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Centro Internacional de Agricultura Tropical

SMALL FARM SYSTEMS PROGRAM

A PROGRAM DOCUMENT

CIAT
BIBLIOTECA

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David L. Franklin

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Grant M. Scobie

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Small Farm Systems Program

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1. INTRODUCTION

Among CIAT's stated goals are to increase the quantity and quality of food for rural and urban people in tropical Latin America, and to improve the general living conditions of rural people, through the introduction of improved technology and the use of more efficient agricultural practices. The fact that these goals are essentially yet to be achieved for most small farmers, has led CIAT and its collaborators to ask the following questions: How does one go about adjusting and modifying traditional farming systems? Is there a general process which can be applied?

These issues were the focus of an earlier document entitled, The Agricultural Systems Program: A Course of Action. From the discussion of these issues the Small Farm Systems Program * has evolved, for which an underlying philosophy, a methodological approach and a near term program of activities are presented in this document.

The present document reflects the planning and thinking of the Small Farm Systems Program during 1973. It incorporates philosophies, principles, ideas and suggested strategies that were presented in a four day Planning Symposium that the Program sponsored in October 1973. It endeavours to capture the essential elements of the suggestions arising from discussions and consultations that have taken place with foundations, national and international agencies, commodity programs within CIAT, individual researchers and farmers.

* For reasons that will become obvious in this document, the Agricultural Systems Program has been renamed the Small Farm Systems Program..

During 1973, the Small Farm Systems Team has solicited guidance and assistance from a wide range of institutions and individuals. It is the earnest wish of the Team that full acknowledgement of these contributions will stem from the successful execution of the Plan of Activities focused on developing a process for improving the well-being of farm families in tropical Latin America.

The Plan of Activities, which is presented in detail in Part V of this document, has been designed to ensure the development of a systematic approach to the understanding of existing farming systems, and to provide immediate backing to the two primary clients of the Program; the national agencies concerned with rural development and the commodity programs within CIAT. The Team proposes to collaborate with (a) the Instituto Colombiano Agropecuario and the Instituto de Ciencia y Tecnología Agrícola in Guatemala in their efforts to design and implement new agricultural technology; and (b) the Swine Program and the Llanos Family Ranch Unit Project of CIAT, where the problems of the successful introduction of new technology to improve the welfare of the small farm family and others dependent on agriculture will be analyzed.

II. BACKGROUND AND PHILOSOPHY

The agricultural development of tropical Latin America has been essentially dualistic. While no attempt will be made here to undertake a detailed analysis of this phenomenon, some understanding is required to establish the subsequent proposed Plan of Activities.

The fundamental characteristic of Latin American agriculture at this moment is the simultaneous existence of a limited but highly commercialized

farming sector on one hand, and a numerically large sector of small family farm units which operate at a near subsistence level on the other. These latter units will be referred to as "small farms", the essential features of which are that a generally small proportion of the total production currently enters the market, and that the principal source of labor is the farm family.

The commercial farming sector is typically located in the more favorable ecological regions, and is principally oriented toward the production of export crops (e.g. coffee, cotton, sugar, bananas) and/or to high value crops (including large commercial extensions of cereals and grain legumes). These relatively large, capital intensive holdings have had access to new agricultural methods, technical assistance, credit, agro-chemicals, markets and transportation.

This dichotomized situation has come about as a result of public policies; partly because of their export orientation (together with greater political influence), the large commercial farming enterprises have benefitted from favorable governmental policies with respect to research, extension, and product and input prices. These policies were motivated by the need for expanded food production and export earnings, both of which were to be generated by concentration on the commercial farm sector. The increased foreign exchange earnings so created, would then be applied to the importation of capital goods to expand the industrial base. Through this, employment opportunities in the non-farm sector would be enhanced, absorbing the excess labor from agriculture. These policies stem in part from the desire to apply the pattern of development in Western Europe and North America, where apparently high rates of economic growth were associated with rapid industrialization and a declining

proportion of the work-force in agriculture.

While these policies have achieved some measure of success (e.g. in Mexico and Brazil), the economic and social consequences for the remainder of the agricultural sector must be looked at more closely. Here, exist a large number of small farms whose productivity has changed little, if at all. Levels of income, nutrition, health, housing and schooling lag far behind those of the commercial farm sector and much of the urban population. This sector is principally (although not exclusively) concentrated in the less favorable ecological areas, with limited access to transportation, storage, input supplies and credit.

While the percentage of the total population in agriculture has been declining, absolute numbers continue to rise. It is now evident that the non-farm sector in most countries cannot bear the full load of absorbing an expanding workforce. The consequence of this is that given an annual population growth of 2.5% to 3.0%, and a growth of non-farm employment of say 1.5%, the rural sector, while declining proportionally, will have to absorb more workers for many years ahead. Part of this increase will be absorbed in the commercial farm sector; but by far the greatest portion will face the alternatives of either migration to urban areas with little or no employment prospects and an existence in abject poverty, or subsistence in agriculture. Until now, economic growth in the agricultural sector has virtually by-passed millions of rural families. Their land and labor productivity, their production, income and nutritional levels have at best been static.

Development efforts were initially concentrated on investments in public infrastructure with the expectation that economic growth of private farms

would follow as a natural consequence. It is now obvious that the problem is much more complex than this policy would suggest. Subsequently, efforts were made to increase the production and dissemination of agricultural technology. While there have been indisputable gains, it still remains that the majority of farm families have been untouched. Within close proximity of any major center of agricultural research (often a few miles) there are hundreds of small farms whose production methods and family incomes have been totally unaffected.

For a time, attempts to rationalize this situation involved arguments that traditional, small-scale farmers were conservative, and because they were ill-educated, lacked the ability or motivation to adopt new methods. Today this reasoning finds little support. The reality is that the small farmer has had few if any profitable agricultural opportunities. Like any other decision-maker, he responds to the set of rewards and penalties he perceives. Through long experience he has evolved farming systems that are often near optimal for the economic, political and ecological environment in which he operates. This essential rationality of the small farmer implies that successful agricultural development requires new production alternatives that are adapted to his environment, that increase his income, that recognize the risky nature of his decision problems, and that fall within the availability of input supplies and stable markets.

Lack of funds for agricultural research, a shortage of trained extension workers, inadequacies of credit, transportation and marketing facilities all are offered as explanations for the failure to have achieved a significant impact on small farms. However, these are secondary considerations. The prime cause

has been the lack of profitable alternatives open to the small farmer. Where these alternatives have existed, there is ample evidence of their rapid adoption (e.g. rice in Asia and Latin America, and wheat in Mexico, the Near East and the Indian Subcontinent).

National goals of expanded food production and employment opportunities are not incompatible with efforts to promote economic growth among small farmers.

In fact, small farms are an important source of food production in many countries. In Guatemala, for example, 84% of the farmers each have less than 7 hectares. They occupy 17% of the land in use, yet produce close to 60% of the basic grains (wheat, rice, beans, maize and sorghum).

Heightened political awareness of the importance and potential of the small farm is evident in many countries (e.g. Colombia, Guatemala, Mexico). International institutions are giving greater emphasis to the social consequences of capital grants, loans and technical assistance. The greatly expanded agricultural loan program of the World Bank planned for the next five years, carries a firm commitment to focus on small farms. The concern of national and international agencies with human nutrition is further evidence that social implications are assuming greater importance. We cannot assume that expanded agricultural research and extension efforts will automatically lead to improved rural welfare. The historical performance of the small farm sector demands a new approach.

III. A SYSTEMS APPROACH

Traditionally, scientific endeavor has concentrated on separating parts of a complex whole, and studying them in detail. This approach was deemed

essential and desirable, because no one researcher could hope to understand all the complexities of a total problem area. Specialization became the hallmark of scientific training and research. By achieving a detailed understanding of component parts, it was hoped that the subsequent integration of these independent solutions would provide an answer to the overall problem. In the context of agricultural research we have breeders, soil chemists, microbiologists, animal scientists, economists, and sociologists among others, each pursuing essentially independent studies using increasingly sophisticated methodologies.

In recent years, this independent "disciplinary" orientation has been gradually giving way to a "problem" orientation. The Systems Approach to problem solving represents a view that transcends disciplinary boundaries. The performance of a "whole" which is made up of many inter-related parts cannot be assessed in relation to the performance of any, or even all of the parts taken individually. It is the performance of the whole that is of interest. Isolated investigation of parts does not form an adequate basis for understanding the complex whole. For example, the use of research resources to develop a high yielding maize production technology does not necessarily assure that this will have a desirable effect on any measure of performance of the family farm (e.g. income or nutrition).

The implication is that we require interdisciplinary teams, each member having both an appreciation of the role of others and a clear perspective of how his contributions will aid in the resolution of the overall problem. Already in CIAT, there is a strong integrated commodity team focus, in which integrated teams work together for achieving goals related to Commodity Production Systems. The evolution of the Small Farm Systems Program is a natural

consequence of the need to integrate the efforts of the individual Commodity Production Systems Programs in the context of the whole farm unit.

The Small Farm Systems Program is a research activity of CIAT, charged with understanding the great diversity of farming systems in tropical Latin America. Because CIAT is concerned with the improvement of agriculture and rural life, the Small Farm Systems Program is concerned with family farms as integrated systems. Because of the diversity and complexity of small scale farming in Latin America, it is possible for the single commodity focus to isolate the researcher from the small farmer. The Small Farm Systems Program is concerned with small scale farming in all its complexity and is focused on the farm family. Its primary goal is to develop a process for the identification and analysis of existing farm systems so as to facilitate the rapid application of agricultural technology in the development of rural areas.

An essential element of the systems approach is the recognition that this family farm system is really a system within the larger agricultural sector. The focal system is one in which the farm family, and others living on the farm, assemble individual enterprises into a production, consumption, and a marketing system, and in which biological and physical factors interact with social, political and economic systems. The explicit recognition of the importance of these interactions is a key part of the methodological approach towards the development of a process for identification, analysis and facilitation of technological change on small farms.

Two higher level systems are also involved in the analysis of small farms. These include: a) the institutions in the public agricultural sector (and the related sectors of health and education); and b) the planning and economic

policy institutions at the national level. Both of these can have important interactions with the central system of interest (see Figure 1). For example, if successful adoption of new technology involves a higher input of fertilizer, then the policy of the public agricultural sector toward fertilizer supply is immediately involved. Is the additional fertilizer available? From what source? At what price? Is this fertilizer price likely to remain stable? Will it be partly obtained by diverting supplies from the commercial farm sector? At the national level such issues as exchange rate policy, and taxes and subsidies on imports and exports can have major influences on the development of the rural sector. A methodology that explicitly recognizes the role of these higher level systems will afford the opportunity to identify bottlenecks at whatever level they occur, and to specify the constraints imposed by these external systems on the performance of small farm systems.

The systems approach involves specifying the inputs to the small farm system from these external systems. By understanding and defining the behavior over time of the farm system as a function of its input and output relationships with the external systems, it is possible to identify feasible agricultural technologies required to stimulate changes in the performance of family farm systems. Furthermore, if the objectives of the farm family can be identified and documented, and if public policy objectives can be defined, it is then possible to select those technological alternatives which are "best" suited to meet these objectives. It is also possible to evaluate the benefit (with respect to the stated objectives) of changing the constraints imposed on the small farm by its input and output relationships with the external systems.

For example, it becomes possible to judge between the alternatives of

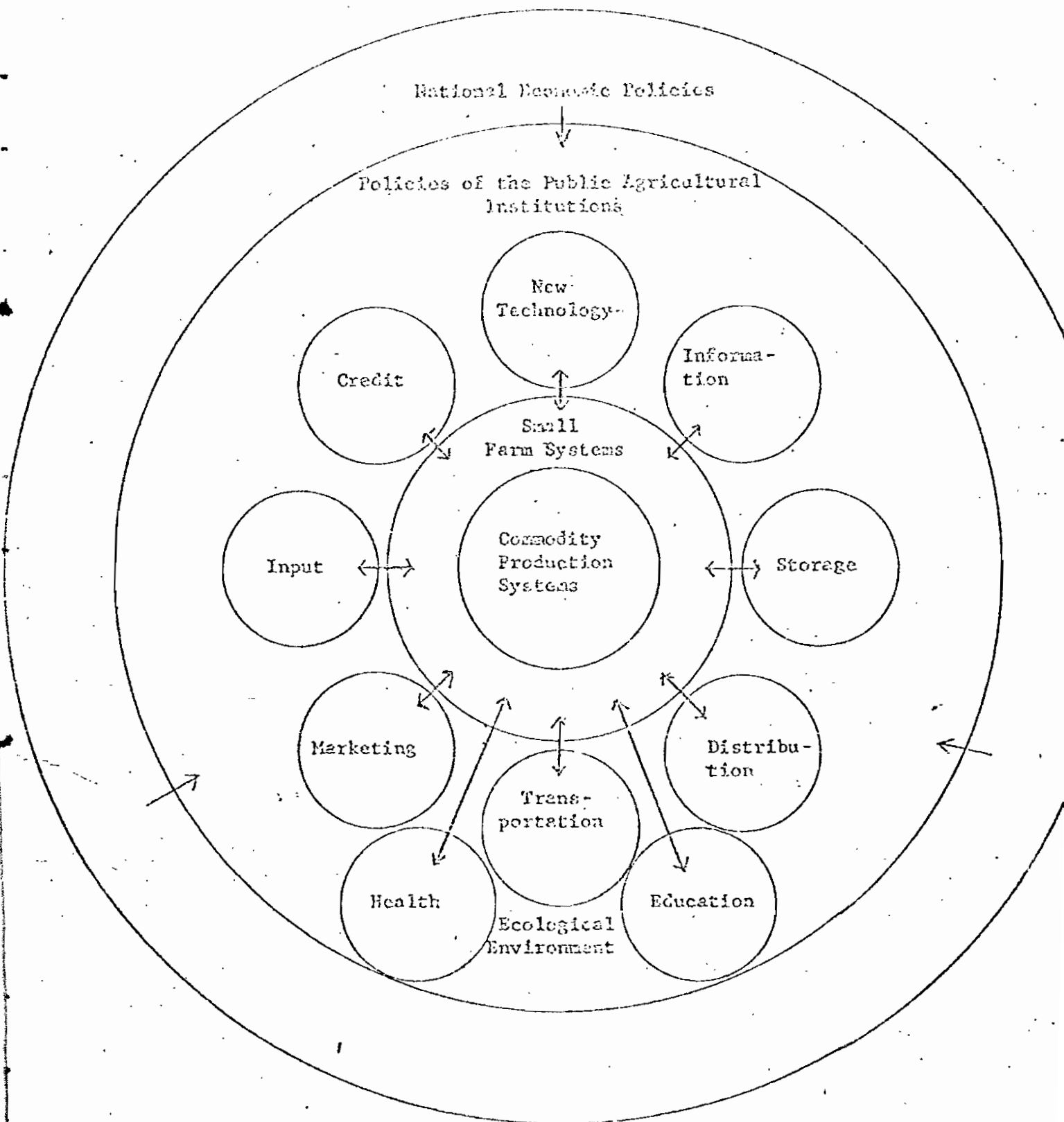


FIGURE 1: A Schematic Representation of the Small Farm System

research, extension and production of improved seeds versus the alternative of restructuring the pricing, storage and marketing system. This selection among alternatives must consider both farm family objectives and society's food production goals.

An intrinsic feature of the systems approach is that it requires the system objectives to be made explicit. For the farm family these objectives probably include income, nutrition, cash flow, security, health, and education. There is as yet no clear understanding of these objectives. In addition, public policy goals are frequently not made explicit. Agricultural research has thus had to strive towards ambiguous objectives or goals which are at best centered on producing "good" technology.

Much research effort will be misdirected unless there is a clear specification of the problem so that objectives are not confused with the activities that can be undertaken to achieve those objectives. The true objective of an effort to promote agricultural development is usually not to raise the yield per unit of land of a given crop (a measure of "goodness" of the technology). There presumably exists some real objective such as improved income or nutrition for producers and/or less expensive diets for consumers, although increasing yields is usually one of a number of alternative activities that can be undertaken to achieve the true objective.

IV. THE DEVELOPMENT OF A PROCESS

Explicit in the stated goal of the program is the need to develop a process for: a) the identification of farming systems and b) the analysis of farming systems.

From the understanding of the rationale of existing systems, the requirements for the introduction of agricultural technology to help achieve farm family and public policy objectives will be specified. A scheme for the development of this process is as follows:

1. Analysis of family farming systems.

In this phase, a number of prototypical systems in tropical Latin America will be studied by the Small Farm Systems Team.

Using the structure of inputs, outputs and states (and their variations over time); these systems will be described in relation to how the farm family transforms its resources of time, land, energy, crop and animal species, information, etc. to achieve its explicit objectives in the context of the ecological, cultural, economic and political environment.

2. Synthesis of prototypical farming systems.

The insights derived from the analysis will be tested both on a component basis and a systems basis. If the understanding of the farm system is correct, the insights will be useful in creating physical and analytical models of prototypical farming systems and their components (as will be done in the Colombian Llanos in collaboration with the Beef Team). These prototypes will help to predict the impact of new technology.

3. Design of Improved Agricultural Systems Technology.

The analysis and synthesis phases will produce the requisite information to specify the technology which is feasible for introduction into small farms in order to better achieve farm family and national food production goals. The knowledge gained in earlier phases will permit the biological scientist on the team (working with CIAT's commodity teams and the production teams of

the national agencies) to select or specify the cultural practices, the species mixes, the levels of inputs, etc. to be tested for potential introduction to the family farm. Depending on the level of technological innovation required, these technology alternatives would be tested on experiment stations or on family farms. An important feature of the process is that the consequences of adoption of technology will be studied simultaneously by other scientists on the team through the use of analytical models.

4. Validation of the Process.

The process will be validated by demonstrating that: a) farm families in selected areas of study achieve their objectives through the use of the technology selected by the process, and b) national agencies adopt the process as a tool to help them achieve their goals.

5. Implementation.

Implementation of the process is a role of national agencies. CIAT will collaborate with them in the development of new technology, and in training for the application of the process.

6. Evaluation.

An important task for the team will be to develop methodology for evaluating the impact of new technology on human welfare. In addition, it is envisaged that CIAT will serve as a focus for the documentation and analysis of national program experiences in agricultural development.

In summary, the process will provide guidelines for identifying limiting factors and selecting research alternatives. It will provide a framework for assessing the probable adoption of research results and the impact on food availability and incomes of that adoption. It will suggest alternative ways of achie

ing explicitly stated objectives. Being dynamic it will be useful in the planning and analysis of multiple cropping systems, timing of new investments (e.g. pasture establishment) and sequencing the introduction of new technology.

In the execution of these phases the Small Farm Systems Program will provide analytical support and information to its two principal clients and collaborators; CIAT commodity teams and national agricultural development agencies. When the process is developed it will be valuable as a planning and evaluation tool for these clients and for international agricultural development agencies. The ultimate clients are, of course, farm families and the consumers of Latin America that benefit from the implementation of the process by national agencies.

V. PLAN OF ACTIVITIES

To execute the scheme for process development the Small Farm Systems Program will commence operations in 1974 with collaborative action research with CIAT commodity programs, the Instituto Colombiano Agropecuario (ICA) and the Production Program of the Instituto de Ciencia y Tecnología Agrícola in Guatemala. Collaborative arrangements (which are being finalized) will be used to develop the various phases of the process development as follows:

1. Action Research with CIAT Commodity Teams.

a) The Llanos Family Ranch Project of the Beef Team.

The Small Farm Systems Team will join in all aspects of the execution of this project which in general falls in the synthesis phase, outlined above. A prototypical small family ranch is being established by the Beef Production Systems Team to test the impact of new technology. The Small Farm Systems

Team will participate in the development of an analytical model for studying the impact of various investment strategies and the impact of technological introductions. The model will permit a comparison of the payoff to alternative research strategies; for example, introduction of improved pasture species could be compared with new methods of nutritional supplementation. The program will collaborate with the Beef Team's economists in setting up an evaluation system for this project. The specific objective to be achieved by the Small Farm Systems Team is an analytical model of the prototype under test.

b) Swine Production Project on the North Coast of Colombia.

The program will collaborate with the Swine Production Systems Program in the analysis of its on-going project in Cacaotal. Efforts will be directed at describing and documenting the rationale of existing systems, so as to assist the Swine Program in evaluating the impact of introduced technology. The specific objective is a description of existing systems as a basis for planning future action.

2. Collaboration with National Agencies.

a) Instituto Colombiano Agropecuario.

In conjunction with the International Development Research Centre and others, the program will collaborate in the analysis of various base line data sets generated by the Institute's rural development projects. These analyses will identify nodal farms for various regions in Colombia. Some regions will be selected for in-situ analysis as contemplated by the process development schema. The program may be asked to participate in the development of methodology for the evaluation of on-going rural development programs. The specific objectives to be achieved are: a methodology for describing nodal farms and

a methodology for the evaluation of achievements of near term goals of rural development projects.

- b) Production Program of the Instituto de Ciencia y Tecnología Agrícola, Guatemala.

In collaboration with CIAT Outreach and the Bean and Maize Programs, the program will participate in the development of ICTA's Production Programs. The team will collaborate in the use of research designs for field experiments. These experiments will be used to develop optimum production formulas for basic grain crops in at least three regions of Guatemala. The production functions produced by these experiments will be optimized with respect to the limited availability of inputs and credit, and the risks of drought. With the collaboration of the CIAT Bean and Maize Programs, basic agronomic research will be directed at understanding various systems of bean and maize associations. With ICTA management, the program will participate in the development of planning and evaluation systems. At the institutional level the program will study credit, input delivery and marketing systems to quantify the relation of these to prototypical farming systems. The specific objective is to demonstrate the application of the methodology through an action program of a national agency.

3. Overview of Latin American Small Scale Agriculture.

Visits to selected national agencies in Peru, Bolivia, Ecuador, Brazil, and Central America will be undertaken with the specific objective of reviewing the broader applicability of the CIAT Small Farm Systems approach to rural development in tropical Latin America.

4. Training Programs.

The program will participate in training in production economics and in

experiential methods for production program research through the production specialists program with the specific objective of introducing the Small Farm Systems Program methodology to the peasants.

5. International Agency Briefing.

The program will host a briefing for the various agencies interested in Latin American Agricultural Development with the specific objectives of informing them of the first year's results of the Program and to seek their counsel in the development of the Program, and in collaborative efforts.

6. CIAT Small Farm Systems Brochure.

The program will publish a brochure to describe its focus, goals, scope and activities.

SMALL FARM SYSTEMS PROGRAM

BUDGET 1974

<u>Category</u>	<u>Systems Engineering</u>	<u>Sociology and Anthropology</u>	<u>Agonomy</u>	<u>Economics</u>
Senior Staff	(.5) 17.270	(1) 5.000 ^{a/}	(1) 34.530	(1) 25.012
Research Associates	-	(2) 12.530	(1) 7.936	(2) 15.375
Research Assistants	(1) 5.683	(1) 6.285	(1) 5.683	(1) 5.683
Secretaries	(1) 5.000	(1) 4.719	(1) 4.600	9.760
Special Resources	-	(0.5) 10.000	-	2.750
TOTAL PERSONNEL	27.953	38.574	52.758	58.500
Supplies	500	4.000	3.000	2.226
Services	-	1.000	2.000	3.180
Travel	2.500	10.000	5.000	5.300
TOTAL OTHER EXPENSES	3.000	15.000	10.000	10.706
GRAND TOTAL	30.953	53.574	62.758	69.256

a/ Special Project Funding

b/ One Research Associate position to be transferred to Systems Engineering for 1974.

SMALL FARM SYSTEMS PROGRAM - Senior Staffing *

1976 - 1979

Specialist	1976		1977		1978		1977		1978		1979	
	Co	Sp	Co	Sp	Co	Sp	Co	Sp	Co	Sp	Co	Sp
Systems Engineer	.5	-	1.0	-	1.0	-	1.0	-	1.0	-	1.0	-
Sociologist	-	.75	-	1.0	-	1.0	-	1.0	-	1.0	-	1.0
Anthropologist	.5	-	-	-	-	1.0	-	1.0	-	1.0	-	1.0
Agronomists												
Production	.75	-	1.0	-	1.0	1.0	1.0	2.0	1.0	2.0	1.0	2.0
Protection	-	-	.5	-	1.0	-	1.0	-	1.0	-	1.0	-
Economists	1.0	-	1.0	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Animal Scientists	-	-	.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Agr. Engineer	-	-	-	1.0	-	1.0	-	1.0	-	1.0	-	1.0
Nutritionist	-	-	-	1.0	-	1.0	-	1.0	-	1.0	-	1.0
	2.75	.75	4.0	4.0	5.0	7.0	5.0	8.0	5.0	8.0	5.0	8.0

* Co indicates core funding, while Sp indicates special funding

SIGNAL PLUM SYSTEMS PROGRAM - Support Staff *

1974 - 1979

Specialty	1974	1975	1976	1977	1978	1979
Systems Engineering	1.0	3.0	3.0	3.0	3.0	3.0
Anthropology	2.0	2.0	2.0	2.0	2.0	2.0
Sociology	1.0	1.0	1.0	1.0	1.0	1.0
Agronomy	2.0	4.0	4.0	4.0	4.0	4.0
Economics	3.0	3.0	4.0	4.0	4.0	4.0
Animal Science	0.0	0.0	2.0	2.0	2.0	2.0
TOTAL	9.0	13.0	16.0	16.0	16.0	16.0

* Research Associates and Research Assistants.