CARIBBEAN FOOD CROPS SOCIETY

Sociedad Caribeña de Cultivos Alimenticios
Association Caraïbe des Plantes Alimentaires

Vol. XX

PROCEEDINGS

OF THE 20th ANNUAL MEETING – ST. CROIX, U.S. VIRGIN ISLANDS – OCTOBER 21-26, 1984

Published by
THE EASTERN CARIBBEAN CENTER, COLLEGE OF THE VIRGIN ISLANDS *and* THE CARIBBEAN FOOD CROPS SOCIETY

Farming Systems: An Effective Methodology for Rapid Agricultural Change

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Farming systems tesearch/extension (FSR/E) embodies a systematic methodology beginning with problem identification and ending with dissemination of appropriate technology. Farming systems research (FSR) is a relatively recent approach dating back to the early 1970's (Collinson, 1972; Ruthenberg, 1971). Work initiated at ICTA in 1973 represents one of the first attempts to institutionalize FSR/E (Hildebrand, 1981). During the past 10 years, this methodology was more fully conceptualized and put into practice. Importation reductions were achieved for corn, beans, rice, and sorghum, with beans now an export crop. These results were achieved through application of FSR/E methodology with a focus on small-farm producers. Based on the farming systems methodology developed in Guatemala, the University of Florida initiated a FSR/E pilot program in 1981. The program is directed at technology generation for small farmers of north Florida and has emphasized improved grain and forage systems. On-farm reserach has proven critical in rapid problem identification and solution testing and is key to strengthening the farmer-extension-research connection.
Keywords: FSR/E; Farming Systems Research/Extension; On-farm Research; Farming Systems.

A farming system represents a synthesis of interpretations by the farm unit members of the biophysical and socio-economic environment in which they operate. To survive in a dynamic environment, the farm unit members must adopt new innovations. For adoption to occur, any new innovation or technology must be perceived by the farm unit members to be appropriate (French and Schmidt, 1984). In response to the recognized need for institutional change to meet the growing farmer demand for appropriate technology, the farming systems research/extension (FSR/E) approach was born.

The primary objective of FSR/E is to accelerate the process of technology generation and testing to final adoption. This is achieved by establishing a multi-disciplinary team approach between farmets, extensionist and researchers. In essence, the success of the FSR/E is a result of its client-oriented focus.

Florida and ICTA Programs

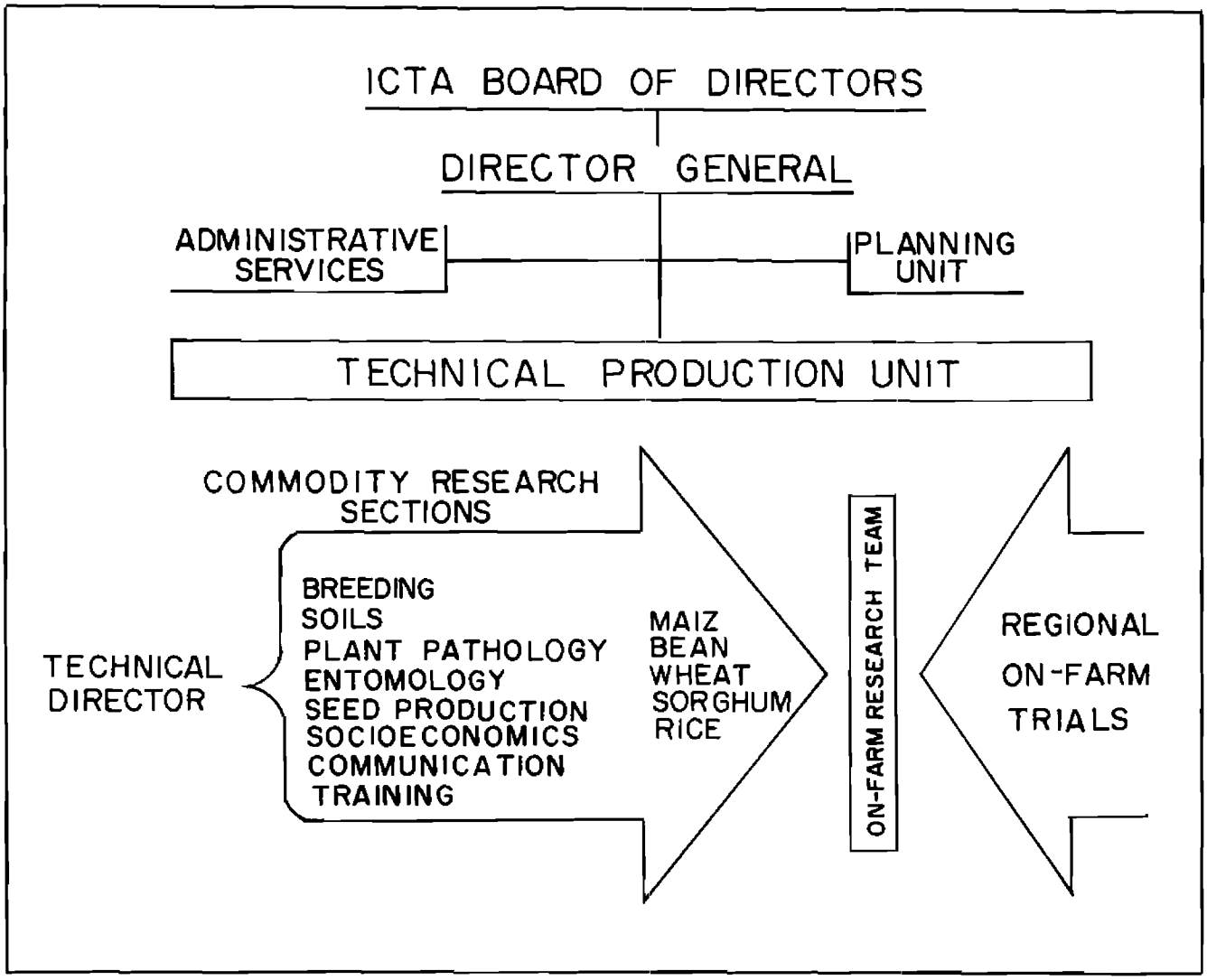
FSR/E has been employed since rhe early 1970's in Latin America, Asia, Africa and more recently in the United States (Collinson, 1972; Ruthenberg, 1971; Hildebrand, 1982; Schmidt, ed., 1984). In Latin America, FSR/E had its beginning in Guatemala at Instituto de Ciencia y Tecnologia Agricola (ICTA) in 1973 (Ministerio de Agricultura, 1971). The University of Florida (U. of F.) small farm oriented FSR/E program, initiated in 1981, has direct lineage to the Guatemala ICTA program (Schmidt ed., 1984). The development of the U. of F. FSR/E program was based on many of the concepts derived at ICTA. The organizational diagtam of ICTA (Fig. 1) embodies a basic underlying ptinciple of FSR/E, *i.e.*, the researcher/on-farm connection. The research orientation taken by the ICTA commodity researcher gtoup in maize, beans, wheat, rice and sorghum, is greatly influenced by the on-farm research teams. The flow of technology moves ftom the commodity tesearchers to the farmers through rhe on-farm research teams for validation and possible disseminarion.

ICTA opened its doors in 1973. It was organized specifically to bring about yield increases of the five basic food commodities. It functioned somewhat as a private enterprise, gearing its operation and budget to produce appropriate technology in the most efficient manner. It differed from the U.S. university land grant system, having no academic/educational function, having no traditional extension service and having a direcred research effort operating from a broad institutional team approach.

The Florida FSR/E program operates similarly to that of ICTA with a team of university faculty and staff members from the main campus and the reguion working to solve specific identified problems. This cadre of research and extension oriented persons make up the equivalent of the ICTA model, technical production unit.

In Florida, a regional scheme has been proposed for incorporating FSR/E concepts and methodology into the existing institutional structure (Fig. 2). The research station serves as the pivor point for rhe region, charged with the principle funcrion of carrying out research priorities established by the regional advisory group. Station facilities, equipment and personnel would be used to conduct research on-station and on-farm in the surrounding counties that make up rhe region. The core staff is responsible for regional day-to-day on-farm and on-station research operations. The core staff, based at the Agricultural Research and Education Center, would be made up of the regional FSR/E coordinator, regional specialty agents and FSR/E field support personnel. Farmers and extension have direct input into establishing research priorities through the regional advisory group and participate in specific research and extension activities. By design, the Florida organizational scheme establishes an integration of existing institutional entities, formalizing a closer marriage with the farmer in order to effectively and rapidly react to farmer felt needs.

FIG. 1. Organizational scheme for the Instituto de Ciencia y Tecnologia Agricola (ICTA), Guatemala.



FSR/E Approach

In many countries, research and extension are separate entitites with little or no communication between them. Often, research is confined to the experiment stations and the researchers have little contact with farmers. Under such an organizational scheme there is a lower probability that research priorities are specific to farmer need. Research results produced solely under station conditions are handed to extension with the expectation that diffusion and adoption will naturally occur. This may or may not be true.

FSR/E embodies a holistic, interdisciplinary approach designed to accurately and rapidly:

1. identify specific problems faced by the farm clientele;
2. develop alternative and systemic solutions to those problems;
3. test the alternative solutions under farm conditions;
4. evaluate acceptability of selected solutions; and
5. disseminate appropriate technology (Hildebrand, 1982; French and Schmidt, 1984).

These five steps are achieved through the close interaction of farmers, extension agents and researchers working as a team. This farm oriented team approach is the underlying concept by which FSR/E operates.

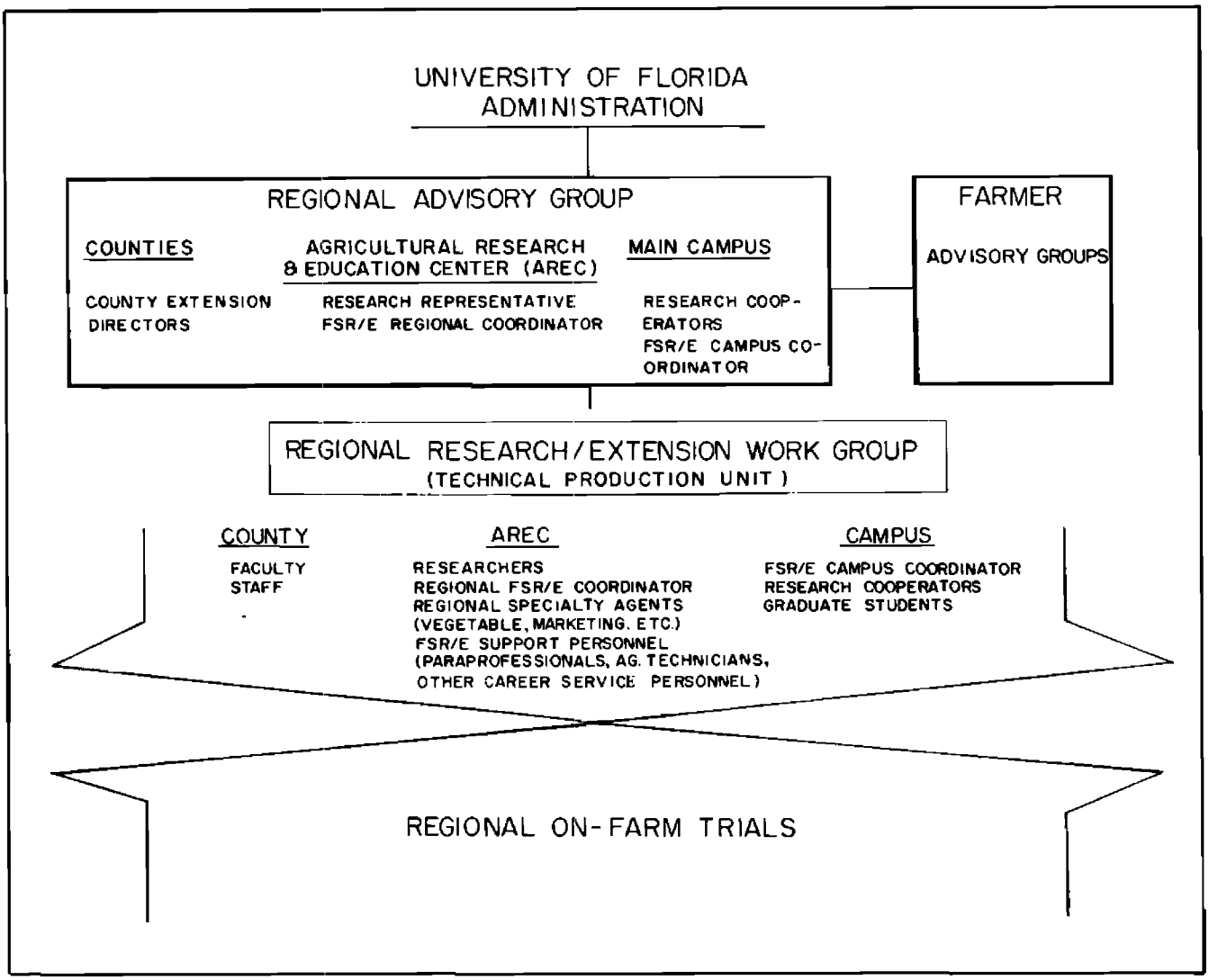
The interactive team approach provides a recognized organizational form which focuses on farmer problems from a systemic perspective. In compliance with the methodology, traditional component or commodity research represented by station research is directed toward a holistic view of the total environment with an applied orientation. Emphasis placed on problem identification, and technology verification at the farm level forms the foundation for rapid generation and dissemination of appropriate technology.

On-Farm Testing

On-farm technology validation is key to the rapid development of appropriate technology. The importance of on-farm testing can be illustrated by ranking, from low to high, the average yields of a particular variable or set of variables measured in on-farm and on-station tests. These average yields make up the range of environmental index (Hildebrand, 1984). In many instances the research station ranks at the high end of the environmental range (perhaps good soil, irrigation, fertility management, etc.), attaining the highest yield average.

When testing a selected group of corn cultivars for example, one would find that the locally grown corn cultivar will produce something even under the low environments, while the composite or "improved" cultivats require good growing conditions, *i.e.*, high environmental index. The only way to attain this type of specific information is through testing at several farm sites as

FIG. 2. Organizational scheme for FSR/E Program Regional Approach, University of Florida, USA.



well as on the station, *i.e.*, the entite tange of environments.

This type of information is absolutely essential for understanding the recommendation domain of a technology, be it a corn cultivar or other recommendation. In this example, it was clear that information diffusion of rhe new corn cultivar should be restricted to areas characterized by a high environmental index. The time period required to gathet such data is relatively short, but the results provide a firm basis for making sound recommendations, which also reinforces institutional credibility with the farmer.

In Florida rhe FSR/E work has been carried out in a designed fashion both on-farm and on-station. Duting the three and a half years rhe program has operated, this work has tesulted in the generation and validation of technology in various areas which range from improved information diffusion to grazing of early maturing wheat, establishment and overseeding of perennial peanur, fertility recommendations on wheat and others. The focus of rhis work has always been to meet the needs of rhe farm family within their environment and do it tapidly.

FSR/E Success

In contrast to the U.S., Guatemala and many other nations have one overriding but simple national agricultural policy, thar is, to increase food production. ICTA has the charge of increasing Guatemala production of corn, beans, tice, and sorghum. Ten years after its beginning, ICTA can boast of achieving most of its goals and more by attaining self-sufficiency in corn and beans, with surplus bean production for export (Table 1). This formidable task was carried out in a relatively short period of time in a designed program of on-sration and on-farm technology generation and validation. This effective and rapid means of achieving technology generation, validation and diffusion has come to be called Farming Systems Research/Exrension.

TABLE 1. Guatemala average national yield of corn, beans, rice and sorghum for 1973 and 1984.

	Before ICTA Yield (kg/ha)	Goals Yield (kg/ha)	Today Yield (kg/ha)
Corn	1,156	1,450	1,636
Beans	724	769	986
Rice	2,136	3,600	2,850
Sorghum	936	1,344	2,080

Source: El departamento de Investigaciones Agropecuarias Industriales.

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