanings. It may refer to a new extension program, or to a change in fertilizer price. However, this volume is concerned with design and analysis of on-farm trials. Thus, in this volume, the term "intervention" is used a type of treatment, a technological or management change fromthe "average" farmer practice in a given domain , designed to solve a production problem.

This example shows several reasons the definitions in this volume are very specific. First, the words "treatment" and "technological or management change" show that this definition relates specifically to on-farm production trials. Second, the words "designed to solve a production problem" show that the intervention is part of FSR/E. That is, this phrase shows that it must be based on diagnosis, because production problems are identified in diagnosis. Third, the definition is linked to other definitions. The words "treatment" "average farmer control,"

"domain", and "production problem" all also have specific definitions in the glossary and in this volume. These words are also defined with specific meanings for FSR/E on-farm trials.

Besides flexibility, another basic premise for the development of the training units was the need for participatory activities. Activities encouraging participation and hands-on experiences accompany most of the training units and are included in this manual. Corresponding trainee instructions appear in each volume. There is a need for many more of these types of activities and we encourage you to submit any activities which you have used and would like to see included in future editions of the training units to the FSSP. Address your comments to:

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As a basis for understanding the process of the development of these training units, and their intended use, the following criteria were established.

1. Objectives - the objectives of the training units and specific sub-units are skill oriented emphasizing developing the abilities of field level practitioners to carry out Farming Systems Research and Extension.

2. Content - the content of the training units is technical in nature, addressing specific "tools" to be used by practitioners in FSR/E.

3. Process - the training processes to be included are to be varied and essentially experiential in nature, allowing for maximum participation by the participants.

4. Audience - the training units are to be directed toward field level practitioners who will have had, ideally, at least a certificate level education and who will have had no more than two years field experience. While the training units will be directed toward this specified audience, trainers will be encouraged to adapt the materials therein to other levels as they feel necessary. Any units, sub-units or sections requiring pre-requisites for their use are clearly indicated at the beginning of each unit.

5. Trainers - the training units have been developed with the idea that they will be used by at least two trainers (one FSR/E content expert, one training specialist). These trainers will be expected to have language capability in the language of delivery, be at least diploma level, and have FSR/E experience (at least previous participation in the course being delivered).

Essentially, the training units are designed as participant manuals. These manuals are supplemented by trainers' notes where ever possible. We encourage you to photocopy the manual as needed. The only item which we cannot authorize photocopying permission is Peter Hildebrand and Federico

Poey, On-Farm Agronomic Trials in Farming Systems Research and Extension, 1985 which is published by Lynne Rienner Publishers, Inc., Boulder, Colorado. This publication can be ordered from Lynne Rienner Publishers, Inc., 948 North Street, Boulder, Colorado 80302. It is distributed ouside of North and South America and Japan by Frances Pinter (Publishers) Ltd, 25 Floral Street, London WC2E 9DS, England.

As mentioned earlier, your feedback is essential for the future improvement of the training units. A general evaluation form is included here for your convenience. Please feel free to elaborate. Thank you for your support in this effort.

VOLUME I: INTRODUCTION

Each unit in this volume has several activities that will enable FSR/E team members to build skills related to diagnosis in FSR/E. The units themselves are arranged in order such that the materials presented later in sequence may depend on material presented earlier. In those cases, the units will have prerequisites indicating that the trainer should ensure that the trainees have the background information necessary to benefit from the unit. Other units require no previous knowledge.

Not every activity in a unit needs to be used in a given workshop, nor has the manual been designed as such. The trainer can choose the activities most appropriate to the training situation, or use the activities as models and construct his/her own exercises with local data. Many of these exercises have been used successfully in previous workshops. They are intended to provide trainers in FSR/E with options and ideas for providing a stimulating learning experience in FSR/E workshops.

VOLUME II: INTRODUCTION

This volume consists of a collection of notes on techniques and choices. The volume has two objectives:

1. Skill-building: to enable farming systems team members to use different techniques.

2. Decision-making: to enable farming systems team members to make better choices among different techniques.

Both objectives are important. Team members cannot choose from techniques which they do not know how to use. Skill-building thus increases choices. Making good choices is equally essential. Using the wrong technique slows down the progress of on-farm experimentation.

The sections are arranged in the order of the steps of on-farm experimentation. Trainers do not need to present all the material at once. However, material later in the sequence often depends on material earlier in the sequence. Sections may have "prerequisites." These indicate the material that the section depends on.

Some techniques are less common than others. The less common techniques are marked "optional." They can provide team members with more choices. Teams can still do good on-farm experimentation without them. Trainers can choose how much to include depending on participants' needs.

Many sections have participant exercises. Trainers can use the exercises "as is" when appropriate. Or, trainers can use them as a guideline to make their own exercises with local examples.

VOLUME III: INTRODUCTION

This volume presents a general framework for analysis and techniques useful for the analysis and interpretation of on-farm experimentation. Analysis does not begin after design. Rather, as the other two volumes have indicated, plans for analysis must begin very early in the process, and continue to guide you through the planning, design and experimentation process. The ultimate success of the alternative technology is its acceptance of and adoption by the farmer. These units provide FSR/E team members with a basic underrstanding of appropriate techniques and of some underlying concepts of diagnosis.

The unit tries to walk the participants through the steps of analysis. Establishing a framework for analysis requires planning and should be linked closely with the evaluation criteria and the design of the trial. This unit helps the practitioner to focus on choosing specific analytical tools and being able to determine the impact of proposed technologies. The ultimate evaluation is acceptability by farmers.

Being able to assess data sets as a preliminary step in analysis is extremely important. This unit provides activitiew which will help the practitioner to preview the data, make statistical inferences, and summarize and describe data.

There are various techniques for analysis. Which one is appropriate depends on the design used. Interpretation of results includes biological, economic, and social interpretation. Analysis and interpretation help the team and farm households make better decisions for future activities. This unit presents a variety of analysis techniques available to the FSR/E practitioner in detail. Sections may have "prerequisites." These indicate the material that the section depends on. For example, analysis of variance (ANOVA) for factorial arrangements of treatments depends on understanding what are designs with factorials. Of course, if participants already understand the design principles (perhaps from a previous workshop), it is not necessary to repeat the prerequisite material.

DIAGNOSIS IN FARMING SYSTEMS RESEARCH AND EXTENSION

FSR/E TRAINING UNITS: VOLUME I

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VOLUME I: ORGANIZATION OF MANUAL

This volume presents concepts and tools useful in the diagnostic phase of FSR/E. During diagnosis an interdisciplinary team works together with farmers to describe the farming system and identify farmers' problems. The team suggests possible solutions and opportunities to improve the farming system that can be addressed by on-farm research or other interventions.

There are several ways an FSR/E practitioner can gather and analyze information necessary for diagnosis. These units provide FSR/E team members with a basic understanding of apropriate techniques and of some underlying concepts of diagnosis.

Unit I. Putting Together the FSR/E Team: Interdisciplinary Interaction

When farmers allocate resources among their various enterprises, they are integrating knowledge from several disciplines. FSR/E teams can gain a better understanding of the farming system and farmers' strategies if they are interdisciplinary in their activities. Interdisciplinarity is one of the main characteristics which differentiates FSR/E from other approaches to research and extension. This unit helps team members appreciate the contributions of other disciplines to diagnosis and the other stages of FSR/E.

Unit II. Modeling the Farming System

Models are used to describe and analyze systems and their component parts. Both structural models and process models help FSR/E team members describe farming systems and analyze farmers' management strategies. Utilization of these two types of models is demonstrated in this unit.

Unit III. Getting Started in the Farming Community

Getting to know the local community within which an FSR/E team will be working is very important. The FSR/E team must obtain the endorsement of local leadership and the range of local farmers in the community. This unit provides information which will be useful for the FSR/E team in preparing to begin work in a farming community.

Unit IV. Grouping Farmers: Developing Recommendation Domains

Extension recommendations based on geographical or ecological factors alone may not be appropriate for every farmer in an area. Since it is not practical to conduct research on the problems of individual farmers, it is useful to define farmer groups or recommendation domains. This unit examines the concept of recommendation domains, their dynamic nature, and the criteria, both natural and socio-economic, used to identify these groups of farmers.

Unit V. Gathering Information for FSR/E: Choosing Methods That Work

There are many ways to gather data for diagnosis (for example, using secondary data, conducting informal and/or formal surveys, experimentation, case studies, etc.). The selection of a method depends on the situation and the type of information needed. This unit provides an overview of the various methods available to an FSR/E team.

Unit VI. Using Existing Information in FSR/E

Team members can use secondary data to acquaint themselves with the area in which they will work. Data are also useful for identifying topics to be included in the informal survey. This unit presents various types of secondary data sources and techniques for more effectively using them during diagnosis.

Unit VII. Informal Surveys for Data Gathering in FSR/E

Informal surveys provide a rapid way of gathering information about farmers' circumstances and problems. They are commonly used during diagnosis. Good interviewing skills and preparation of topic outlines, two of the techniques that permit practitioners to plan and conduct effective informal surveys, are among several covered in this unit.

Unit VIII. Formal Surveys for Getting Stated in FSR/E: Some Simplified Procedures

Formal surveys during diagnosis are most effectively used to verify the findings of an informal survey. The pros and cons of using formal surveys versus informal surveys, the complementarity of these two methods, and the strengths and weaknesses of formal survey as a tool for diagnosis are treated in this unit.

Unit IX. Setting an Agenda for On-Farm Trials

This unit addresses the linkage between diagnosis and design of on-farm experiments. Since initial diagnosis usually reveals more farmer problems than a team can address, it is necessay to establish research priorities. This unit helps practitioners differentiate between problems and solutions, and provides them with tools for evaluating possible solutions and establishing research priorities.

DESIGN TECHNIQUES FOR ON-FARM EXPERIMENTATION

FSR/E TRAINING UNITS: VOLUME II

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VOLUME II: ORGANIZATION OF MANUAL

This volume presents techniques useful in the design. On-farm experimentation moves through a series of steps. At each step there are various choices to make. No one choice is right all the time. Each choice has advantages and disadvantages. Sometimes one choice is better than another under one set of farmer conditions and a given problem to solve. The next time, under different farmer conditions, or for a different problem to solve, another choice may be better. The objective of this volume is to help farming systems teams make better choices.

The steps in on-farm experimentation help farming systems teams and farm households answer several questions. Each unit in this volume addresses one of these questions.

Unit I. What Kind of Testing To Do?

Initial diagnosis usually reveals more farmer problems than a team can address at one time. Prioritization of farmer problems is necessary. Prioritization is the link between initial diagnosis and design of on-farm experimentation. Planning for evaluation through setting clear evaluation criteria helps to focus on-farm experimental design and analysis.

Types of trials for priority problems can be classified by three criteria:

a. The basis of the production system (yam-based, rice-based, etc.)
b. The cropping or grazing pattern (monoculture, crop association, pasture rotation, etc.)
c. The subject of the problem (nutrition, disease, spacing, etc.)

On-farm experimentation can take two pathways. One pathway is based on spontaneous farmer experimentation. Another pathway is based on researcher-planned experimentation. Researcher planned experimentation moves through a sequence of trials. Farmer management increases as the trial sequence progresses.

Unit II. What Treatments to Test, and Where?

Many different treatments may be possible for a priority problem. Some will be more useful to farmers than others. The amount of land available on each farm can limit the number of treatments. More replications on each farm can also limit the number of treatments. Conversely, more treatments may limit the number of replications possible on each farm. Input from farmers is important in making choices among experimental treatments, control treatments, treatment specifications, and replications.

Unit III. How to Design the Trial to Obtain Analyzable Data?

Farmers' fields and livestock are variable even without experimental treatments. Statistics is a set of techniques for comparing treatment differences against natural variation. Experimental designs allow a team to analyze trial data using statistical techniques. Different designs

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result in different layouts of treatments within each farm, and from one farm to another. The different types of designs each have advantages and disadvantages.

Unit IV. How to Carry Out the Trial?

Dialog with farmers is needed to determine where to place treatments in fields. Timing of planting is critical. Some data gathered from on-farm trials are different from on-station trials. Which data to collect, how to collect it, how to sample, and recording and handling all involve different choices.

Unit V. How to Manage and Administer FSR/E at the Field Level?

There are many commonly encountered management and administrative problems which interfere with the smooth implementation of the FSR/E approach. Recognizing the major areas of problems encountered by field-level practitioners will help in actually implementing a FSR/E approach.

ANALYSIS AND INTERPRETATION OF ON-FARM EXPERIMENTATION

FSR/E TRAINING UNITS: VOLUME III

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VOLUME III: ANALYSIS AND INTERPRETATION OF ON-FARM TRIALS

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VOLUME III: ORGANIZATION OF MANUAL

This volume presents a general framework for analysis and techniques useful for the analysis and interpretation of on-farm experimentation. Analysis does not begin after design. Rather, as the other two volumes have indicated, plans for analysis must begin very early in the process, and continue to guide you through the planning, design and experimentation process. The ultimate success of the alternative technology is its acceptance of and adoption by the farmer. These units provide FSR/E team members with a basic underrstanding of appropriate techniques and of some underlying concepts of diagnosis.

Unit I. A Framework for Analysis

Establishing a framework for analysis requires planning and should be linked closely with the evaluation criteria and the design of the trial. This unit helps the practitioner to focus on choosing specific analytical tools and being able to determine the impact of proposed technologies. The ultimate evaluation is acceptability by farmers.

Unit II. Looking at Data Sets

Being able to assess data sets as a preliminary step in analysis is extremely important. This unit will help practitioners to preview the data, make statistical inferences, and summarize and describe data.

Unit III: Analysis Techniques

There are various techniques for analysis. Which one is appropriate depends on the design used. Interpretation of results includes biological, economic, and social interpretation. Analysis and interpretation help the team and farm households make better decisions for future activities. This unit presents a variety of analysis techniques available to the FSR/E practitioner in detail.

How Systems Work

Farming Systems
Research Symposium
1987: Abstracts

Farming Systems Research Paper Series
Paper No. 14

1987

University of Arkansas
Winrock International Institute for Agricultural Development

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INTRODUCTION

Over the past 7 years, many components that affect the farm family have been researched, identified, and reported. Our knowledge base has been built upon several foundation blocks: the small farm (1981), the field (1982), animals (1983), project implementation and monitoring (1984), methodology and management (1985), and food for humans and feed for animals (1986).

This year's program is a benchmark in the evolution of the Farming Systems Research Symposium. Therefore, now is an appropriate time to review the current body of knowledge that has been generated since the first symposium was held at Kansas State University in 1981. The generation and application of that knowledge has been accomplished by means of the systems approach, which allows characteristics and operations of farming systems research (FSR) to be presented this October at the University of Arkansas at Fayetteville.

This year's program continues to address two traditional areas -- crop systems and crop/livestock systems -- while recognizing three areas that have been identified by FSR researchers and practitioners as key components of the farming system -- agroforestry systems, information and communication systems, and macro systems.

As we look forward to next year's symposium and beyond, the 1988 program will focus on the knowledge base of information and communication systems in agricultural development, while the 1989 symposium will assess the impact of FSR in comparison with other agricultural and rural development strategies.

Abstract Volume

For ease of use by symposium attendees, each abstract of the paper and poster sessions in this volume is arranged by subtheme area according to the day of its presentation, and then arranged alphabetically by authors. Those papers and poster sessions listed under Special Topics will be presented throughout the symposium, according to room availability. All authors' institutional affiliations (at time of research, as well as currently) and addresses are as accurate as possible. There have been minor changes in authorship, and paper and poster titles, between the publication date of this volume, and this week's symposium.

FARMING SYSTEMS RESEARCH PAPER SERIES

Both the abstract and proceedings volumes are part of the Farming Systems Research Paper Series, and are distributed through Kansas State University. The Farming Systems Research (FSR) Paper Series was started at Kansas State University (KSU), with support by the U.S. Agency for International Development Title XII Program Support Grant. The goal of the grant was to increase the university's ability to implement Title XII programs for agricultural and nutritional development assistance in less-developed countries. The series is maintained by the FSR Program Associates -- a multidisciplinary team of professors who are aiming their activities at applied research on farming from a systems perspective.

The purpose of the FSR Paper Series is to disseminate information on FSR. Publication categories include updated bibliographies from KSU's FSR database, proceedings from KSU, and the University of Arkansas' annual farming systems symposia, selected papers presented in KSU's FSR Seminar Series, and selected papers prepared by Kansas State University's Program Associates.

Copies of papers in the series may be obtained from the Distribution Center, Umberger Hall, Kansas State University, Manhattan, Kansas 66506, U.S.A. There is a charge for selected papers and multiple copies to help defray printing costs. (See the following pages for the Farming Systems Research Paper Series -- Order Form.)

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