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Farming Systems Research Group
Michigan State University

The Farming Systems Research Group at Michigan State University, supported by Title XII Strengthening Grant Funds from the U.S. Agency for International Development, and administered by the Institute of International Agriculture, has included Dr. Jay Artis, Department of Sociology; Dr. Robert J. Deans, Department of Animal Science; Dr. Merle Esmay (and Dr. Robert Wilkinson), Department of Agricultural Engineering; Dr. Eric Crawford, Department of Agricultural Economics; Dr. Russell Freed, Department of Crop and Soil Sciences (also representing Horticulture); Dr. Al Pearson, Department of Food Science and Human Nutrition; Dr. Tjaart Schillhorn van Veen, Department of Veterinary Medicine; with Dr. George Axinn, International Studies and Programs and Agricultural Economics, Chair; and Ms. Beverly Fleisher, graduate research assistant.

Issues in Farming Systems Research--an agronomist's perspective

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Farming Systems Research Group - WORKING PAPERS

The papers in this series were prepared during the 1980 - 1981 academic year by members of the Michigan State University Farming Systems Research Group. Papers one through nine were prepared by individual members of the group, after much discussion, and were reviewed by members of the group prior to final revision by the authors. However, each of the papers represents the author's personal perspectives on Farming Systems Research. Each paper is different from the others. All papers are an attempt to answer the following questions:

From the perspective of my discipline - what is Farming Systems Research?

What research has been done in my discipline which relates directly to Farming Systems Research?

What opportunities are there for further research from the perspective of my discipline?

What assistance would scholars from my discipline need from other disciplines in order to carry out Farming Systems Research?

Each individual responded to these questions in his own way. Paper number ten is an attempt to summarize the perspectives of the various disciplines represented, identifying commonalities and differences. Paper eleven sets forth the recommendations of the group for further work in this field at Michigan State University.

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1. What is Farming Systems Research?

Farming systems research is the application of a systematic analysis to agricultural research development, implementation and evaluation. Farming systems research takes a holistic overview of the different component systems which interact with the farm. These component systems include social, technological and political aspects. Farming systems research then is the integration of the research between these three large systems as well as the integration of the research within each large system.

Farming systems research is an administrative tool which is used to direct and evaluate research programs. Farming systems research will serve as the communication link between the systems which operate on the farm. Many of the component systems will do their work independent of the other systems. However, FSR will provide the opportunity for the different systems to exchange information and ideas. This information will then be used to formulate and implement improved research projects.

2. How does Farming Systems Research relate to problem solving in agronomy?

Agricultural development has made some dramatic changes in the last century. It has shifted from the "frontier model", through several other patterns to the "induced innovative model" (Ruttan, 1980). The agronomists have been responsible for much of this change with their introduction of science-based agriculture. Science-based agriculture has brought about some sudden and dramatic changes to the farm scene.

Farming systems research will be used by the agronomists to do three major operations: (1) identification and development of research projects, (2) implementation of research programs, and (3) evaluation of the new technology.

The identification of research priorities is the first thing the agronomist must do in developing a research program. FSR plays a very important role in this process. When the needs of the farmer and society are viewed in their entirety (through FSR), better research programs are formulated. The agronomist will first look at the farmer's present production practices. He will try to understand why the farmer does what he does (Harwood, 1979). The agronomist and the extension worker need to communicate concerning the farmer's condition/needs. The extension agent has the responsibility of understanding the farmer. Some agronomists prefer to have a social scientist involved in this process. The agronomist will then see if there are technologies which can make the system more productive and/or efficient. These new technologies may involve different cultural practices, varieties, cropping patterns, water utilization, fertilizer use, etc.

When considering the implementation of agronomic research the agronomist will participate in building a model which will show how any new technology will interact with other systems on the farm. Are the necessary infra-structures present or if not, can they be built? FSR will allow scientists from other systems to evaluate the potential impact upon their own systems. For example, if it is decided by the political powers that there is an urgent need for an increased grain production by the farmers, the agronomist will develop several possible programs which could possibly solve the problem. The more efficient use of fertilizers and/or new high-yielding varieties are the most common solutions. The agronomist would then get feedback from the other systems (animal, social, economic, harvesting) about what kinds of impact this technology would have. If the new technology is too disruptive to the system then other approaches would have to be formulated.

Farming systems research needs to be conducted on the exreriment station as well as the farmer's fields. Much of the basic research is done on the experiment station while the applied is done on the farmer's field.

Evaluating the consequences of the new technology is done by the agronomist, farmer and other interested persons. The farmer is usually the best judge for new technology, since he is the person who must want and be able to use it (Zandstra, 1979). This phase of research should be the extension phase. Enough evaluation tests have been done so that these tests can also serve as demonstration plots.

When a farming systems research approach is used by the agronomist to improve his research program, the assumption is that the quality of life for the farmer and society will be improved.

3. What have agronomists done in Farming Systems Research?

Several international institutes have had Farming Systems programs (IITA, ICRISAT, and CIAT) while others had cropping systems programs (IRRI, AVRDC). Hildebrand (1976) uses the economist and agronomist approach to farming systems research.

A very good example of FSR work would be the National Rice Research team that was organized in Sri Lanka. There were several groups of scientists which worked on their own systems but interacted with other groups when beneficial. The first group was the resource capability survey group which did agro-ecological mapping. They concentrated on water availability, soils, and climate. This group partitioned the country into different common zones, each zone having major common elements necessary for crop production. This group then selected test sites where agronomic and variety yield tests should be conducted to insure that the major soil types were included in the variety evaluation tests.

The next group of scientists were the cropping systems specialists who determined the most efficient cropping patterns for the various zones. This group also did production research to determine the most viable production procedures. The group included an economist, agronomist and pest management person (Fernando, 1978).

The next group of scientists were the basic scientists who worked in the research institutes and research stations. These scientists generated technology which was used by the cropping systems specialists. The cropping systems specialists interacted with the "basic" scientists to relate specific needs and also familiarize themselves with any new technology.

The farmer was also a very important person on the team. The research scientists had constant communication with the farmers. The researcher also had trials which were managed by the farmer to see if the technology was acceptable.

The extension worker also participated in the research program. Extension-Research dialogues were held regularly. Joint field inspections to check for problems were also made. The communication link helped to formulate the research priorities as well as to keep the extension worker informed about any new technologies which were being generated.

4. Generalizations about farming systems and agronomists.

"If present trends continue, the world in 2000 will be more crowded, more polluted, less stable ecologically, and more vulnerable to disruption than the world we live in now. Serious stresses involving population, resources, and environment are clearly visable ahead. Despite greater material output, the world's people will be poorer im many ways than they are today." This would be a concise summary of the Global 2000 Study.

Agronomists have been very active in producing new technologies which have benefited society (Everson, 1974; Ruttan, 1977). Their

participation in international agricultural development has also been significant (Brady, 1979; Herdt, 1979). Plant breeders have changed plant architecture and raised yield levels dramatically (Coyne, 1980; Evans, 1980; Johnson, 1980). Despite the progress made by agronomists in the last 40 years, the major hurdle still remains, developing the agriculture of the developing countries.

Farming systems research may help solve some of the problems which need to be corrected if agriculture is going to improve in the developing world. FSR recognized that the problems are social, political and technological and all three areas must be addressed if progress is to be made.

5. What other disciplines are needed to carry out better research?

Plant breeding has always leaned heavily on other disciplines to formulate breeding programs. The disciplines in the plant sciences (entomology, pathology) have been the most important but many programs include other disciplines (chemistry, nutrition, ag engineering, etc.). The economists and sociologists/anthropologists have not been heavily involved in program development but they do get involved in program evaluation. The social scientists are needed to help understand the farmer. How will he accept technological change?

The marketing of agricultural products is a major problem to increased food production. Incentives are also needed to encourage the farmer to produce more.

Farming systems research and interdisciplinary research are often used together. The Nobel Laureate Theodore Schultz called interdisciplinary research as "weak on theory and soft in the quality of research which gets done." Interdisciplinary research may be difficult to manage but interdisciplinary communication can function as the needed ingredient to combine the knowledge of the different fields which are needed to solve our agricultural problems.

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