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IICA
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SOCIAL SCIENCES AND AGRICULTURAL RESEARCH
A Systems Approach

AREA OF CONCENTRATION II
SCIENCE AND TECHNOLOGY, NATURAL RESOURCES AND AGRICULTURAL PRODUCTION

WHAT IS IICA?

The Inter-American Institute for Cooperation on Agriculture (IICA) is the specialized agency for agriculture of the inter-American system. The Institute was founded on October 7, 1942, when the Council of Directors of the Pan American Union approved the creation of the Inter-American Institute of Agricultural Sciences, to be headquartered in Costa Rica.

IICA was founded as an institution for agricultural research and graduate training in tropical agriculture. In response to changing needs in the Americas, the Institute gradually evolved into an agency for technical cooperation in the field of agriculture. These changes were officially recognized through the ratification of a new Convention on December 8, 1980. The Institute's purposes under the new Convention are to encourage, facilitate and support cooperation among its Member States so as to promote agricultural development and rural well-being.

The Member States participate directly in the Inter-American Board of Agriculture (IABA) and the Executive Committee, the Institute's governing bodies, which issue the policy guidelines executed by the General Directorate. Today, IICA has a geographic reach that allows it to respond to needs for technical cooperation in the countries, through its Technical Cooperation Agencies and five Regional Centers, which coordinate the implementation of strategies tailored to the needs of each region.

The participation and support of the Member States and the relations IICA maintains with its Permanent Observers and numerous international organizations provide IICA with channels to direct its human and financial resources in support of agricultural development throughout the Americas.

The 1994-1998 Medium Term Plan (MTP) provides the strategic framework for orienting IICA's actions during this four-year period. **Its general objective is to support the efforts of the Member States in achieving sustainable agricultural development, within the framework of hemispheric integration and as a contribution to human development in rural areas.** The Institute's work is aimed at making changes in three aspects of agriculture: production, trade and institutions, using an integrated approach to development which is based on sustainability, equity and competitiveness. IICA carries out its technical activities in four Areas of Concentration: Socioeconomic Policies, Trade and Investments; Science and Technology, Natural Resources and Agricultural Production; Agricultural Health; and Sustainable Rural Development. IICA's actions receive support from two Specialized Services: Training, Education and Communications; and Information, Documentation and Informatics.

The Member States of IICA are: Antigua and Barbuda, Argentina, Barbados, Belize, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, the United States of America, Uruguay and Venezuela. Its Permanent Observers are: Arab Republic of Egypt, Austria, Belgium, European Communities, France, Germany, Hungary, Israel, Italy, Japan, Netherlands, Portugal, Republic of Korea, Republic of China, Russian Federation and Spain.

SOCIAL SCIENCES AND AGRICULTURAL RESEARCH
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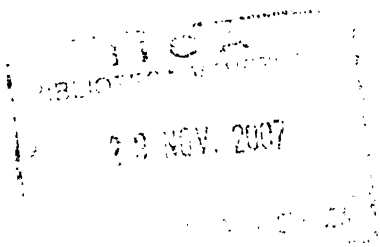

Inter-American Institute for Cooperation on Agriculture
(IICA)

Latin American Research Network for Animal Production Systems
(RISPAL)

San Jose, Costa Rica
1994

IDRC

AGRARIAN SECTOR
INIA
NATIONAL AGRICULTURAL RESEARCH INSTITUTE

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SOCIAL SCIENCES AND AGRICULTURAL RESEARCH
A Systems Approach

PROCEEDINGS OF THE FIRST WORKSHOP ON
THE APPLICATION OF THE SOCIAL SCIENCES
IN PRODUCTION SYSTEMS RESEARCH
Seeking a Methodology

Chincha, Peru, January 25-27, 1988

Under the auspices of the
RISPAL, INIA/IDRC Agreement

Manuel E. Ruiz
(Editor)

AREA OF CONCENTRATION II
SCIENCE AND TECHNOLOGY, NATURAL
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REPORTS, RESULTS AND RECOMMENDATIONS
FROM TECHNICAL EVENTS SERIES
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This book was published by the Latin American Research Network for Animal Production Systems (RISPAL). It is a translation of the book entitled "Ciencias Sociales y Enfoque de Sistemas Agropecuarios" edited by E. Nolte and M.E. Ruiz, published by RISPAL in 1989. RISPAL was created by virtue of Agreements entered into by and between the International Development Research Centre (IDRC), of Canada and the Inter-American Institute for Cooperation on Agriculture (IICA), the Instituto Nacional de Investigación Agropecuaria y Agroindustrial (INIAA) of Peru (presently), the National Agricultural Research Institute-INIA) and the Tropical Agriculture Research and Training Center (CATIE) of Costa Rica. The objective of RISPAL is to cooperate with institutions in Latin America and the Caribbean in the promotion, development and application of improved animal production systems.

December, 1994

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INTRODUCTION

The use of the systems approach as a tool for analyzing agricultural problems has obliged biologists and social scientists to construct a common language and logic. Ever since farming systems research was first proposed, the interdisciplinary relationship between the biological and the social sciences has been taken for granted. Accordingly, genetics, reproductive physiology, nutrition and pathology, together with social anthropology, economics and sociology, have naturally generated several types of integrated information. It is incumbent on all of us, however, to join together to define and characterize production systems, identify problems and constraints, and generate, validate and disseminate technology.

In practice, however, such well-founded proposals pose specific problems. First, we must acknowledge the difficulty inherent in creating interdisciplinary teams, either for lack of funds, the experience required to work in such diverse areas, or simply because of the reticence about accepting the very concept of the systems approach. And even on those few occasions where we did succeed in gathering experts in the social and the biological sciences, there was clearly a communication gap. An overwhelming degree of ethnocentricism characterized many of the discussions, with both sides pointing fingers at each other's deficiencies or shortcomings --making it difficult to pursue the dialogue-- while defending the nature and logic of their own science.

The biologists virtually denied the scientific foundation of sociology and anthropology, because of the supposed lack of objectivity and the variability and volubility of responses to interviews and surveys; and the sociologists and other "humanists" objecting to the oversimplified or isolated approach of the biologists who, in their estimation, sought to cure the world's ills by applying simple technologies which fail to take into account the sociocultural, political and market conditions that shape them.

Nevertheless, there is no question that the dialogues have been fruitful. The growing awareness and resolute determination on the part of researchers to focus their efforts on the farmer and the dissemination and adoption of farming systems research have led, in recent years, to a

certain rapprochement, which could be called empirical, and which has been motivated by nothing other than the personal conviction of the members of both camps that this dialogue is indispensable.

In light of this situation, previously witnessed in projects in Peru and other countries and in certain spheres of study and analysis of the agricultural sector, it became necessary to create a forum where biologists and social scientists could discuss, openly and systematically, the specific terms under which their interaction and the combination of their different disciplines could establish a meaningful, ongoing and effective relationship to strive towards a common objective.

This first Workshop has brought together renowned researchers in the agricultural sector with specific project experience in the application of the systems approach. The group succeeded in taking a significant first step in the analysis of the proposed subject matter, and prescribed future activities which will contribute to the development and refinement of interdisciplinary work. This document contains the presentations and discussions which took place during a three-day meeting in 1988, organized by RISPAL.

The following year the proceedings of the meeting were published in Spanish, with Drs. Enrique Nolte and Manuel E. Ruiz acting as editors. Now, in view of the dearth of information concerning the social and biological disciplines' interactions in farming systems research, as well as the demand for this book, RISPAL has translated it to English. At the same time, this decision expresses the firm interest, on the part of IICA, IDRC, and RISPAL, to extend a communication bridge between Latin American agricultural researchers and their colleagues in Africa, Asia, the Caribbean and elsewhere. The Network hopes that this book will encourage future efforts to favor the ultimate beneficiaries of agricultural development: the peasant farmer and all those who consume the products they produce.

E. Nolte and M.E. Ruiz

NOTICE OF MEETING

THE LATIN AMERICAN RESEARCH NETWORK FOR ANIMAL PRODUCTION SYSTEMS (RISPAL)

INIAA-IDRC Agreement

The Application of Social Sciences in Production Systems Research: Seeking a Methodology

Workshop held in Chincha, Peru, January 25-27, 1988

BACKGROUND

The objective of the RISPAL Project (INIAA-IDRC Agreement) is to promote the development of methodologies to make better use of the systems approach to production systems research as a working tool and a means of steering research and development. To be able to integrate all the factors involved in the animal production process, the systems approach requires more extensive and more effective participation from the social sciences --particularly sociology and anthropology-- for identifying the impact of the constraints generated by different components and orienting the technological alternatives best suited to the needs of the peasant, as an individual and as part of a community.

Several research and development projects have demonstrated the critical need for close communication and interaction between personnel in the biological and the social sciences. It might be necessary to identify or adapt to farming systems pertinent research methodologies developed by the social sciences, to create new ways of gathering and analyzing social data, to simplify the task of identifying and characterizing production systems in a specific area, and to render it more objective. The systems approach requires data useful for making estimations or predictions based on hypothetical changes at the biological, administrative, organizational, or market levels. Social data, in some instances, should point the way to or define the nature of such changes, as well as evaluate their impact on the well-being of the individuals in the system. These topics, which reflect the current objectives of RISPAL, will be addressed in the Workshop.

OBJECTIVES

1. To discuss the conceptual aspects of the application of the social sciences to farming systems research which lead to the procurement of quantitative information suitable for designing technological alternatives.

2. To review possible criteria for *ex-ante* social evaluation of technological alternatives and other potential changes which affect the social organization and well-being of human groups.

3. To analyze the peruvian experiences which pertain to the above.

4. To build a research methodology with the systems approach.

EXPECTED RESULTS

It is to be hoped that the Workshop will result in a document summarizing the current trend among social scientists vis-à-vis the systems approach, as well as the role and application of sociology and anthropology in said approach. The workshop is also intended to spark concern, interest and debate,and lay the groundwork for subsequent dialogue, by way of a second workshop to be held over the course of the next six months.

FORMAT

The Workshop will be open exclusively to guests invited by RISPAL. There will be a panel of researchers in the biological and economic sciences, including persons versed in the application of the systems approach. Several social scientists (sociologists and anthropologists) will be invited to air their opinions on the subject under discussion. An introductory presentation will serve to describe and summarize the current state of the systems approach. Each presentation will be discussed first by the panel, then by the participants, with the assistance of a moderator. The presentations must be delivered in writing, prior to the meeting. The final publication, which is the responsibility of the Executive Secretary of RISPAL, will reflect the content of the discussions.

WELCOMING ADDRESS

Antonio Chavez[1]

It is truly a pleasure to attend this meeting organized by RISPAL. It is a valuable and innovative contribution to the analysis of animal production with the systems approach, particularly where the role of the social sciences is concerned. I should like to make a few remarks in my capacity as Executive Technical Director of the Instituto Nacional de Investigacion Agraria y Agroindustrial (INIAA), and to issue a formal welcome on behalf of this organization. I am particularly interested in the agenda of this meeting and the select group of professionals who will participate in the Workshop. I should like to add that the management of the Institute is extremely keen on furthering those topics, of high priority for agricultural development. I shall also speak to you, in brief, about INIAA, because it will prove useful to be familiar with the institutional framework in which the theoretical and methodological efforts undertaken over the next few days are being channeled.

INIAA was created very recently; in fact, the decree which governs its operations was issued only two weeks ago. This institute represents the union of three institutions which carried out research activities: INIPA (Instituto Nacional de Investigacion y Promocion Agropecuaria, not including its former extension and development activities); INDDA (Instituto Nacional de Desarrollo Agroindustrial), and INFOR, the former Instituto Nacional Forestal. INIAA is responsible for generating technologies for agricultural and livestock production --previously the task of INIPA-- as well as developing agroindustrial and forest research.

This enriches the research focus of INIAA, because additional valuable commitments have been assumed: in agroindustry, because of the tendency in the rural sector to improve the quantity and quality of a finished product, as if it were an artisanal process which cannot be separated from agriculture and livestock activities; in forestry, because in many areas of the country the agrosilvipastoral approach is the most

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appropriate, integrated way of addressing the problems of conserving resources, raising productivity and income, and generating wealth in the rural areas.

We are all extremely optimistic about this enrichment of INIAA's sphere of competence, and the prospects for institutional consolidation in the short term are very promising. The biggest task entails developing concrete research programs. Moreover, INIAA's new structure will also require the reorganization of its complex bureaucratic apparatus which, like most institutions of its size, is cumbersome. This partitioning and integrating process implies numerous staff reassignments.

A major effort is required to do so quickly, thus establishing the leadership of our technicians in the framework of a concrete program. One area which has demanded more discussion in terms of the organization of this concrete program is livestock research. This challenge is being addressed at a national level. The basic proposal is to develop a role for the institution as catalyst and leader, to rally together the academic and private sectors, including those researchers working in other institutes or free-lance. In other words, to create a National Agricultural and Livestock Research System.

We are prepared to invest the resources required to achieve effective coordination and joint efforts. INIAA is also the national representative at the international level in its field of expertise. Agreements have been entered into with international centers and bilateral cooperation programs which aim at organizing their efforts around a workable program. I should like to pledge our full support and open the doors of the Institute to you. I am confident that your contributions will be both positive and unrestrained. We have very high expectations regarding your performance because INIAA must respond swiftly to concrete and pressing problems. INIAA is particularly keen on the fact that a methodology has already been devised for applying the systems approach to agricultural and livestock research.

In Peru, we are basically talking about a technological revolution. Researchers like yourselves should be able to provide concrete information on the social variables that make it possible to explicitly develop and introduce technologies which, on the one hand, are tailored to the technological objectives of increased production and in keeping with government policy and, on the other, meet the needs and expectations of farmers, as individuals and as members of society.

In Peru, as in other countries, the State provides the necessary economic mechanisms and resources. However, if these are not translated into concrete and viable technological alternatives, there is always the risk of funds being cut. In the end, this could prove to be a tremendous source of loss and frustration for the country. Subsidies, no matter how large, are not sufficient, unless they go hand in hand with an aggressive policy which can achieve, within a specified time frame, greater and more profitable productivity, stimulate production, generate employment in the rural sector and, in short, develop agriculture. In view of your competence, enthusiasm and resolve to build for the future, I wish you every success in the serious, yet creative task that lies ahead.

Thank you.

THE SYSTEMS APPROACH TO LIVESTOCK RESEARCH IN LATIN AMERICA: A METHODOLOGY

Manuel E. Ruiz[1]

BACKGROUND

As in other parts of the world (Sands 1986), very little was known in Latin America in the 1970s about research which was managed and shared with the farmer, particularly the farmer with limited resources (Li Pun and Ruiz 1986). Up until that time, livestock research had been almost exclusively discipline- or product-oriented, confined to experiment stations and based on the premise that the problems limiting production and productivity could be resolved by technology largely generated through adaptative experimentation; in other words, technology which sought to tailor technologies created in other environments to local, often different, conditions.

The idea of channeling resources for research and extension work by discipline or product was reinforced by the early effects of the Green Revolution on agricultural production. However, subsequent to that event, it became increasingly apparent that technology generated through traditional research was difficult to introduce to small farmers with limited resources (Brady 1977; Norman 1980; Sands 1986). Obviously, even in those cases where the technology is built on a sound and scientific technical foundation, it is empty unless adopted by the farmer.

The reasons given to explain the poor performance, if not absolute failure, of adoption of technology resulting from traditional research include the following:

- Intensive use of inputs, limited use of labor and a tendency to design technologies which aim at maximizing net income (Navarro and Moreno 1976).

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- Technical shortcomings when compared with the technology currently employed by the farmer (Zandstra et al. 1981).

- Out of step with social and economic conditions and the farmer's objectives (Sands 1986).

- Lack of a joint plan for generating and transferring technology based on and geared for the farmer and his environment (Ruiz 1987).

- Lack of communication between livestock technicians and the sector responsible for designing agricultural development policies (Pomareda 1988), which means that development plans do not take into account the constraints, needs, resources and objectives of the farmer and the community. Gastal (1975) maintained that the traditional research methodology, while starting from a clearly identified problem (be it based on reality or intuition), inherently results in the researcher's identification of new problems as the research process unfolds. However, for this very reason, the search for solutions may become increasingly removed from reality. There is a risk of generating technology increasingly less equipped to help the farmer advance. And if the generation of this type of technology is associated with its dissemination, chances are that with the passage of time the farmer will have lost confidence; this stumbling block must be overcome (Ruiz 1987).

On the other hand, it would be unfair to generalize that traditional research in Latin America has made no contribution whatsoever. When it is successful, it is because the researcher is aware of the farmer's problems and environment (either because of familiarity with the rural sector or experience working with farmers), or because the research is aimed at meeting the technological needs of a sector of farmers with ample resources.

According to Sands (1986), the fundamental change which led to a new conception and organization of research was the understanding that the production systems of small farmers in the tropics and subtropics are neither as static nor as primitive as previously thought. On the contrary, they are complex and dynamic, and their evolution responds to agroclimatic, ecological and socioeconomic variants. In addition, it was discovered that small farmers do not reject pertinent technology because they are either too traditional or too ignorant, but because their decisions are a function of logical and rational processes and respond to goals and

evaluation procedures (see, for example, Norman 1974, 1980; Harwood 1979; Zandstra et al. 1979; Shaner et al. 1982).

One of the first Latin American institutions to adopt the new research approach was CATIE in 1974 (Navarro and Moreno 1976). However, this application was limited exclusively to cropping systems. It was not until 1976 that CATIE launched its first livestock research project using the systems methodology (CATIE 1979; Ruiz 1982), which served as a catalyst for establishing other projects, with a similar approach in Panama, Peru and the Dominican Republic. Today, thanks to support from the IDRC, 18 research projects in animal production systems form a Latin American network whose objectives include promoting the application of the systems approach to research work (RISPAL 1986).

ANIMAL PRODUCTION SYSTEMS RESEARCH: APPROACH AND METHODOLOGY

Livestock research associated with the idea of systems is a new phenomenon, particularly in Latin America. The novelty of the concept, and the fact that systems are dynamic, meant the emergence of a variety of definitions. What is especially worrisome is that these definitions also lead to confusion. For example, sometimes it is necessary to adapt a methodological procedure in systems research to some other project or institution. However, this should not be interpreted as a departure from the systems concept; a change in work methodology does not imply ipso facto a change in approach. Accordingly, some definitions and concepts are provided below.

The approach

It has already been mentioned that the research strategy and traditional or disciplinary agricultural development (often referred to as "top-down") have enjoyed relative success in improving the quality of life for the farmer; more specifically, clear and distinct benefits have been derived from the development of methods to control diseases, crossbreed and select animals and develop improved forage varieties. However, in most instances, research priorities are set in the experiment station without any farmer participation in the process (Norman 1980). Farming systems research, on the other hand, is based on the idea that (1) the development of a technology which is relevant and viable for the farmer be based on a thorough understanding of the real farm system, and (2) that the

technology be evaluated not only in terms of its technical performance, but also with respect to the goals, requirements and socioeconomic conditions of the farm system (Sands 1986) and the farmer as main factors.

System. There are several definitions of the word *system*. Finally, they are all alike. One definition, provided by Norman (1980), states that a system is any set of interacting related elements or components.

Agricultural system. This is a combination of factors and processes which act as a whole, interact with one another and are managed either directly or indirectly by the farmer in such a way as to consistently obtain one or more products which are both viable and in keeping with his goals and needs, but which are furthermore affected by the social, physical, biological, economic, cultural and political environment. This definition assumes that the agricultural system is governed not only by factors endogenous to the farm but also by a variety of exogenous influences, as illustrated in Fig. 1.

According to Fig. 1, the total environment is divided into technical and human elements. The first determines the physical type and potential of the livestock and agricultural activities and includes physical and biological factors which may be modified by man. The second is characterized by two types of factors: exogenous and endogenous. To a large extent, the exogenous factors (for example, the social environment) are beyond the control of the farmer and consist of community structures, external institutions (both consumer-oriented, such as extension and credit services, financed by the government, and product-oriented, through which the government can influence the prices to the farmer) and other influences such as population density and population location (Norman 1980).

Elements characteristic of agricultural systems research. Sands (1986) has drawn up a list of concepts which characterize farming systems research:

- The approach is farmer-oriented. Given that the farmer is looked upon as the research beneficiary, the technologies developed should reflect his goals, needs and priorities.

- The approach is systems-oriented. The farm is the frame of reference and therefore the research should take into account the interactions among its components.

- The approach is concerned with problem-solving. The strategy, first and foremost, is to identify the technical, biological and socioeconomic constraints of the production system, to later design solutions tailored to the system's management conditions. In addition to Sands' concept, it is fitting to point out that, between the identification of constraints and the design of alternative stages, it is necessary to prioritize or rank the constraints together with the farmer, the researcher and the extension agent.

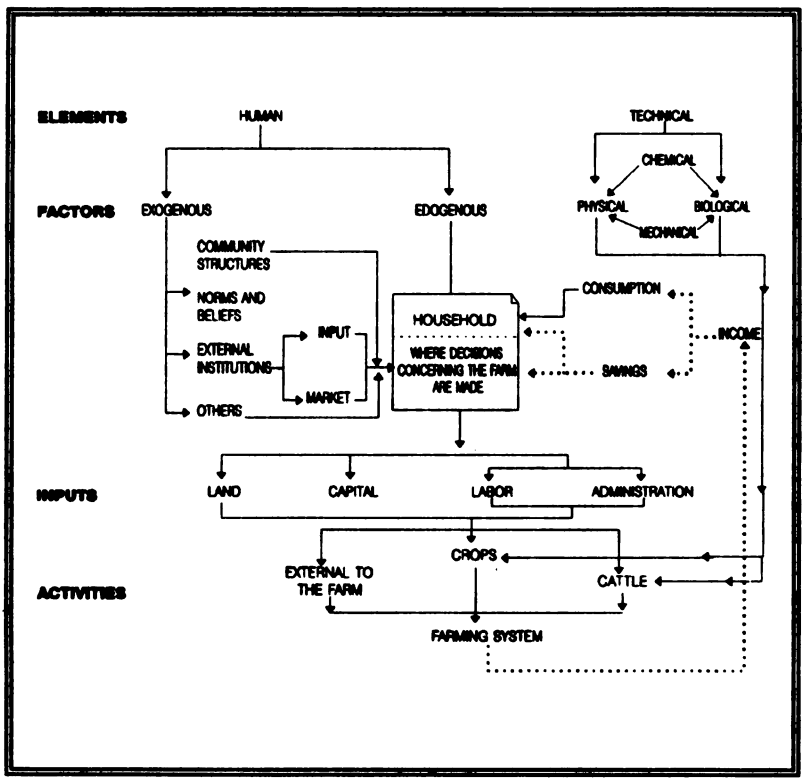

Fig. 1. Diagram of some factors determining the farming system (Norman 1980).

- The approach is interdisciplinary. This is precisely one of the features the approach should provide as an alternative to traditional disciplinary research and as a means of better understanding the multifaceted nature of the farmer, particularly in the decision-making process.

- The approach complements traditional disciplinary research, but it is not used in its stead. The approach makes effective use of data bases, technologies and strategies generated by traditional disciplinary research and attempts to adapt them to the environmental and socioeconomic conditions of a group of farmers.

- On-farm experimentation is a basic feature of the approach. That is, the approach promotes farmer participation in the research process. This affords the researcher a better understanding of the production system, and experimentation serves to evaluate the technology under the management and environmental conditions in which it will eventually have to operate.

- The approach allows for feedback of information from farmers, researchers and extension agents.

With the definitions and preamble provided thus far, and due to the dynamic nature of the application of the farming systems research, it should come as no surprise to find certain variations in the amplitude of the overall concept when referring to development or research programs or to the specificity of the system. For example, farming systems research is often used as a frame of reference or a working philosophy which makes it possible to conduct research as prescribed above. For others, the approach is an action strategy targeting the development of a highly specific universe of farmers. For still others, the approach is an adaptative research methodology (Sands 1986). It would appear that what is most important is a philosophy that can be applied to research, extension, and, in short, agricultural development.

There could also be some ambiguity regarding the "size" of the system. While all researchers use the farm as the frame of reference for their research (Sands 1986), in practice one sees and hears of a variety of production system constraints, from the agroclimatic zone to the production system of, for example, dual-purpose cattle. Undoubtedly, the specificity of a target system depends on the task undertaken by a project, program or institution, and a broad definition is totally acceptable if it is clear and does not overlook the interrelationships with the systems contained therein and with the system in which the target system, in turn, is contained. Hart (1979) refers to this aspect as the hierarchy of the system (Figs. 2 and 3).

The methodology

A variety of documents on general research methodology in animal production systems are available today. These include Borel et al. (1982), Solano and Avila (1985), Ruiz (1985) and Li Pun and Ruiz (1986).

Moreover, one of RISPAL's principal achievements has been the continuous improvement of a research methodology. While much remains to be done, there are presently several specific publications on farm diagnosis techniques (CATIE 1978; Fitzhugh et al. 1982), designing alternatives (Ruiz and Li Pun 1985), and evaluating alternatives (Quijandria et al. 1986; Quiel et al. 1986b). Due to its nature, the present document provides only a brief discussion of the general methodology.

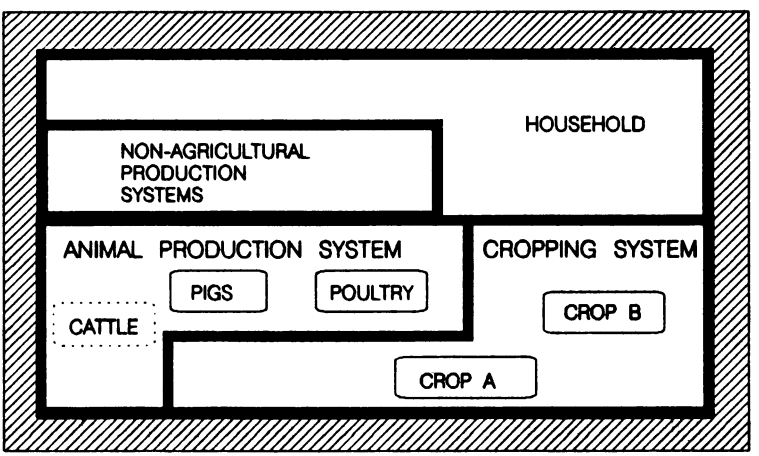

Fig. 2. Diagram of a small-farm system with four production-consumption systems (adapted from Zandstra et al. 1981).

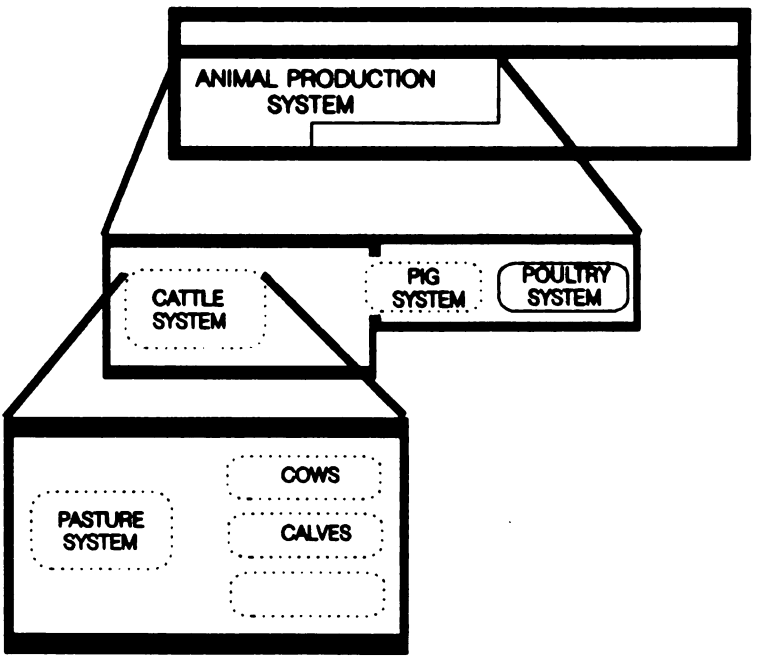

Fig. 3. Example of a diagram reflecting the hierarchization of the systems.

The following headings are borrowed from the diagram shown in Fig. 4. While both the diagram and the sequence of the headings suggest a rather rigid order for the methodological steps, they should not be interpreted as such. The design stage, for example, overlaps with the diagnostic stage and even with the evaluation stage, since the design of the alternatives depends to a large extent on feedback from the other two stages.

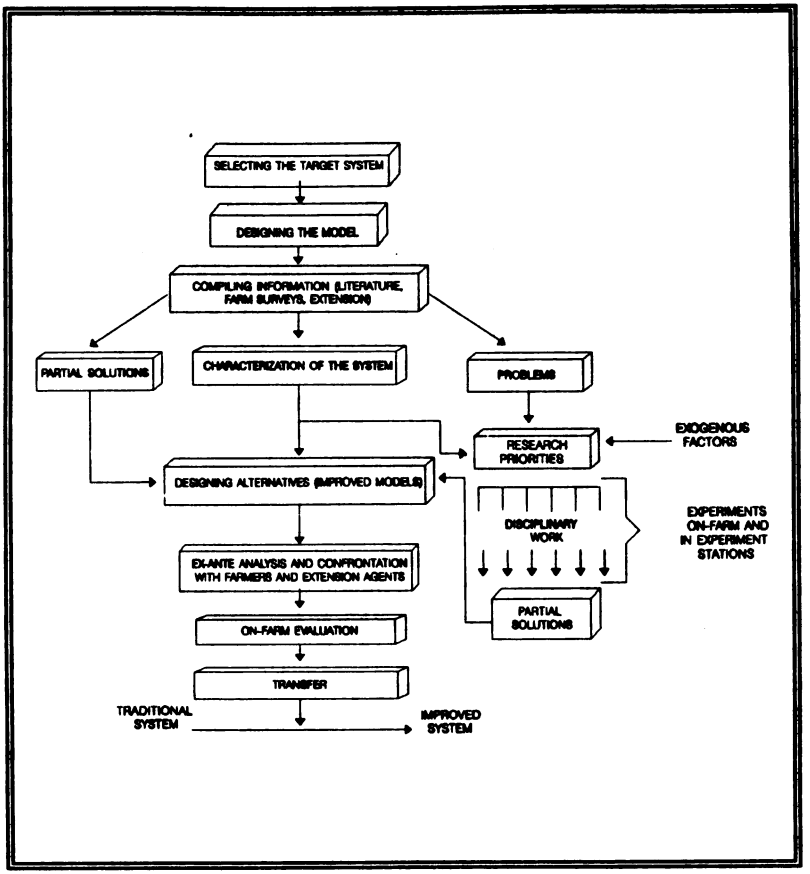

Fig. 4. Simplified diagram, without feedback loops, for agricultural production systems research methodology.

All the interactions or feedbacks between the stages have not been included in Fig. 4 for purposes of greater clarity in the diagram. In addition, at the beginning of the diagram it is assumed that the area of project action has already been selected.

Selecting the target system and the area of action. The systems approach methodology begins with selection of the target system (e.g., dual-purpose cattle, mixed production systems with small farmers, etc.) under the responsibility of the program or project. If the area of action has already been selected, the next step is to compile historical data and other information concerning business activities, migration, population

projections, development plans and interactions between the target system and other activities involving land use. The breadth and depth of the target system in the area is defined on the basis of this information. This is a preliminary consideration which will affect the orientation and form of the technological alternatives to be developed, as well as the nature and objectives of the experiments by disciplines.

Formulating the preliminary model. Information on the area is useful for constructing a preliminary model representative of the prevailing system or systems (Borel et al. 1985). The primary objective is to create a means of determining the structure of the system and providing guidelines for identifying problems and missing information. This work requires the participation of professionals from different disciplines; however, during the course of this work, particularly toward its completion, it is important to consult the farmer on a regular basis.

In the early stages of the research process the model will probably be rather general, but it may be refined as the process progresses. The model need not necessarily be mathematically complex, with precise definitions of the internal interrelationships; it could very well be a flow diagram, or even a list of variables and factors (Borel et al. 1985). In fact, these are used in preparing the survey questionnaire.

Defining the recommendation domain. At this stage it is necessary to define the recommendation domain; that is, the socioeconomic and ecological environment in which the farmers are situated, specifying common features such as cattle production systems, the presence of crops, the size of the farm and others. External factors, ecological factors in particular, are a good starting point. The thinking behind this recommendation is that if the areas vary substantially in ecological terms, then it will be necessary to better define the recommendation domain. However, if the ecological differences between the areas are less pronounced than the ones within the areas, there is no need to define more than one adaptation domain (Ruiz 1985). Other factors may be used as criteria when defining the recommendation domain, such as those discussed at length by Ruiz (1985).

Compiling information and characterizing production systems. The next step involves characterizing the farm systems in the target system. In Fig. 4, this step combines the "characterization" and the "information compilation" blocks, for the purpose of describing, and diagnosing the production systems prevailing in the area. To that end, secondary

information is used, and rapid rural appraisals or one-shot surveys (static diagnosis), as well as multiple-visit surveys of no less than one production cycle (dynamic diagnosis) are conducted. The static diagnosis helps to: a) identify and describe the predominant farms in the area, b) identify the production systems and begin to describe them, and c) establish a preliminary scale ranking the constraints of these systems (CATIE 1986). It should be added that the static diagnosis helps to identify topics for component research and affords the researcher a better understanding of the model.

Both the static and the dynamic diagnoses require compilation of information at three levels of the system. The reader should consult Fig. 3 for that purpose. If the key objective is to characterize the farm, then the pertinent information should be combined with characterization of the agroecosystem (or even the components); at the same time, information should be compiled about the area where the farm is located.

The farm-level diagnosis tends to be static, that is, more of a fixed image based on a single visit. Because of the limited investment in time, it is possible to include a large number of farms and thus cover a very broad area to ensure representativeness. By contrast, the dynamic diagnosis is more concerned with characterization of the agroecosystem or component, and serves to introduce the time factor into the observations, thereby making it possible to observe changes and their causes throughout at least one production cycle. This diachronic picture of the systems is acquired at the expense of geographic coverage. It should now be clear that the farmer is both the object and essential participant of the systems characterization process. The quality of the information obtained will be superior if extension workers and local leaders are included in this effort.

Identifying problems. It has already been established that systems diagnosis leads to identification of problems subject to investigation. This process should not only be based on technical analysis of the information but also on the viewpoints and remarks voiced by the farmer himself. Experience in several systems projects in Costa Rica, and in Central America in general, has shown that the farmer cooperates well once the technicians have won his confidence; he gives his impression of the problems plaguing his farm system, but also requires the assistance of the researcher to identify the causes and to formulate hypotheses about the actions to be taken to deal with these problems.

Lastly, given that the problems identified imply generating a hypothesis, it has been discovered over the past two years that the same data from other surveys can be used to eliminate some of the hypotheses formulated, thus orienting more precisely the biological research.

Identifying solutions developed by the farmer. One of the advantages of the diagnosis is that it enables the diligent researcher to detect solutions which the farmer has developed by himself or as a result of his ancestors' or neighbors' efforts. These solutions should be evaluated, and should they merit it, be incorporated into the proposed solution.

Experimenting in components. Problem identification and prioritization leads into the planning of the experiment. This process is the same one followed in experimentation of the disciplinary type, except that, with farming systems research, experiments can be conducted both in the experiment station and on-farm. The different types of experiments and the pros and cons of conducting them either on-farm or in the experiment station are questions addressed by Li Pun and Borel (1986). These authors advise against conducting on-farm experiments employing critical treatments which could be stressful for both the animals and the system as a whole. Experiments conducted in the station may be complex or basic.

Designing alternatives. According to CATIE (1986), the design stage can be defined as a set of management techniques which modify the traditional system either partially or totally. These changes may refer to a subset of components or to a specific component. Generally speaking, these changes are meant to increase the efficiency of the system in terms of the farmer's goals, constraints, resources and socioeconomic context. The design stage begins with the original model, retaining the basic points of reference of the traditional system previously characterized and drawing on the solutions developed by the farmer and through formal component research.

The use of a model helps identify problems in the traditional system, which the technological option them seeks to resolve. Participation of researchers, extension workers, credit entities, planners and farmers is important in every stage, but at this particular stage it becomes especially significant. The choice of techniques for increasing productivity should be based on knowing which resources are least available.

For example, if there are no resource shortages and existing resources are being underemployed, then a higher level of administrative efficiency should be sought. For biological problems, one procedure is to compile a list of possible solutions, the advantages and disadvantages of which can be weighed by means of stepwise regression studies that assess their relative impact on response parameters (Ruiz 1985). Comparative studies can also be conducted between the farms where the solutions have been applied and those where they have not. Moreover, those solutions may be pre-selected on the basis of bioeconomic analyses (Ruiz 1985).

Ex-ante analysis and assessment of technology with farmers and extension workers. Intimately linked to the design stage, this step consists of a set of procedures for biological, economic, social and logistic pre-evaluation, which seek to ensure, before the fact, that the proposed alternative is truly in keeping with the ecological and socioeconomic context of the farmer and his production system. At the same time, a margin of statistical safety is sought as to whether the alternative will actually lead to more efficient use of resources, improve the socioeconomic conditions of the farmer, reduce or maintain the risk factor, minimize the initial investment involved in its introduction and be accepted and adopted by the farmer.

The *ex-ante* analysis is an evaluation of the way the system is expected to behave in response to the technological alternative. It should be borne in mind that the alternative may consist of a change in a component, the introduction of a new component, modifications to a group of components, or an entirely new system. Accordingly, the *ex-ante* analysis should be limited to the technological alternative.

The *ex-ante* analysis includes estimation of the interactions anticipated between components, between subsystems and between the pertinent system and the others contained in the same area of action. For this reason, the use of computerized simulation models can be a major time- and energy-saver, particularly in the case of systems with extensive, complex production cycles such as cattle, forest and pasture systems. However, it must be remembered that simulation models are only a means of arriving at a preliminary evaluation of the behavior of an alternative for the pertinent system.

The *ex-ante* evaluation addreses a number of technical aspects, such as the need to project, over several years, the introduction and evolution of the alternative, the selection of evaluation parameters, the economic

feasibility of the alternative, and its sensitivity to price changes for inputs and outputs, among others. There are several papers on these subjects, including Borel et al. (1985), Riesco et al. (1985), Avila et al. (1985), Ruiz (1985) and Gutierrez-Aleman (1986).

Technology assessment sessions are conducted using a technological alternative that has already undergone *ex-ante* technical analysis, but which could have shortcomings in terms of its suitability to the farmers' social and environmental values and their investment capabilities. Prior to the meetings with farmers, extension workers and credit agents (together or separately, according to the cultural environment), the presentation of the alternative should be modified to make it readily comprehensible. Technical terminology should also be adjusted to each group; for example, discussing values of internal rate of return would be meaningless to the farmers.

There are several well-documented experiences with technology assessment techniques (Zandstra et al. 1979; Riesco et al. 1986; Quiel et al. 1986a; Mares and Perez 1986) using different methods and in regions with varied ecology, history and anthropology. This step appears to be well-accepted by all parties (researchers, farmers, extension workers and credit agents), and extremely valuable to the entire technology research and transfer program.

Evaluating alternatives. Application of the systems approach to livestock research is a relatively new phenomenon. It has required serious efforts in developing appropriate methodologies, due to the nature of livestock systems, the characteristics of resource-poor farmers and the stochastic nature of the variables affecting livestock activity. It is still necessary to perfect the strategies and analytical methods employed, particularly for evaluating alternatives.

Evaluations of technological alternatives consist of the introduction, follow-up and study of the behavior of an alternative already in use in the farm system, under the technical and administrative control of the farmer. Today, proposals exist for biostatistical (Henao 1986) and socioeconomic (Sepulveda 1986) evaluation methods, which have been considered in a set of recommendations and methodological steps which must be followed for statistical and economic evaluation of production alternatives (Henao et al. 1986).

From a statistical perspective, it is preferable that each farm system constitute an experimental unit; on the other hand, there are no two farms alike; thus the experimenter would try to offset this constraint by using a large number of farms in the study; but, to compound the problem, the cost of introducing alternatives is high and, as a result, it would be financially impossible to have several experimental units.

Evaluations in the form of case studies are another option, which may, however, fail to meet the rigorous scientific demands of the traditional researchers who frequently sees those demands as a way of making a name for himself in the scientific community. Consequently, it is still not generally accepted that equal or greater value should be attached to generating technology and demonstrating that it can be adopted by the farmer.

At present, the Latin American Research Network for Animal Production Systems (RISPAL), with headquarters at IICA, in Costa Rica, has on its agenda advances in methods for the evaluation of technological alternatives.

If the general methodology described above is applied fully, it could be possible to dispense with the evaluation of alternatives. That is, if the farmer and his family come to play an active role in each methodological stage, it is logical to assume that technology assessment itself will serve to test the merit of the alternative. In any case, it is clear that the responsibility of the scientist conducting farming systems research is to develop a transferrable technology centered on the farmer.

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THE SOCIAL SCIENCES AND PRODUCTION SYSTEMS

Orlando Plaza[1]

INTRODUCTION

Meetings like this one are extremely important in light of the difficulties encountered when seeking solutions to agricultural problems because of a lack of communication between researchers in the biological and the social sciences[2] and the different ways in which researchers, politicians, trade union leaders and planners approach the problems at hand.

This document looks at: (1) the idea of the system, (2) the dimensions of production systems analysis, and (3) key elements for analyzing production systems. While these remarks apply to different contexts, the main point of reference is the peasant of the Peruvian Andes.

For the past 40 or 45 years, different national and foreign organizations in Peru, each one with a different picture of the problems besetting the agricultural sector, have been experimenting with different development models, none of which have been assessed to date. Accordingly, most communication problems are due to each organization basing its interpretations and proposals on its own perception of agricultural conditions, rather than to a lack of theoretical capacity or a lack of will. It is not enough to reconcile these different interpretations. It is also necessary to analyze and clarify the ideas on which these organizations base their work when addressing agricultural issues.

The systems approach should take stock of the experience gained in our countries in order to identify those cases that have met with failure and

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2 Although more recently, based on the notions of economics and production systems, several fruitful encounters have taken place; in the case of Peru, the seminars organized by SEPIA.

the reasons for such failures. As illustrated by Manuel Ruiz in his presentation, the concern about the systems approach is intimately linked to the desire to help bring about social change. This means finding solutions not only to immediate poverty --a constant in Peru-- but to the problems associated with projects carried out which have failed to serve the type of farmers for whom they were intended[3]

In light of these successive failures, alternative proposals have been sought. In 1981-82, William F. Whyte of Cornell University conducted a review of rural development projects worldwide. According to Whyte, these projects failed because, among other reasons, too little attention was paid to the farmer, his production logic and his expectations. It is particularly striking that so little priority has been attached to this aspect, which should be the starting point of rural development projects. This is not to blame the professionals in the biological sciences. On the contrary, in many instances, the social scientists have forgotten about the social fabric and structure. In many rural development projects, the social sciences have tended to ignore social structure or have reduced it to a set of variables that are effects rather than causes: health, education, housing, etc. All of these social indicators have replaced the social structure, impeding better understanding of the reality in which the indicators operate[4].

One basic idea, vital for understanding social change, is that we are not working with static and homogeneous societies that only require an energy boost to make up for their deficiencies. While this might sound like a truism, it must be emphasized because of the frequent disparity between proposals and practice. In reality, societies are dynamic, undergoing dramatic transformations. In the case of Peru, the bases for organizing

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3 The CIP in Peru, for example, has successfully developed proposals for highly monetized farmers, who are furthermore incorporated into the market; they do not apply for other farmers from the Mantaro region, according to pertinent observations and experiments.

4 In the social sciences in Latin America today, theoretical movements have come about which demand another type of analysis, due to the fact that, for many years, the social sciences, sociology and economics in particular, focused almost exclusively on structure and institutions, overlooking everyday relationships. Society is not made of static structures, but of interests, passions, ways of seeing the world and everyday interactions. This, then, is a unique moment, both for the social and the biological sciences, where both disciplines are reassessing and reconstructing the bridges for bringing their areas of specialization closer together.

people and production in the agricultural sector, and in the society as a whole, are being reassessed separately from the information which professionals have been able to assimilate. On the other hand, it is also fitting to make an appropriate distinction between economic policy, agrarian policy and rural development. It could be said that our countries lack coordinated and clearly conceived relationships among the three.

Economic policy is formulated on the basis of macroeconomic variables which have an impact but are not necessarily conceived in terms of sectoral policy. Agrarian policy is aimed essentially at the modern agricultural sector and is concerned with feeding the large urban population; the Ministry of Agriculture in Peru, for example, in addition to proposing coherent agricultural alternatives, is responsible for providing the cities with foodstuffs. But rural development, in most cases, is seen as a set of marginal policies for marginal sectors; little will be achieved as long as the difference between mainstream production and marginal peoples remains.

THE IDEA OF THE SYSTEM

The coordinator of this event, Enrique Nolte, has suggested that this document address some aspects of the social sciences as they relate to the question of systems. In fact, we have more concerns than concrete recommendations.

We must explore, at length, concept of *system* to determine what each one of us understands by the term and the progress which has been made in developing this concept. In the agricultural sciences, the notion of the system became very fashionable in the sixties; for many agronomists, this idea shook the very foundations of science, and even some of their works state that systems are revolutionizing twentieth century science. Perhaps, from their perspective, this is the case; but the system concept has always been at the very foundation of the organization of scientific thought. Science cannot be conducted without it. In fact, the humanities use the notion of a philosophical system to refer to the organizational dimension of thought, when facing key questions about society and human nature.

The idea of the system, referred to by different names, has been in vogue among social scientists since the last century and earlier. It fact, it parallels the birth of the social sciences. The notion of the social system, in some cases used interchangeably with structure, borrowed in turn from

architecture, is also used to refer to the cultural system, the organizational system.

The idea of the system in the social sciences is very similar to what has been proposed in this forum. First, it is not the sum of its parts, but the result of their interaction. Second, it has a defined spatial dimension. Third, it is characterized by its specific permanent, temporal nature. Based on these characteristics --interaction, temporality and permanence-- it is possible to see the ways in which different schools employ the term. Generally speaking, there is a movement that stresses (as inherent to the system) the search for a balance, while another seeks to understand the contradictions that exist in its reproduction. The first movement is more clearly represented in the social sciences by structural functionalism, according to which each part of the social system fulfills a predetermined function. As soon as one "part" ceases to do so, dysfunction sets in and the system as a whole operates to correct this dysfunction and restore a balance. The second trend, essentially developed by Marx and later adopted by non-Marxist social scientists, maintains that the contradictory interactions between the elements that make up the system are responsible for its existence and reproduction.

However, in the social sciences, as in all the sciences, progress is based on accumulation; at the same time, things are forgotten. Marx proposed three aspects for understanding the social system: (1) relationships between people; (2) relationships between people as conditioned by material goods; and (3) relationships with nature. In other words, he pointed out the global nature of the different interactions which take place among human beings, through production relations and relationships with nature. This dynamic approximation becomes a constraint, however, when the concept is limited to its production aspects: it loses the richness of operations and is forgotten.

Roughly 40 years ago, in the field of anthropology --a science which ultimately opted for analysis of interpersonal relationships-- a group of scholars rediscovered that this alone did not suffice for understanding peasant and primitive societies (kinship relations, cultural relations, etc.); what was required was to recover man's relationship with nature, which later gave rise to a school known as cultural ecology. From this school of thought a conceptual approximation was later developed to analyze the relationship and interaction between human, plant and animal populations, which ultimately concluded that a system was only effective if its operation involved minimum energy consumption.

Another angle to the idea of the system is based on cybernetics. With the advances in the world of computers and the expansion of the logic of input, transformation and output (which is related to the question of energy), the notion of the system became fashionable, and even some Marxist economists believe to have found in the technique generated by cybernetics the soundest scientific answer to operationalizing the production angle of the concept. This author is of the opinion --naturally open to discussion-- that the concept used in agronomy and the "systems approach" is the notion of the system via cybernetics. I would like to point out that the various concepts of the system have had different evolutionary paths and different stages of development. Moreover, even if they have common characteristics, they also have different elements from which we all have something to learn. These elements have been summarized here.

THE DIMENSIONS OF PRODUCTION SYSTEMS ANALYSIS

The four dimensions of this analysis, demanding an interdisciplinary approach, are:

1. The agroecological dimension

2. The technical-productive dimension

3. The socioeconomic dimension

4. The cultural and political dimension, not usually taken into account but central to systems analysis

Systems may be viewed as having four dimensions; each one is viewed from a specific angle, and is not necessarily the exclusive domain of a single discipline; for example, both geographers and anthropologists are concerned with agroecology. In order to work with the systems approach, the user must be aware of the existence of these dimensions. The systems approach should distinguish rather than confuse these dimensions, but once this distinction is made, the common denominator which ties them together should be sought. To a certain degree, this link is provided by the individuals themselves; not just people knowledgeable of the total situation, but also as bearers of a social framework which goes beyond their free will. This is the first element.

A second element linking these dimensions is that they do not develop in the same way in all human groups, nor do they have the same degree of consistency or importance. They are connected in different ways. This leads us to ask a number of questions, including: What is it that makes these dimensions connect differently in each of the human groups we wish to study, and what are the consequences for their social production and reproduction?

KEY ELEMENTS FOR ANALYZING PRODUCTION SYSTEMS

A partial answer to these questions requires a set of proposals which would also serve as a working model. In view of the problems set forth, it is proposed that the work be based on the following three key elements:

- The rationale or logic behind the system.
- The units of action and analysis, and their contexts.
- The structural logic and the logic of the actors.

The rationale or logic behind the system

Considerable headway has been made in this direction in Latin America over the last 10 or 15 years, based, in part, on the concerns of Chayanov about the peasant or small farmer economy, which are being raised again eighty years down the road. Chayanov wrote of the impossibility of studying peasant production with the same approach and concepts used to analyze capitalist agricultural production. In peasant families, the concept of salaries and profits does not apply. There is a specific production logic which must be understood, and this requires looking at their production conditions and biological and agricultural cycles.

A number of points about peasant logic should be understood. The rationale of production systems is often interpreted, by persons unfamiliar with the term, as meaning that the system is flawless. The rationale of the system does not refer to its perfection nor to its potential for change, but to the fact that in a given situation it will respond with its own peculiar characteristics.

Moreover, campesino reasoning or logic, in the case of the Andean countries, takes on a special social connotation and invites value

judgments, because the majority of peasants are Indians. In these countries, for centuries following the Conquest, the dominant groups maintained that the Indians had no soul, were irrational, and were therefore easily dominated. When one speaks of peasant rationale, in such a context people get excited because this "shows" that the Indians do in fact think. On that basis, they tend to idealize the peasant system, or some of its parts, as is the case with peasant technology.

The discussion surrounding the rationale or logic of production systems also extends to the economy, where there has been a tendency to suggest that the rational way of organizing production is through enterprises. According to this line of thinking, any form of production organized in any way other than the enterprise is irrational. To maintain that the peasant economy has its own rationale and logic is to overcome the simplistic ways of understanding forms of organizing production and the cultural and political prejudices against different groups.

The units of action and analysis and their context

The concept of peasant rationale or logic means understanding and distinguishing immediate social aspects from those over the medium term. Almost all rural development proposals --whether or not these employ the systems approach-- maintain that the success of a project will depend on the context in which it is carried out. If everyone agrees that the context is vital to the success of a project, why is this often forgotten or mentioned only in passing? How is the context viewed in the notion of the system? A recurring problem in rural development projects is the simplistic search for a unit of action and analysis which permits the project designer to maintain that "pertinent" intervention is the solution to the problem.

Review of development proposals reveals that some focus on the family, others on the community, and still others on the microregion. But all of these are short-term solutions which neither solve the contextual problem nor enhance the possibilities of working on it in connection with the action units. This requires distinguishing between medium- and short-term conditions for production and social reproduction. Part of the strength of the systems approach is that it enables the researcher to make this distinction not only in the analysis, but also in the action proposals. Comparison of the forms of community organization and entrepeneural undertakings help illustrate the distinctions and connections between production unit and context.

The operation of the enterprise can be analyzed in terms of the use of factors of production. The enterprise, because of overall conditions in the society, can be analyzed as an autonomous entity and reproduction conditions can be avoided, since the society provides the necessary support in terms of reproduction and organization: institutional, juridical-legal, property ownership, scientific and technological. The reproduction of the enterprise, in social terms, is guaranteed by the society as a whole, which explains why it can be analyzed in terms of factors of production.

By contrast, analysis of the reality of the community reveals that the general organization of the society neither guarantees its reproduction nor provides substantial institutional support: universities, research centers, property ownership structure, citizenship, organization, power, and the possibilities of cultural development do not concern themselves with the living conditions of the peasant community. Therefore, in the community, the peasants assume, alongside the production process, the costs of their social reproduction. This comparison illustrates the importance of the distinction between the medium- and short-term conditions of production and reproduction. The importance of this distinction can also be appreciated when analyzing the production unit with respect to the four moments of production.

In peasant communities, for example, it is generally accepted that the production and consumption unit is the family; but the practical implications are not derived from this fact. To maintain that the production and consumption unit is the family implies different levels of abstraction and complex realities; for example, that there is no major mediation, neither social, institutional nor temporal, between the moment of production and of consumption; between those who produce and those who consume; between the forms in which goods are produced and exchanged; that is, that there is no social institutional support, that peasant participation in production is very specific and that, as such, their development opportunities are very limited, more so than for other forms of organization. From this, it can be concluded that analysis and proposals cannot be confined to the family parcel or production system. From the beginning, what is loosely referred to as the context must be considered.

The structural logic and the logic of the actors

The third point is the problem of making the right distinction and connection between structural logic and the logic of the actors. In the social sciences, in classical terms, there is no such thing as a social system without a social structure and culture, and, by the same token, without the reproduction of contents, processes and exchanges between the subjects which are the carriers of this structure. From the point of view of the systems approach, this problem translates into a need for distinguishing and relating the context, production conditions and responses of peasants.

It is interesting to discuss the assumptions, proposals and observations which the scientists in the social and the natural sciences make about production systems. The orderly discussion of these three problem areas could provide common ground for arriving at an understanding of the systems approach based on the different disciplines. Lastly, it must be remembered that all concepts are historical; therefore, the systems approach must have substance, and reflect the social and ecological characteristics of the peasants.

SYSTEMS RESEARCH: SOME METHODOLOGICAL QUESTIONS

To conclude, some practical problems are proposed which arise in the research process when the systems approach is employed. A research project currently being carried out by Myriam Granados and Walter Melendez (Universidad Católica, Peru) on the peasant economy, using the systems approach, covers five zones and monitors 10 families in each zone, throughout an entire agricultural cycle. What follows is a very brief description of the process. Every research effort has an analytical side, selects the dimensions to be studied and seeks to ensure that these explain the situation of the persons under study.

The first objective was to understand the way in which peasants find solutions to the problems of agricultural production and its constraints[5]. The second was to analyze the different types of peasants considering that the general conditions of the majority of the peasant communities in Peru

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5 In Peru, there are two sides to the discussions on the nature of the limitations to development in the peasant economy: some sustain it is the market, others argue that it is the ecological setting.

are characterized by the "minifundio"[6]. The third objective was to call attention to the absence of proposals and policies concerning the "minifundio," based on analysis of the logic of peasant production and reproduction.

In light of the above, it was necessary to overcome a tendency to define the unit of analysis and its dimensions in a very limited fashion. To this end, it was important to distinguish levels of analysis: when working with peasant communities, it is necessary to distinguish the family from the community organization, and from what could be called the zone. In order to define the zone, aspects such as market and ecology were considered.

Even in the actual family as a unit of analysis (considered a priority for understanding the system), it was necessary to distinguish the family, the agricultural activity, the parcels and the crops, which meant working simultaneously with four units of analysis. This also meant that for each of these units a model had to be built to control the selected variables and follow up in a dynamic fashion.

In order to analyze the variables, a plan was drawn to help distinguish the immediate situation from the logic of the actor, the peasant. With respect to the immediate or short-term situation, the following items were included: land, climate, water, cattle, technology[7], labor, tools, and others. Each one of these elements was treated as a subsystem. When looking at the systems approach and working with scientists from different disciplines, each one will naturally focus on in his own field; therefore, limits must be established to prevent this from happening.

Within the sphere of the so-called logic of the actors, work organization, decision-making, management and planning elements employed by the peasants were selected throughout the agricultural cycle. It is interesting to compare different families and to see how organization, decisions, management and planning operate in each one, as well as to compare the management and organization of the family with that of the community and, where possible, with that of the microregion.

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6 In this instance, "minifundio" not only refers to small parcels of land, but to the logic of the peasant economy and its inability to reproduce itself through agricultural and artisanal activities.

7 It is understood that technology includes both the tools, the know-how and the practice.

The result of the interaction between production conditions and subjects' responses is what constitutes a system. Thus, a system is not only made up of the structural elements or natural conditions, but of their interaction with the responses of the social actors. The actors' responses are not an intervening factor, but rather a part of the system. Accordingly, the analysis must necessarily include both the logic of the actor as well as the logic of the structure.

To analyze the system in this way does not presuppose perfection. As in any other social endeavor, there is an upper limit. In order to analyze that upper limit, clear criteria are required to classify family types, and to compare, for example, how they use the same resources in different ways and determine the pertinent intervening factors. For this reason, in the case referred to above, a comparative methodology was used, monitoring families in five areas, in an effort to determine whether the upper limits of the system are attributable to the family's economic logic or to zone-specific variables.

In the case of the peasant family, forms of exchange and trade should not be considered external to the system. There is no way the Peruvian peasant community can reproduce itself without barter, the exchange of labor, tools, seeds and trade. Moreover, the peasant's guarantee for securing credit is based on an unequitable exchange with the merchant. For this reason, peasant production systems should not be explored only in terms of the family technical and production process, but must be looked at in terms of the four moments of production as a social process: physical production, distribution of the production value, circulation of goods and consumption. In this connection, problems also arise in defining the system.

Some solutions at the family or the farm level are conceivable, but they will always be limited unless all activities are taken into account. Even if solutions are found by attaching priority to the farm, these will never be viable unless the multiple activities of the family are taken into account.

One of the doubts about the systems approach is the fact that some researchers suggest using the farm as a unit of analysis, while others recommend the agroecosystem, and still others confine themselves to the farm production system. But the methodology, in general, is applicable at all three levels. What is important is that the level at which the institution or project is working and the main objective are clearly stated. If the focus is the farm, then basic information should be adjusted to this level, even if

information is required about the ecosystem in which the farm is located. If the focus is the goat production system, the study should not only cover the farm system, but also the integral nature of this activity in all its geographic, economic, social and technical productive dimensions.

In brief, what is proposed herein is the following: First, there are elements in the different disciplines which have incorporated the systems concept, but with different degrees of conceptual and technical development.

Second, it is imperative to recognize the importance of cybernetics in the concept of the system. It is necessary to consider very clearly all elements of contradiction (energy, etc.), and understand the dimensions of the systems approach and how these are connected and take on a personality all their own, according to the different situations and human target groups.

Third, attention is called to the three key problems (even though there are more than three) concerning: (1) the rationale and the logic of the system; (2) short- and medium-term conditions of production and social reproduction; and (3) the relationship between structure and will.

DISCUSSION

Moderator: Enrique Nolte[1]

Sergio Ruano

It is almost impossible to carry out every level of analysis to the degree required in countries such as those of Latin America, the reason being the lack of coordination between the different research institutions. Generally speaking, projects of this kind are highly specific and limited in scope. However, different levels of analysis also require different analytical methods. The depth of any analysis will naturally depend on the type of project. Familiarity with various aspects and designs is imperative.

In connection with the comments of Orlando Plaza, if a project is concerned with dual-purpose cattle, then the most serious analysis must take place at this hierarchical level, without overlooking other levels which, in some way, affect both the system and the reproduction of the system. At present, the systems approach, at a purely technical level, remains to be consolidated; therefore, its best application could consist in providing technical solutions to concrete production problems, based on the conditions and available resources in a given socioeconomic and agroecological context.

The people directly involved in technology extension programs and projects should focus their efforts on this aspect in particular, fully aware, however, that this will not change matters; another type of action, which goes beyond the mere generation and dissemination of technology, will always be required. For example, for many years potato research in Peru was confined to a variety of potato consumed by certain social strata of the population of Lima. This technology never had any practical application for many peasants in the Peruvian highland, because their rationale with respect to technology is very different. This is a perfect example of how consideration of social factors could totally redirect the course of a project.

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Otto Flores

Sergio Ruano touched on two points concerning conceptual problems. This is most interesting; perhaps because the problem with the term *systems* is that it has led to a detachment, of certain specific areas of work, from the real world and has been used for many years at a strictly theoretical level.

This is particularly clear at the teaching level. Teaching, in most cases, is concerned with discipline rather than problems, discipline which comes from books and books which come from abroad. This calls to mind an example cited by Sergio Ruano --the case of the potato. In effect, for quite some time, research has been dictated by the interests of the academics, as illustrated by Orlando Plaza. This leads us to the role of economic policy, which is so important for steering the discussion on this topic.

Unlike the white potato, wich has few eyes, the yellow potato is small, sandy in texture, has several eyes, and is not used industrially in the cities for French fried potatoes or at the local fried chicken stand. It is the white potato which has been developed to cater to consumption patterns in France, the United States of America and other countries. When potato research first began it succeeded in bringing about genetic improvements, basically with the white potato; as a result, some 30 varieties are available to us today. But some of these varieties are not very persistent and, as such, deteriorate in the field, calling for urgent technological packages, mostly imported, with products plagued with viruses. As a result, certain varieties have had to be renewed continuously, with an eye to making improvements to cater to that particular market.

Cristina Espinosa

One aspect of Orlando Plaza's position regarding various inputs is extremely important. The notion of reproduction in the campesino family underscores the meaning of the rationale of the system; the conscious objective is given in reality by a certain balance, in an environment and at a moment in which the peasant was treated with undue pressure, in response to which he invented different pretexts. This strategy included conscious and unconscious elements, which generated a series of technical, economic, social and biological elements. All these elements, as a whole, constituted a response at different levels, for achieving this reproduction.

Benjamin Quijandria

Orlando Plaza should be congratulated. For many years, existential questions have been raised in connection with the issues that he has addressed here today. While this will be discussed later on from another perspective, the real problem is that of weighting.

When a researcher in the biological sciences first begins his work, he is immediately exposed to the systems approach and discovers that it is like Pandora's Box. He comes up against a series of factors which make it imperative to weight the different aspects of his work. Invariably, there is talk of exogenous factors at work at some level, and there they remain. But often he concludes that the exogenous factor is even more important than the biological one, and that in effect is the one conditioning the system. What is more, the exogenous factor proves to be more important than the actual technology. The problem lies in recognizing this phenomenon and deciding how to proceed. That is why Orlando Plaza's proposal is so interesting, because it comes about in response to these queries.

The researcher always strives to become familiar with a number of factors which are at play influencing a given system or group of systems: ecological factors, factors associated with the high Andean plateau, factors concerning goats, etc.; but equally important are other factors concerning man, policies, and traditions. Orlando Plaza's presentation has been extremely useful in this regard, because it has helped to clear up a number of questions.

Enrique Nolte

It appears as if the ideas set forth by Orlando Plaza create a problem as to what, in practical terms, a project in systems can achieve in three, four or five years, a period of time which, by definition, obliges project participants to limit or reduce the length, depth or breadth of the analysis required to understand the system. This, in light of a complex reality which explains the reason for previous failures in the use of new technologies, for lack of an overall picture of what is happening in biological, ecological and social terms. This leads us to conclude that the reasons why a given technology has failed is that it has overlooked some aspect concerning its insertion in a given setting or the existence of previous technologies, and other similar explanations.

All of these problems can be related to the evolution of the study of the animal or human organism. Why do we study physiology? First, because of the presence of a pathology, an illness; because a disease is found. Historically, when faced with illness, man became interested in understanding how the affected part or organ worked when it was well so as to understand why it became diseased; and lastly to find a remedy. There is growing internalization of the need to understand a system, at its most basic level, in a way comparable to an aspect of physiology, before tackling the problem of the meaning of poverty, ecological degradation or technological or economic inefficiency. These problems are similar to the social pathology for which solutions are sought, such as factors associated with underdevelopment and human misery.

Ana Maria Montero

The contributions of the social sciences, specifically in social psychology, despite being few in number, concrete and specific, are elements of analysis and organization within the structures, which lead us to conclude that there are systems and subsystems. For example, elements, factors, activities and feedback processes can all be found in the community, in the microregion, even in a single family.

The social sciences, in this sense, would attempt to present a concrete plan and program, for inclusion in agricultural and livestock plans and programs. Regarding goats, for example: What work can be done in connection with Malta fever in this sector? What findings, effects, transformations, magical thoughts, primitive thoughts, popular medicine, etc. exist and have been experienced by the peasant, and how do they condition his behavior?

There are alternatives in this regard. But when a problem comes about and the structural aspect is a cause for concern, it becomes apparent that it is within the different disciplines that actions can be effective. Thus, in a research project on the psychomotor development of rural children, questions such as the following arise: Why do campesino women carry their children strapped to their backs, and why is it that children, the world over, begin to walk at age one or one and a half, while our campesino children do so at age two? What effect does this have on the future development of the cognitive skills of the campesino community? In what way does this affect production, for example, in terms of technological development? This is an example of how different areas come together and interrelate to help explain the whole.

Orlando Plaza

As for disciplinary interaction, it is important to see where the technological alternatives are headed and the possibility of analyzing them. Many of these concepts have also been developed without the need for systems. If a systems approach exists today, it means that something new is being introduced, that a qualitative leap is being made in terms of knowledge and the capacity for issuing proposals with respect to the foregoing. If this is the case, then it is necessary to discuss the contribution of the systems approach.

Ana Maria Montero

What Sergio Ruano has said is clear. The elements are always there; the human element, the technological element. The factors are always there, both endogenous and exogenous. And the activities are always in interdisciplinary actions and each discipline is capable of constructing its own evaluation tools within an integrated framework, as long as what is being proposed can be verified, tested and controlled. It is this framework which will help achieve effective integration.

Antonio Chavez

It is fitting to make reference in this discussion to some practical aspects. The forms of enterprise found in the agricultural system are both varied and complex. Still, what we call *modern agriculture* (expressed in economically viable medium-sized farms) are in fact complex systems, which are threatened or constrained by a series of conditioning factors which are not only economic and technological in nature, but social as well.

Looking at this from the practical side of an institution such as INIAA, it would be necessary to provide a technological alternative which includes, for example, qualification of a specific variety of potato, demonstrating that it is suitable not only because it is adapted to such and such a latitude, which requires such and such a soil type and temperature, etc., but because it is adapted to such and such a type of rural community with "x" amount of capital, "x" amount of labor and "x" amount of available resources over time.

All this is combined with other activities; for example, agriculture in the Central Andean region, which may be coordinated, to some degree, with

mining or artisanal activities, which differ from those of the Cajamarca area. In brief, if the objective is to provide this totally qualified technological alternative, then it is important to determine the level of analysis and effort required.

Essentially, this entails describing all the items on the menu, not only the ones that appear at this time, but the entire legacy of long years of practice in approach and ideology which the social sciences have bequeathed us and which are our heritage. Moreover, these concepts have a specific application at a given point in time. Emphasis must be placed on such questions as: What levels are we talking about? How much information is required for this purpose? This should not be overlooked.

This is a concern for INIAA, and it is obvious that in order to carry out effective and meaningful work it is necessary to address social questions which may prove complicated but which can be resolved in a practical fashion. I think it would be appropriate --although this cannot be resolved immediately-- to hold another meeting, to make concrete proposals concerning the extent of social components or social resources which an institute such as INIAA should have at hand, in order to begin, at least in some way, perhaps with macroregional programs for Andean crops, grains, and similar topics.

THE SOCIAL SCIENCES, SOCIAL SCIENTISTS AND THEIR USEFULNESS IN AGRICULTURAL RESEARCH PROJECTS: A CRITIQUE

Sergio Ruano[1]

INTRODUCTION

The participation of the social sciences in programs for generating, testing, validating or transferring agricultural technology is a relatively new phenomenon. Generally speaking, the three disciplines most involved in this process, and listed here below in terms of chronology and role, are agricultural economics, social anthropology and rural sociology.

The role of agricultural economics --the pioneer-- has been widely accepted and relatively well defined. For the most part, its findings are concrete and tangible. Initially, it assigned monetary values to production functions, beginning with previously generated technologies. Today, it participates in a much broader and more complex context, analyzing economic activity and integrating the factors of production under different conditions, and initiating the biological process of agricultural research and transfer. Its work methods and techniques continue to be employed throughout the process until its completion, at which time the impact or results are assessed. This discipline is the least polemic of the three and the most readily accepted by biologists.

Social anthropology and rural sociology are less defined and, for that very reason, less understood and less recognized by biologists. The findings of agricultural research conducted in these disciplines are less tangible, making their utility more nebulous.

In many instances, an agricultural economist has a background in either agronomy or biology; in fact, some agricultural economists are even graduates of agronomy faculties. On the other hand, almost all anthropologists and sociologists, prior to participating in agricultural

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[1] Rural Sociologist. Coordinator of the Maya Project, IICA, Guatemala.

projects, are familiar with the biological process of a plant or animal product only from the time it is purchased in the market place. For the majority, the experience is limited to tasting or experiencing such products as foodstuffs. The contribution of each social or economic discipline to agricultural research will depend initially on training, experience, ideology and, perhaps most importantly, the individual. The following are observations of the author on the major obstacles preventing the social sciences from contributing to the biological sciences. Although the critique does not apply in all instances, it does descibe the experiences of a large number of persons concerned with farming systems research.

A CRITIQUE

An extremely common error which has had a negative impact on the effective contribution of social scientists to agricultural research is to pretend that the socioeconomic methods, techniques and their results are the *raison d'être* of said research. Rather, the research they produce is based on the particular theory which a sociologist or economist masters and defends.

While it is true that the ultimate objective of agricultural research is socioeconomic in nature, the means are the domain of the biological sciences. In other words, agricultural research has been conducted with and without the participation of social scientists; the participation of the social sciences, if effective, will be to ensure that this research is tailored to the needs of the user of the resulting technology. It is impossible, then, to turn agricultural research into socioeconomic research and biologists into social scientists, thinking that this is the key to designing an "appropriate" strategy for agricultural research.

On several occasions, social scientists who form part of a farming systems or research and transfer team have been known to conduct their work in a vacuum instead of in an interdisciplinary fashion, using orthodox methods and techniques from the social sciences which are of no importance to the biologist counterpart of the so-called team. In other words, there is a rift between the work conducted by the social scientists and that performed by the rest of the group, although the explanation given most often by the social scientists is that the biologists are too narrow-minded to understand the importance of the socioeconomic variables; that they "tired" of fighting to make the biologists understand the importance of such variables, and so they quit after having concluded that

it was better to work alone and to do "something" which shows that they are actually productive, even if that something is often futile in terms of project objectives.

Wherein lies the problem? Years of experience and long hours of reflection reveal that the problem is generally with the social scientist who hopes to work within the project, as if it were a question of strictly economic, political, social or cultural research. This person turns up with theoretical experience (largely academic), and often with practical experience in research characteristic of his scientific discipline, be it anthropology, economics or sociology.

Upon integration into the work team, where others are unacquainted with his discipline, he attempts, from the start (because he is part of a minority), to demonstrate how "valuable" it would be for his colleagues to bear in mind that the social sciences have an important role to play and that their criteria are "decisive." It should be recalled that the social sciences do not produce tangible results, such as crop varieties, but they do provide concepts, methods, techniques and criteria which could be useful as long as they are in keeping with the conceptual and methodological context of the biological sciences. Because it is a biological project, the objectives will be based on biological criteria, even if the goals are socioeconomic; therefore, the methodology should be governed by biological guidelines.

Sooner or later, this situation creates a communication problem. The biologists do not attach the importance that the economists would like to their criteria. By the same token, the economists do not understand all the biological criteria (nor try to do so). Recalling that the project is a biological one, it is the economists who should find the formula for communicating with the biologists and not the other way around. For this reason, the economist must understand general aspects of the biological methods and techniques of the project, as well as general information about its nature and implications.

Experience has shown that the solution is not to be found in having the economist arrive the first day extolling the virtues of socioeconomics --the key to the success of the project. On the contrary, he should be very cautious (after all, he is the outsider) and, from the very start, analyze the project objectives. If his theoretical training does not include the biological dimension of the project, he should immediately study the pertinent subjects, so as to grasp the basic concepts. If the first stage of the project

involves a diagnosis of the work area to be able to proceed with the research plan, the worst error the social scientist can commit is to hope to implement an orthodox methodology from the social sciences or to conduct an analysis based on the methods of his own discipline.

The diagnosis, as a first stage in an agricultural research project, normally requires compilation of primary data, information from the actual farmers. If the person conducting the analysis is an anthropologist, he could serve to help improve researcher-farmer communication by way of communications or interview techniques. By the same token, a rural sociologist or an agricultural economist may be the person best equipped to design the survey, but the one most familiar with the biological variables, vital to understanding the objectives of the project, is the biologist.

The anthropologist could be very useful in interpreting the farmer's views concerning agricultural activities and then translating these views into the actual perspective of the biologist, as long as he knows as much about the technical tools of agricultural activities as the farmer and the biologist. Likewise, if he cannot tell rice from wheat and his only experience in this connection has been at a gastronomical level, then his participation and contribution run a high risk of being irrelevant. The natural tendency of the social scientist, "misunderstood" by the rest of the working group (the biologists), is to devote himself to studying agricultural aspects, but strictly from the standpoint of his own discipline. In the long run there will be sufficient information on the subject, but what is most likely to occur is that it will be of little or no immediate application in terms of the project. The report will collect dust on a library shelf, to be consulted only occasionally by students interested in the data or the methodological guidelines.

Ideology is a very delicate area, so far unresolved. First, the number of theories which focus on a single phenomenon is substantially higher in the social sciences than in the biological sciences. There are clear reasons for this. The natural sciences can be tested through experiments, and many of their derived laws are universal. In the social sciences, the interpretation of the human being, immersed in his social, economic, cultural, political and natural environment, depends on numerous circumstances, and the same is true of the perception of this reality, which tends to be partial (even though the opposite is believed to be true). Some colleagues have been known to adopt highly inflexible positions, with a negative impact on the project at hand.

In Latin America, a research program or project is normally part of a national agricultural development plan. It is important to understand that such a project plays a certain role and is one of the parts of a whole. That is, a deep-rooted agricultural problem which has existed for centuries, whose final solution will depend on structural changes, is not going to change overnight. If a project is successful, short-term concrete problems of a technological nature will be overcome, of which will bring about an improvement in the standard of living for farmers, mostly in quantitative terms. The underlying qualitative aspects will depend, in many instances, on other factors traditionally beyond the scope of the project.

When the foregoing is not clearly understood, it is very common for the social scientist to become frustrated, isolated and removed from effective participation in the tasks expected of him. Consequently, the project, which aspires to a more integrated approach, runs a higher risk of becoming the very antithesis of the desired result: traditional actions, without any farmer participation and exclusively agronomic criteria.

CONCLUSIONS

A social scientist who gets involved in a research project, particularly if the project employs the farming systems research approach (participatory), should be fully aware of the scope and limitations of the project. If this is the case, but he is lacking training in biology, he should acquire, as soon as possible, a basic notion of the science. One way, which the author believes to be highly effective, is to get involved with the biologists in their research areas, and with the farmers in the daily tasks of crop and animal management; in other words, seeking training in services so as to understand the biological process and the justification for the technological alternative.

As for agricultural research, it is important to participate actively in the entire process, starting at the planning stage. The social scientist should at least be familiar with the experimental designs, their implementation in the field, collecting data and analyzing results. This is not an easy task. On the one hand, it is imperative to know and understand the language and dynamics of the farmer's agricultural activity; on the other, it is important to know and understand the language, working methods and viewpoints of the biologist. If there is good will, after one or two reproductive cycles of the pertinent agricultural activity, then significant results should follow.

DISCUSSION

Moderator: Enrique Nolte

Orlando Plaza

A misunderstanding has arisen concerning the nature of the meeting. It is understood that the meeting is essentially concerned with the social sciences, as they apply to farming systems research. I get the impression that the paper delivered by Sergio Ruano was geared more toward agricultural research and the role of the researcher than to the actual production systems approach. Second, Dr. Ruano spoke of agricultural research in biological terms, as if agricultural research could be conceived of in strictly biological terms --in sharp contrast to yesterday's comments when someone mentioned that the painter observes people and their relationships (with nature), while researchers only observe nature. If this is true, then there is nothing to discuss. If it is agreed, from the outset, that agricultural research is basically biology-oriented (and that social scientists can lend a hand in that process to make the work of the biological researcher more palatable for public consumption), then we are simply off track.

The second question, and this is strictly a personal opinion, is that agricultural research is not only a biological pursuit or activity, but a social one. Our disciplines (be they biology or the social sciences) mistakenly approach agricultural research in a very compartmentalized fashion. Since the real world functions like a system, scientists, from their respective disciplines, must construct approximations which make it possible to understand them as a system; therefore, biologists and social scientists are in the same boat.

It is difficult to know how to manage this reality in scientific terms. It is equally difficult to assimilate the failures encountered when facing this reality as a system. In this respect, the systems approach offers us many possibilities and it should not be reduced to a narrow strategy, although it would appear that Sergio Ruano is proposing that the biologists already have a systems approach of their own. It appears as if they do not. It seems as if the term *system* is being applied to the discovery of a set of

processes within the actual discipline, but that's where it ends, although it is true that certain limits must be established.

Every approach assumes a way of reasoning and reformulating problems, knowledge and experience. This must be stated implicitly when talking about the systems approach. The systems approach is a proposal for discovering and reading the real world, without supplanting the different disciplines. Therefore, it is a field which should be constructed simultaneously by the biological and the social sciences. So if it claims to be different, what is so different about it? Ruano's critique is not different from others heard elsewhere. How can we get the peasant to accept what we believe is appropriate for him? Experiences in promotion, extension and adoption are infinite. All these things have taken place and will continue to take place without the systems approach.

For this reason, it is also fitting to ask what the steps enumerated by Sergio Ruano actually consist of: conducting a diagnosis, talking to the farmers, conducting experiments, etc. These are steps which should be imperative in different fields, for example, planning and promotion; but this is not the systems approach. This is what any organization or institution does when it becomes aware of a problem, sets out to accomplish a task and proposes an action to that end.

Now, it is clear that there is a basic assumption implicit in this formulation. It is presented as such, in a provocative fashion, to spark debate. It would appear that the proposal is suggesting that both the constraints and the prospects lie with the farmer and the farm. It would also appear that underneath all this we agree that by managing the factors of production it is possible to improve farmer and farm conditions. But this is equivalent to ignoring the logic and rationale referred to earlier and forgetting about the approach. As a result, there is a tremendous paradox, this web of conceptual paraphernalia.

The systems approach is proposed for purposes of analysis, but the action and solution proposals are disciplinary. So why all the fuss? Furthermore, they are so disciplinary that each one is given a specific role, such as the procedure to make farmers participate in the confrontation process, where all disciplines are hopefully present. The systems approach is in the development stage and it must not be confused with parallel research; otherwise it will be meaningless, and only cooperation could be proposed.

Sergio Ruano

Getting peasants to accept a technological alternative is very different from getting researchers to generate appropriate technologies. What is most important is to find a way to ensure that the researchers truly take into account factors and circumstances beyond what is purely biological, in order for the technological proposals to be accepted. The research process, from an experimental and biological standpoint, can be conducted without a hitch; the problem arises as to how to introduce the technology and how to involve the farmer in the process so that he adopts that technology. There appears to be a consensus on the first point.

This process has already been going on for 15 years, but in the history of mankind what is 15 years? At present, there is no institutional infrastructure to enable the participation of the social sciences within the systems approach to go beyond the partial aspects which I was trying to illustrate. Ideally, this participation should be much more integrated. Unfortunately, this is not feasible at present. What is ideal is one thing; what is feasible is another.

Perhaps in some cases (the universities, for example), it is conceivable to think of something more integrated; although, at this level, it is very common to run into problems in an agricultural research project, simply because of concrete needs and problems, and the very nature of academics. The systems approach can be used to conduct research which integrates all the important elements required to understand a given reality, not only some aspects thereof. Depending on the circumstances, the central level of the analysis can be the farm or other levels. This will serve, for example, to take a look at available resources and adjust project objectives.

On the other hand, the social sciences, within the systems approach, can provide a greater number of elements, a wealth of information for understanding the whole, that is, an integrated picture of reality.

Unfortunately, personal experience has shown that when people from the social sciences undertake field work in a project of this kind, using the systems approach, the final product tends to be a very pretty study, which explains a number of situations, but is totally isolated and out of context; in other words, it is of no use in terms of project objectives. It may make a major contribution to the social sciences, in terms of teaching something specific, but in the short term it provides nothing which could help study

the production system and find a solution to the technical problems detected therein.

Manuel Ruiz

Orlando Plaza has succeeded in sparking debate. He has raised two points which warrant analysis. One of them refers to the objective of this meeting, and in this connection, emphasis is placed on something Sergio Ruano said. This is precisely a meeting in which the participants, within their own projects which apply the systems approach to research (agricultural research in particular), attempt to understand the context of an expanding system. It becomes apparent, almost from the very beginning, that in addition to considering matters of an economic nature. and devoting time and energy to biological evaluation (which has traditionally been the case), participation from the social sciences is required to ensure that the technology which is going to be developed stands a better chance of being accepted by the farmer.

Empirically, the work being carried out is certainly within the realm of the social sciences and the biologists have been the first to admit it. While they have been conducting activities in this field, there is a clear and distinct need for active and effective participation from colleagues in the social sciences with practical experience in farming systems research.

Another important point is the objective of the meeting. We need to know what tools biologists use to obtain a superior characterization of the systems, to conduct a better *ex-ante* evaluation of the technology being developed and to increase the probability of the farmer accepting the technology generated. Another point raised by Orlando Plaza, which perhaps was misunderstood, concerns the diagram of methodological steps which I included in my presentation. This is simply an interpretation which biologists make of the methodological organization of their research projects when attempting to apply the systems approach. The diagram is not the approach; it only reflects the procedure; it is a general methodology.

The leaders of RISPAL's projects are fully aware of the need for more integrated methodological action and seek out the support and participation of social scientists accordingly. The current methodology plan is not inflexible and may be modified if deemed appropriate.

Otto Flores

Meetings of this type provide an excellent opportunity to establish the roles of the different disciplines. Orlando Plaza has pointed out something which, in my opinion, is very important: If the objective is to develop an approach, one task which comes to mind immediately concerns development at the conceptual level, at the level of key categories, which could lead to a better definition of the approach. It is also necessary to look at the mechanism which could facilitate this process.

If we recognize that this sequence or order is not characteristic of farming systems research (because in effect it is not) and can be found in the methodology of various disciplines, then the question is where is the systems approach headed to in terms of developing key categories and analytical tools? And if these are not developed, which points appear most promising? Unless these questions are answered, the systems approach will remain as just a need for integrated interdisciplinary work which, in the final analysis, will fail to grasp the meaning of the methodological steps vital to achieving the established objectives; what parts of the methodological framework are general in nature and which ones are specific to farming systems research? At the conceptual and instrumental levels, what areas of work are being developed in this direction?

Orlando Plaza

It happens, at times, that certain principles about society are understood, and that the researcher wishes to apply them in all instances. It is indispensable to test and verify their applicability in each case, so as to be able to apply universal findings. This is the approach at the root of all sciences. It is necessary to avoid compromising between the immediate reality, and these academic-professional statements without reflection, which is indispensable. In order to find practical solutions it is not necessary to work exclusively according to scientific principles. Scientists should not deny themselves the right to speak, because after all they do hold a professional degree, although they do not always explain the principles on which the solutions rest. This is not academic, and there is no way to be practical if reality and science are not addressed simultaneously. It is imperative to strike a balance between the practical and the academic and decide where to attach importance.

Second, the practical solutions to agricultural problems do not come about because of some thoughts generated by high-brow groups. In

effect, the identification of technological alternatives is also one of the roles of the social sciences, although not necessarily that of the social scientist. We must break with the idea of a social monopoly. When working in a team, there is a language communication problem regarding analysis and expression.

Third, we have the sequence of studies prior to the actual action. The notion of the system points to the following order: research, proposal and adoption, as if it were a mechanism, an ideal. While this is perfectly logical, the fact is it poses a problem, not for the professional or the farmer, but for the researcher, inhibiting him immediately from putting forth any action proposal which is not based on this formulation. There could equally be people dealing with a problem for 10, 15, 20 years, without succeeding in generating a proposal. The fact is, there is a sort of fence between the knowledge generated by common sense and experience and the knowledge which filters through an entire analytical sequence, and only in this way is it possible to reach the point of being able to put forth a proposal. It is important to insist on this, because in many cases the analysis and action proposal can come about immediately. If, on the other hand, years of diagnosis and analysis are required, then something has gone awry.

Otto Flores

There are two very important points in connection with what Orlando Plaza has just said. First, it is not a question of a discrepancy between theory and practice; there is no such thing as a good theory without a good experiment; theory springs from experience, otherwise it is not theory. Second, something which could be translated into a question: What does this bottom-up research guarantee? Why, if the goal is to have a physical and productive margin, is there so much insistence on the system approach? On the other hand, there is insistence about the need to go to the beneficiary directly and that it is not a question of the biologist telling the sociologist that questions and personal opinions will crop up which are influenced by the system or viceversa. It would be fitting at this time to insist that the problem first be defined on the basis of specific cases. A look at the problem will already make it apparent who should take part in the research, be it an animal specialist, a biologist, a geneticist, or an economist. Is it not the problem which will help resolve which disciplines will be needed?

Raul Hopkins

In the field of agricultural economics, the first author to write about systems was Chayanov, at the beginning of this century in Russia. The experience of this economist is extremely interesting. He devoted almost all his life to analyzing agricultural problems, but curiously enough, he was also a scholar, working in extension agencies, in direct contact with the farmer.

In this sense, what he developed and left us as a legacy is extremely valuable. He tried to develop an analytical tool for understanding reality. He proved, by studying agricultural problems, that an approach concerned with the interaction between the different elements of the farm and between these elements and the outside world, was vital to understanding and designing working tools. He later developed a plan which appears in his books. His approximation entailed working with production systems in a rather intuitive fashion, which may have been justifiable in his day, but is less so in ours.

If the objective is to develop a theory about systems, then we must follow in Chayanov's footsteps. For him, for example, the family and its consumption needs are at the center of the farmer's decision-making process. On the basis of labor resources and consumption requirements, he integrated the different elements of an entire production system. His strategy, in terms of method, was extremely interesting: Once the general plan was drawn up, he began to develop, chapter by chapter, the different interrelationships, until he arrived at the ensemble of technical relations, the management of agricultural relations with livestock problems and the set of factors which should be taken into account. Works of this kind should be continued.

At the same time, it is necessary to establish certain critical areas,with an approach which prioritizes the interactions between the different components. Here, an interdisciplinary approach would be fruitful. There are some areas where disciplinary division and integration are an absolute requirement, but there are others where this is not the case. It is necessary to determine in which areas the systems approach could make a contribution and in which areas it is of no consequence.

Mercedes Bracco

It is fitting to underscore something which was said about the projection and expectations of the family, as concerns production. In this sense, systems are not uniform. By the same token, it cannot be said that it is impossible to work with such and such a type of farmer, or with a specific system, for lack of conditions ideal for farming systems research work; for example, the size of the family or the level of formal education, which prevents a more fluid transfer process. If emphasis is placed on the dynamic factor of a technological change, thought should be given to developing technologies which, in some way or another, can bring about a change in the system or influence a change in the transfer process.

Sixto Ibarra

It is necessary to find alternative applications of the systems approach in practical terms, to be able to make a better contribution to the social and economic development of the agricultural sector, a form of development where man can realize his potential as a human being. To state that some research carried out in the field has had only a modest impact, and that this is the generic response, is to judge too precipitously.

Instead, we must recognize that this is only the initial phase of a research process destined to identify probable causes which have existed and may continue to exist, is why concrete solutions have not been proposed.

Occasionally, studies of a biological and social nature are conducted, but unfortunately the transfer has not been effective. In the case of CIPA, for example, the extension agents were assigned middle-management staff without sufficient training or transfer capacity, and the result is being looked upon as a failure. Ultimately, the failure is not determined by the person who effects the transfer, but by the policy employed, using only mildly effective elements, largely incapable of reaching the farmer.

There are other examples of generic research in different fields. For example, a biologist undertakes a study on parasitosis. He determines its incidence and establishes certain quantities, but he does not succeed in proposing modifications or recommending norms for resolving this problem in the future. So, as a basic science, the problem has been identified, but there has been no attempt to tackle it. From this perspective it would appear that too much attention is attached to existing problems.

Perhaps now we are beginning to witness a process of seeking some system with interdisciplinary participation to conduct a more real, effective study and to provide better answers for the farmer.

Another vital aspect is the importance of government rules and regulations and policies. If a good dairy policy is adopted, this will undoubtedly improve all the systems and improve the social and economic conditions of the farmer. But a subsequent poor policy can undo all this. It is fitting to ask oneself how to achieve this progress; what are the mechanisms, the channels, for achieving these objectives? It seems that this is what is most lacking at the national level.

Another example: The university researches what it deems appropriate and not necessarily what is of concern to the nation. This could be entirely divorced from what a development policy should be, laying down general guidelines for the entire country. There must be established policies which are adequately associated with the research. On one occasion, in the University of Ica, a proposal was made so that INIAA would assume this normative role of research planning, and the universities would implement these programs. The proposal was accepted, but coordination and planning never took place. Apparently, this divorce frequently exists and perhaps this phenomenon is responsible for creating the problems which continue to be considered. There must be coordination, a definition issuing from the government, based on its policies and research systems, to truly reap the benefits from any changes which may be formulated.

Sergio Ruano

There is a big difference between what one would like to do and what is feasible. Every aspect of agricultural research is subject to financing, which in turn is based on general policies and specific initiatives. The research institute is normally attached to a ministry, as is the case with several of the RISPAL projects. What happens here depends on what is programmed in connection with these conditioning factors, which in one way or another impede the full development of the different disciplines. It is important to really know where participation can take place, given this series of constraints. It is also important to make the distinction between the academic and the pragmatic; both aspects must be joined in order to generate useful products.

Orlando Plaza

At this stage in the meeting it is fitting to ask: What do we achieve by defining the participation of the social sciences? This is not clear. Not at a personal but at a metaphorical level, what is it that one offers the other which makes the other have to define what in fact he is being offered? This also is unclear, because there is no understanding as to what is being offered. An approach? A prescription for how to implement development projects? A methodology for working with peasants or enterprises?

If these questions are not cleared up, then it is unrealistic to expect definitions. It is one thing to have a notion of what an animal expert can do in a given situation. It is another to have a notion of what the sociologist can do. There are a number of things which the social sciences have to offer in terms of the specialization of the social scientists: socioeconomic diagnoses, an understanding about peasant communities and the rural sector; in short, methodologies for analyzing processes, methods for systematizing data, capacity for team interaction, etc.

If a list were to be drawn up, then the social sciences would clearly have a lot to offer. What is not understood here is that the concern appeared to be to try and understand how viable and how useful they could be; not in academic terms, because often, as Oscar Wilde suggested, what is academic is interpreted as being useless ("beautiful things are useless"). The academic is beautiful, but nothing more. But it was understood that what we were trying to do was to establish the importance of this focus beyond the actual discipline.

RISPAL's concerns are fully justifiable. But there too, doubts remain. Raul Hopkins was on the right track by identifying critical areas which allow for interdisciplinary approaches. This is an excellent starting point, even for RISPAL.

THE AGRICULTURAL ECONOMICS VIEW

Raul Hopkins[1]

The majority of the studies conducted in the agricultural sector (4,000 published works between 1950 and 1982) have been carried out by economists; some have been outstanding, and constitute a kind of research model. The development of agricultural economics in Peru in recent years and the success achieved by the works of Figueroa, Gonzalez de Olarte, Maletta, and Amat and Leon, to cite only a few, are due to the transition from an impressionistic and intuitive discipline to an increasingly analytical one. There may be other reasons for the advance of agricultural economics, but its greater emphasis on rigorous and analytical work has been key.

During the 1960s and early 1970s, social science research on agricultural issues tended to be extremely ideological, dictated by the researcher's own value judgments. At that time, the land tenure issue was considered Peruvian agriculture's number one problem. Rapidly, agrarian reform came to the fore, and what was once an extremely ideological approach to the problems plaguing the agricultural sector began to crumble. In frustration, some researchers began to propose a new, more modest strategy for this intellectual undertaking.

Adolfo Figueroa took eight communities and devoted several years of study to gain a more scientific understanding of how they actually functioned. Subsequently, in fields such as the peasant economy, agroindustry, agricultural policy, and credit, more specialized studies began to shed light on different aspects of agriculture in Peru. The most successful were those with clear goals and theoretical frameworks. Theory is nothing more than a set of categories that help order this extremely complex landscape which is the world, establishing a hierarchy which serves to understand it. When experimentation was unsuccessful, these relatively specialized studies make some headway.

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Behind the evolution in agricultural economics is the parallel work being conducted at the academic level. Hector Maletta, for example, would not have been able to study Peruvian agriculture over the last 30 years if he had not first established an understanding of the Marxist framework. By the same token, Jose Maria Caballero would not have been able to write a series of specialized discussions without years of reflection on agricultural economics and theoretical frameworks. And Manuel Lajo would not have had the opportunity to formulate a series of questions concerning the implications of agroindustry for agriculture had it not been for the literature published internationally on these subjects. If an economist does not take stock of what has been achieved in agricultural economics, then he/she will not be able to conclude that specialization has indeed been advantageous and has served to overcome the excessive ideologization previously prevailing in the social sciences.

From the point of view of economics, different levels of abstraction may be used. Two examples are partial analysis, or partial equilibrium analysis, and general equilibrium analysis. For example, the majority of analyses of agricultural supply, demand, etc. are partial equilibrium analyses, which enable us to see more details about how the farmer reacts to changes in economic variables which are otherwise lost if the system is looked at as a whole. By calculating elasticities, greater clarity and precision is achieved, but at the expense of more global interactions. On the other hand, analysis of a system in equilibrium requires simplifying some things which could be explored in detail only in a partial equilibrium analysis.

To illustrate, Adolfo Figueroa studied the peasant economy, along with Efrain Gonzalez. The two used the input-output table as an analytical tool --useful for studying systems. The table also serves to establish relationships between factors, between different sectors, and to establish, with precision, the links between different activities. However, the table has its limitations; for example, it is inappropriate to draw conclusions on the basis of each one of these interrelations. And it is for this reason that Adolfo Figueroa proposed the input-output table to see how the different components of an agricultural activity relate to one another; it can also be useful for analyzing another system, as in the systems approach.

But there are other topics which Figueroa addressed without using the table, because an input-output analysis only treats the relations between subsectors at a given point in time; time-series analyses are not possible. Other parts of his book discuss more qualitative aspects, such as analysis of seasonality or risk behavior, but he addresses them separately. Among

agricultural economists, a method often employed is the clear definition of the phenomenon we attempt to explain and, on this basis, the design and development of analytical tools.

If a research strategy has been relatively specialized, why should we show interest in the systems approach? Might it be necessary to resume the discussions supposedly already concluded in Peru? Is there a danger that the indiscriminate use of the term *systems* will lead to less rigorous work?

For example, students have been known to present a work carried out with the "systems method." What is it about? What are the hypotheses? What is the theoretical framework and which are the indicators? "It's all interrelated," they say. There is a risk here, but one worth running, because, along with the progress which has been made in agricultural economics, there are also major constraints. That is, even though major strides have been made in agricultural economics, there is still an appreciable gulf between field work and the work being conducted by some centers or government planning offices. As a result, researchers are blamed; while some responsibility is certainly theirs, also to blame is the work style or approach which has been developed. Specialized work has its advantages, but does not allow application of economics in the broadest sense. Work with the systems approach can help overcome these problems, since it is much more linked to reality as a whole.

On the other hand, there have been and continue to be problems understanding the economic constraints affecting the farm. Economists have dealt with topics they know too little about; their specialized approach impedes understanding other aspects of reality which have not been addressed in depth by the discipline. Generally speaking, economists, when working in specific environments, always assume that certain characteristics are given. Oftentimes, this is not the case. They often assume, for example, perfect information --that the public is familiar with the changes in the range of variables; or they assume the non-existence of externalities (links or transactions of a specific type which operate between the agents but that are not market-dependent). However, in the case of the agricultural sector, they often the lack perfect information, and externalities are notorious.

There are three aspects of peasant economies which merit a systems approach. The first is risk. In agriculture the farmer has limited information about variables such as natural settings, prices, and demand for products.

Moreover, he is usually unaware of the government's objectives. This uncertainty arises in a world hungry for information. Here, interdisciplinary work may be fruitful, because these factors are not exclusively of an economic or biological dimension. Instead, they are concerned with aspects involving the farmer's overall strategy.

A second area which has already been cited in this meeting is the problem of dynamics, illustrated, for example, by the importance of seasonality. Chayanov refers to the dynamics of the life cycle; but there is a vacuum in terms of dynamics throughout the year. This is also difficult to understand via a single discipline; a series of elements --rituals, cultural and organizational aspects, migratory issues-- overlap, and a pertinent model, constructed with the joint participation of different disciplines, would be fruitful.

The third point is the link between the organization and characteristics of production resources. Traditionally, at least in Peru, resource management and organization have been dealt with separately. Nevertheless, there is a close link between organization --for example, that of the community-- and the requirements of the production process. That is, organization has not been purely subjective; instead, it has been evolving in response to the requirements of the production process. At the international level, this is another path being explored. It demands interdisciplinary research , and the sociologist or economist must turn to the technician in the agricultural sciences and learn about the requirements of the production process; likewise, the technician in agricultural sciences should explore the forms of organization best suited to specific requirements.

DISCUSSION

Moderator: Enrique Nolte

Otto Flores

There are other points which could be raised in connection with the more general aspects, particularly in terms of policies concerning technologies, technology generation and technology transfer, on the one hand, and pertinent economic policies, on the other. It should be mentioned that, following the Peruvian Agrarian Reform of recent date, land ownership has been restructured in terms of cooperatives, followed by parcelling. How would these events constitute a demand for technology? The technology generation and transfer system is a field with several points worthy of discussion and study.

The techniques are provided by social psychology and sociology, and need only be adapted. For example, when questions are formulated to compare fatalism with an orientation toward the sciences, a survey may be conducted asking the respondent "You think it is necessary to believe in God in order to produce good crops, don't you?." Such a question leads to an affirmative answer. However, these questions can be posed in such a way as to generate either a negative or affirmative response, in which case the responses are measured with a battery of crosschecks. Obviously, the survey is not going to measure fatalism with one question alone, but with several along these same lines. Values can be assigned to the responses, which will later be analyzed with the aid of a computer.

This is not all that difficult if first the interviewer becomes familiar with the community (by using anthropological methods), and community leaders are consulted once a certain degree of confidence has been won. The respective tests for validity also have to be conducted.

Cristina Espinosa

Experience dictates that it is often preferable to pose open-ended questions, because language is tricky in that it can condition the response or make the response biased. The problem with open-ended questions is that they give rise to such a wide range of responses that the tabulation

there of is much more arduous. On the other hand, in some cases, they may prove more effective in providing a more realistic picture. In any case, caution should be exercised when fixed-alternative questions are posed.

Ana Maria Montero

The subject's attitude with respect to real objects or phenomena is extremely important, because this includes affective components which may be measured by his opinions and beliefs about reality. Moreover, there are concrete objectives in cognitive components, sensations and perceptions which the farmer has with respect to his beliefs and which imply reaction times when facing the possibility of modifying or changing some of the components of his behavior.

The point raised by Otto Flores concerning attitudes is reminiscent of the works of Ruben Ardila and Rodriguez Aroldo of Brazil, which are concrete case studies of realities similar to those of Peru.

Benjamin Quijandria

It is important to deal with the specific problems of representativeness and sample size. In the United States, it is not uncommon to work with samples of 1200 persons who represent a population of 200 million inhabitants, and which nevertheless show an error of only 3 to 5 percent. This must be accompanied by a referential baseline, from which a projection is made according to the sample's specific characteristics.

The National Institute of Statistics has reliable data in some areas, based on a sample framework which has been extensively discussed and tested. It is extremely important to conduct a horizontal study with a sample framework and an in-depth study, so that the two can be combined.

Ana Maria Montero

There is a methodology for selecting subjects and there are instruments to help conduct an investigation, verified with hypotheses and statistics which respond to nominal variables, in the field of the social sciences. That is, there are procedures for analyzing these data with a computer, even if they are scant, and obtaining meaningful results.

We must also mention technology adoption by the farmer. Even though the primary objective may be to assess the efficiency of a technology which is going to be transferred, it could also be interesting to know how much of the technology already possessed by the farmer can besalvaged. For example, perhaps more importance should be attached to beliefs such as that which say that, when birds start to nest, more rainfall can be expected.

Otto Flores

It is more than a simple belief. That association of ideas has a scientific basis, although unknown to the farmers. There are countless other examples, for instance, the belief that the presence of certain insects predicts whether or not there will be frost.

Sixto Ibarra

In the field of poultry veterinary science, the effect of light on the maturation of the ovary is common knowledge, and it is used to speed up the onset of the egg-laying process. Thus, nesting is a response to changes in the environment and these changes may be associated to the nearness of the rainy season. Perhaps these beliefs have not been studied in sufficient depth, and many may prove to have a scientific basis.

Manuel Ruiz

It can be said that the farmer is aware of the problems, but it is the scientist who can help him in finding the causes of those problems. The evaluation criteria of a group of social scientists could serve to define the nature of the problems perceived by the farmer. What remains to be defined are the actual social evaluation criteria; it does not seem wise to leave this task to the farmer.

Otto Flores

If the farmer defines his needs, then the social scientists can define the measurement variables. This is essentially a technical task which focuses on the actual problems and on defining the research teams in response to these problems, rather than the other way around. First the problem, then the discipline.

When speaking of problems, it is imperative that the farmer take part; moreover, when speaking of participatory research, the most brilliant contributions may come from the farmers themselves.

Raul Hopkins

Concerning methodologies, it is necessary to recognize a certain degree of disciplinary specificity. The likelihood of helpful generalization is much greater in some fields than in others. In terms of sociology, not everything which can be generalized is necessarily valid.

LESSONS LEARNED FROM SOCIOLOGICAL RESEARCH WITH A SYSTEMS APPROACH

Cristina Espinosa[1]

This paper deals with experiences in rural sociology conducted over the course of two and a half years in the Small Ruminant Collaborative Research Support Program (INIAA/University of California Agreement). Its focus is twofold: first, the contributions which the social sciences can make to the systems approach; second, the contribution the systems approach can make to the social sciences. The advantages of holistic training in the social sciences include rapid understanding of the whole problem to be tackled, integration of the social scientist, and enhanced understanding of and interest in how other disciplines work in a multidisciplinary project.

The systems approach made it possible for the author to overcome certain language and communication barriers, crucial for understanding the production process as a whole. It also made it easier for her to place the reality and context in a conceptual framework, thereby making it easier to interpret scientific aspects and their impact on the farmer in his family, community, local and regional contexts. It proved to be superior in problem solving to other theoretical frameworks, methodologies and approaches, which tended to constrain or fragment reality. However, the systems approach occasionally promotes an overly self-critical attitude. The disadvantages include the unnusually wide scope of the field of study, as well as difficulties in formulating hypotheses with clear-cut variables, and which may be contrasted empirically. In other words, it creates an aversion to reducing phenomena which then tend to be seen in very complex terms; there seems to be a fear of oversimplifying situations.

The author's first contact with the systems approach was through flow diagrams, an experience which might have been traumatic. However, despite negative first impressions, it was possible to postulate that social phenomena include production variables, not just what is usually typified as social: health, family, age, etc. In this sense, the systems approach made it possible to understand that social reality has different dimensions,

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a point raised by Orlando Plaza when he attempted to illustrate how the sociologist operates. While our colleagues in the field of agroecology look at variables such as rainfall, soil type and a number of other very objective parameters readily quantifiable, the first thing the sociologist thinks about is the farmer's relationship with nature.

A system is a composition in which man is part of nature, and his interaction with nature is something which has been inherited from his ancesters (for example, predicting the weather, as noted by Otto Flores). This is clearly illustrated by an experience in Huancayo, where farmers, by observing the snow-capped mountains, can tell whether or not it was going to be a good year; or by counting the phases of the moon are able to determine the best days for planting.

Phenomena which people in the biological sciences might associate with ecology proved to be valid empirical knowledge which was part of a whole, a way of seeing the world, and also reflected socialization processes learned from childhood and transmitted from one generation to the next. Then, there is the technical and productive level. While the agronomist is concerned with crops, per-hectare yields and other specific details, the first thing the sociologist sees is how the man, the farmer, organizes a series of efforts and resources to carry out the production process. In the case of the Andean farmer, there are many complex aspects which need to be studied; he not only risks resources which are available at the family level, he also deploys an entire network of interfamily relationships in order to supply the needed labor. At the same time, as a member of a community, he has access to resources granted to him by the community in exchange for services and obligations.

The socioeconomic level is a rich source of knowledge because it enables the sociologist to see, firsthand, that the rural family has characteristics all its own. On the one hand it is a nuclear family, but over the course of the life cycle, it is also an extended family. When the family is first formed, the young couple lives with the parents of either the bride or the groom. With the years, the couple becomes more independent and moves into their own home. At the end of the life cycle, when the children marry, the parents serve as a support unit. The children may go to live with them. It is important to see how the composition of the family changes throughout this process.

There is also a certain logic with respect to the organization of labor in the family. In many cases, labor is a limiting factor in family production

systems. But analysis of the number of children reveals that there are one or two youngsters in the city, studying or pursuing some other activity. Why? One, because of expectations, and two, because the family unit cannot keep up the costs of maintaining them at home. What follows is an "expulsion" process, whereby the children leave the house to ease the burden of these costs. Moreover, public education, already relatively widespread throughout the country, implies new values, innovations and expectations which affect not only children but also the parents and, consequently, Andean or traditional culture as a whole.

At the ideological, cultural level there is a series of subjective dimensions in terms of expectations, on the one hand, and values and norms, on the other. Social conduct is closely monitored, particularly in the communities where there is a very clear code. These factors interplay and enhance our understanding of how rural groups confront reality. It is common to observe a series of processes and their interconnections. In the final analysis, the campesino carries out the production process as a basic part of his survival tactics; this is what is known in sociology as the reproduction of the family, because it reproduces itself at the material level; it reproduces its own living conditions; it reproduces socially as a unit and as an organization, and it reproduces itself at the demographic level. These different activities, resources and resource management skills are a central part of the reproduction of the rural family. Thus, the social component should not be seen as a compartment; rather, it allows for the interpretation of reality in a social dimension.

Reproductive behavior can differ, depending on the way resources are allocated and overall family strategies. Therefore, reproductive behavior cannot be studied in a deterministic manner because there is a social dynamic inherent in these processes, in which several factors exist that explain why families A, B and C, who start off with similar resources, eventually head either for disaster or for accumulation of wealth and a better life. There is also a need to identify the different production systems and subsystems at the local level, once appropriate criteria have been established. A first division would be the mixed systems, the livestock systems, the crop systems, and the agrosilvipastoral system.

There are few problems associated with approaching the study via a classification of goat or sheep systems, etc. But when conducting the study, either in communities in the highlands or in a goat project on the northern coast, it becomes evident that within each system and each zone there is an overlapping of situations with different subsystems. This

suggests that it is feasible to establish clear and distinct guidelines for identifying these subsystems under specific ecological, social and economic conditions. This could lay the groundwork for extrapolating certain results, which, in the case of Peru, would be essential, given the variety of deep-rooted agroecological, socioeconomic and cultural environments.

If the dynamic survey is taken as a reference, it will serve to identify variables at the technical, productive, and social levels, which make it possible to reconstruct the logic of the systems and formulate an alternative during the follow-up; in other words, these variables oblige us to discuss and define the relationships and limiting factors. At a more advanced level in the basic characterization of communities, a disciplinary study could be developed; disciplinary, because what is proposed is an effort to better understand the families' survival tactics within a characterization of production systems.

For purposes of illustration, several studies of mountain communities in Cuzco were combined. Previous classical diagnoses already existed, and a static survey was conducted, exploring in great detail technological and production variables such as crop type and labor (family, reciprocal hired, female, child, etc.). The static survey gathered information concerning expectations about the production processes and living standards. Also included were life histories of three rural families. Unfortunately, there were barely two months between the end of the field work and the submission date of the report, which marked the end of the systems work. One conclusion is that certain means and human resources are still lacking, because it was impossible to be more precise or to process all the data collected. However, preliminary analyses constitute the basis of the presentation which follows.

The study tried to analyze family strategies by breaking them down into production strategies, demographic strategies and purely social strategies. The study of the production strategies was complex, as it included individual cases with 25 farm plots and even as many as 32 farm plots, different crops, and different management techniques for crops with parallel cycles. The study centered on production strategies, combined with life histories and expectations. Some preliminary conclusions were drawn, including the fact that inheritance was not a determining factor, as was thought initially.

Without entering into descriptive detail of the system, it was evident that some people had started off with a disadvantage and later succeeded in turning their luck around; these peasants were extremely dynamic. Migration appeared to be an important socialization process. Formal education, by contrast, did not seem to make a major difference, since those enrolled only reached the first years of primary school; apparently neither schooling nor number of children was of any relevance. Most striking was the growing rural-to-urban migration of young family members with very clear-cut expectations in terms of living standards, whose parents also did not want them to be farmers.

This was confirmed in the northern coast and in other locations, and it is very important because we are talking about a second generation which will no longer master skills such as managing nature or production processes, but instead will have their eyes on the city, whether or not the city is capable of absorbing them. Something which was expected was also observed: There is an intermediate group of farmers --intermediate in terms of the level of technology-- who have the greatest potential for advancement and innovation.

The foregoing illustrates how the social sciences can contribute to systems research. But it is also important to see that the systems approach is of great help to social science research in the agricultural sector. First, when assessing the merits of agricultural research in the social sciences, there is a consensus that it is necessary to look for a typology in light of the heterogeneity among farmers, and to establish guidelines for arriving at this typology. On the other hand, there are case studies which require more extensive knowledge of the interaction between livestock and crop production. Many studies in agricultural research focus on crops and ignore livestock production. They are also studies which, despite providing a theoretical framework, have not generated clear crititeria for identifying differences.

Initially, attempts to explain the differences in farming practices via production-oriented parameters were unsuccessful. Using factors of production did not enhance the ability to discriminate different systems because, generally speaking, it can be said that all farmers, to varying degrees, establish the same type of production relations. There are researchers who use market-related criteria as discriminatory factors, but this is an exogenous, insufficient approximation. The typical grouping of poor and rich farmers is useless. Experience has shown that production systems research is not only a holistic approach which helps

interdisciplinary efforts, it also leads to the development of clear-cut discriminatory categories which make it possible to classify farms and to generate technology that can be extrapolated to analogous regions.

The author's experience has shown that there are four or five criteria which serve to classify systems. One is the greater or lesser role of livestock production as a complementary activity; another is the use of family, exchange or salaried labor, as the case may be. Another is the greater or lesser level of technology use in agriculture; yet another is the time devoted to non-agricultural activities, which either results in greater accumulation of wealth (i.e., farmers who may have a certain amount of equipment, or additional activities, such as a truck or a mill). Then there is also proletarization, peasants who are so poor that in reality they form semi-proletariat. The last criterion depends on the degree to which an agricultural system is market-oriented.

By combining these criteria it was possible to establish three production systems in each community. The case of Puno was different because the ecological factors were much more influential; there, the alpaca-sheep system predominated at higher altitudes, while the sheep-alpaca system predominated at lower ones; a third system consisted more of services and diversification, where agricultural activities had a complementary role.

The most effective work can be achieved at this level, demonstrating what the systems approach has meant for the agricultural research as a whole in the country. Moreover, systems research does not isolate each discipline, allowing them to become part of an interdisciplinary group whose members approach their work from different angles, but with a single objective. At the same time, it is necessary to maintain disciplinary research alongside interdisciplinary work. This proposal is a new one, because it prescribes a different way of doing social science research, in the sense that a different set of problems are addressed and an effort is made to combine methods which have been used in other disciplines to achieve more concrete objectives, while working with several dimensions simultaneously. This is quite difficult, and will require more time, discussion and reflection.

The idea is the following: There are certain variables which serve to classify systems. So in a given sphere, first we identify systems 1, 2 and 3; then we reconstruct the logic of systems 1, 2 and 3, and define the limiting factors for each of the three systems; lastly, we propose a specific alternative for each case. In other words, these are discriminatory criteria

for identifying systems in a local, concrete environment. For example, when analyzing the agroecology of a site, it turns out that there is no homogeneity among systems. One might think that because we are studying just a village or a province that we are dealing with only one system, when in effect there may be more than one. This calls for an explanation of the differences in the village or province, avoiding simple classifications based on single categories, such as large and small, rich or poor farmers. At this stage, the five criteria enumerated above could be applied to interrelate and distinguish the differences inside the target area.

Since we are working with several variables, it is best to begin with questions to the people at each of the project sites to become familiar with each case: how many have mills, who has cattle, etc. It could happen that the ones with mills have next to no cattle, but they do conduct commercial agriculture; a subsequent step would be to identify characteristics and compare and contrast, crosscheck and classify data.

DISCUSSION

Moderator: Enrique Nolte

Benjamin Quijandria

There is a study by Jamtgaard which simplifies cluster analysis for generic classification of all rural communities. Part of the analysis leads to some of the same conclusions drawn by Cristina in her work. There were two important aspects: One was to identify systems in different agroecological environments, which was relatively simple: an alpaca production community in the Andean tundra and a goat producing community in the desert, with a mixed agricultural community between the two. The other was to look at the particular ecological unit, in order to make distinctions within that unit. Some of the criteria published by Jamtgaard in this cluster analysis are still pending, although all the information is available. A preliminary analysis has been conducted, but remains incomplete.

Jamtgaard used a series of observations in the domain of all rural communities in Peru and some of the criteria employed in the cluster analysis were found to be useful in helping to distinguish between rural communities (for example, he selected key crops which only grew in certain agroecological strata. Some of these criteria were extrapolated to the level of the family system --not the community system-- producing seven elements which clearly help characterize) the systems. This served to identify three strata in the majority of the communities.

Stratum I is characterized by its agricultural activities, accumulation of wealth, and availability of services. The farming conducted here is known as intensive agriculture because of the presence of a tractor, a mill and a truck. There is limited livestock production and hired labor is employed; in some instances, the farmer has means which appear to be superfluous. A total of 25% of the members of the community enjoy this privileged status. The farmers in this stratum have technology and use it; interact with other systems and share resources "fifty-fifty." They also use fertilizer and provide land and inputs, while other community members provide labor. Stratum II is that of the typical community farmer who pursues both livestock and crop production with the same intensity. The level of

technology in this stratum is intermediate; association with other activities is linked, in general, to small business, but the central activity is crop and livestock production. Stratum III is characterized by the proletariat community member, with little land of marginal fertility. In many instances, he has a limited amount of livestock and works in the systems described above. The better part of his income is generated by his services as a day laborer for the community members in Strata I and II. In any case, the target group would be the community members in Stratum II, first, because they represent approximately 80% of the community, and second, because they are truly devoted to crop and livestock production. Stratum III is made up of hired day laborers who continue to be rural proletariats. The farmers in Stratum I have already crossed over the poverty line. They are familiar with different technologies and use them.

Cristina Espinosa

These conclusions are very important because many projects go to the community and select leaders to work with who are generally from Stratum I. Therefore, what the project does is reinforce the inequalities, consolidating those who are more powerful and accentuating the poverty of the other two groups. For this reason, it is necessary to identify these differences within the community or within a region.

Raul Hopkins

Some years ago there was a very heated debate about the unit of analysis, and whether that unit should be the farm or the community. The issue was addressed in academic terms but the implications were obvious: When planning extension work should farmer types be taken into account, or should the strategy be geared towards communities or other criteria? In the case of the IEP[1], individual farms have always been the unit of analysis. In light of her experiences, what are Cristina's thoughts on the subject?

Cristina Espinosa

Rather than opposition, there is complementarity. The unit of analysis should be the farmer, with the understanding that he is the community member with access to resources and a cultural heritage and an organization that protects and represents him. Moreover, the relationships

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[1] Instituto de Estudios Pecuarios, Lima, Peru.

established at this level are interfamily; in the final analysis, everyone is related. Therefore, there are very close and very strong links. It should never be forgotten that these people are part of a community. And it is very important to view the community as an entity. If, as a unit of analysis, the researcher studies three farmers, without forgetting that they are members of a community, when it comes time to carrying out the extension work he could go to the community knowing that A, B and C do exist; however, it would be a mistake to conduct that work on an individual basis. It is also necessary to reinforce community organization without losing sight of the fact that differences do exist and trying not to accentuate them.

Sergio Ruano

One of the major contributions of the social sciences to agricultural research has been to identify different aspects to be taken into account, as well as to classify farming systems. This typing is extremely valuable when deciding which technology is best for a given system. There is a direct relationship between farmer type and production system. Typology is equivalent to recommendation. There are two ways to define this. One is to conduct an exploratory study, looking for determining elements to arrive at types; then functions are defined. An easier way, which involves interdisciplinary action, is to look at the production system.

A system is always made up of subsystems. The unit of analysis, in this instance, can be an agroecological zone. The researcher studies the different systems and subsystems, the relationship between them, and how they may be grouped. For example, if, in the majority of production units there is a combination of subsystems such as potato, oats and sheep, but there are some who have wheat and dairy cattle, then it would be necessary to see what it is that determined this variation. Why do some produce dairy cattle and more wheat, and others potatoes, sheep and oats? This would reflect a number of circumstances.

Cristina Espinosa

The problem is that in most cases, even in the case of goat production, which constitutes a system different from cattle production, there are also several subsystems; so this proposal would be aimed at working with subsystems.

Benjamin Quijandria

We find as many as four subsystems in the goat farms in sparsely inhabited areas, in environments characterized by natural shrub ranges. The same components are observed in all four subsystems. There are goats, dry farming and salaried work outside the farm. But variations of the latter can modify the scheme entirely. Thus, in this zone, we find agricultural cooperatives created by the Agrarian Reform; we may have the case of a cooperative member who has some money, who works from five in the morning until two in the afternoon as a cooperative member and also has goats. The way in which he manages these goats differs from that of his neighbor, who only works occasionally on the cooperative; but this man also has goats and other animals. As it happens, the cooperative member doesn't aspire to having a bigger herd than the other fellow, because his needs are less pressing.

The other, however, is a man who lives exclusively from goat production and the sale of his cheese; he tends to his herd more intensely, because he is more dependent on that herd. There are several works published on this issue, such as the doctoral dissertation of Avi Perevolotski, where nine systems were established originally. Some time later, Roxana Diaz wrote a master's thesis based on a static diagnosis; she reduced the division to six systems. The final follow-up work reduced the classification to four systems.

What Sergio is showing us are the steps which have been taken in this regard. But there is one variable which has hardly been touched, and that is time. In the past it was very time-consuming to construct a data base. Now this is being achieved with increasing speed. This is interesting, given the fact that Peruvian agriculture is so complex.

Sergio Ruano

To continue with the case of Peru, it is very interesting to see how, at times, a single species, be it corn or beans, can be managed in some zones or areas under four different ways on less than a hectare. Why? There are market, climate, soil and consumption reasons. Furthermore, consumption embraces not only actual intake, but also beliefs in food combinations which tend to have a scientific basis and a logic. Yellow, white, black and red corn is grown; it has been found that black corn is planted in less fertile areas, because it is quite sturdy and is better adapted there than other ecotypes. It is not unreasonable to see these people

eating a plate of black corn and white beans one day, and a plate of yellow corn and black beans the next. This leads to a myriad of dishes, meals and combinations.

Benjamin Quijandria

In the mountain communities in Peru, we have the case of agroecological strata management. In fact, it is not uncommon to find up to four well-defined agroecological strata among the group of farm plots managed by a single family, beginning at 2,500 meters above sea level with corn, then the intermediate layers with grains, then the third stratum with integrated Andean crops and lastly the upper part, the tundra, with bitter potato crops. There are parts which have a little of each thing, and if it doesn't work well it is because the river is dry. You can imagine the problem of monitoring situations such as these, and the concomitant problem of economic analysis. Another aspect which has attracted a lot of attention is the fact that the technologies are effectively employed. All of the crops produced for consumption are purchased, and in the case of potato, what is most interesting are the mixed plots, where we find different species growing at the same time.

Manuel Ruiz

A question comes to mind in connection with this point, regarding something that was mentioned earlier which Cristina Espinosa stressed considerably today --that is, the family's desire to send the children to the city. When this becomes widespread, the family is eventually replaced by another family migrating to the region. Or is it that one child is left behind and appointed to continue the family's farming activities? In any case, this is a problem because research must ultimately lead to technology transfer. But if the family does not remain in one place, there could also be difficulties in terms of the continuity of the transferred technology.

Cristina Espinosa

The reproduction of the family requires that some of its members leave, because the production unit is no longer capable of maintaining all of its children. The reproduction costs of the total number of family members are higher than the utility of labor over the course of the year. So the family believes it is more profitable, or perhaps more useful, at a given point in time, if some of its members leave. The shortage of labor is compensated for by exchange labor and, in some cases, hired labor.

GENERAL DISCUSSION

Moderator: Benjamin Quijandria[1]
Rapporteur: Sergio Ruano[2]

Benjamin Quijandria

These days have witnessed a lively and enlightening debate. At the beginning, I observed certain barriers between the social sciences and the biological sciences. But, in the end, as I listened to Manuel Ruiz speaking about the "reproduction of the family," I could not help but think that the barriers had been broken down! And like Manuel, I am also passing over that same hurdle to a comprehensive understanding. This particular meeting marks one of the first times that the issue of interaction between the biological and social sciences has been addressed. We cannot write in stone the 10 commandments on these questions. There are three different areas of work which we should look at and strive to make compatible.

First, the meeting program contains background information which reflects part of the problem, in very general terms. The objective of this meeting is to discuss conceptual aspects that the social scientist takes into account when working with a farming systems approach, which may lead to the generation of quantitative and qualitative information. Qualitative information is important because we can neither ignore qualitative aspects when designing technological alternatives nor fail to review possible criteria for *ex-ante* social evaluation of alternatives. The contribution social sciences have made thus far, in an attempt to enrich technologies, has been relatively successful. Second, it is important to review the diagram (Fig. 4) which Manuel Ruiz presented in his paper, on simplified research methodology (without feedback), as a type of guideline. The diagram reflects some of the stages considered as basic steps in developing technological alternatives suitable to a given farming system.

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[1] Executive Director of CE&DAP, Lima Peru.

[2] Rural Sociologist, Coordinator of the Maya Project, IICA, Guatemala.

The third point I would like to make concerns the paper by Orlando Plaza, where he speaks of four major "inflows" into a system, which must be connected and clarified. These include agroecological, technological, socioeconomic, cultural, and political aspects. It is necessary to reach a balance between these inputs and the generic systems approach to meet established objectives. As long as we can diagram these inputs it will be possible to analyze certain stages where the social sciences can clearly contribute, in methodological terms, to finding much-needed answers to problems in farming-systems research. It is also important to identify areas where the social sciences are going to have to conduct their own in-depth studies, as pointed out by Raul Hopkins and Otto Flores.

For example, if we wish to know the implications of an alternative which entails using bananas to feed dairy cows during the dry season, then we may be led to a discussion of ruminal biochemistry, with all its nutritional implications. However, the social sciences would be equally entitled to predict implications arising from the adoption of such a technological alternative. Therefore, we should first devote some time to the definition of systems. If there is a very general consensus, we could proceed to the methodological aspects, the objectives and the consideration of some "macro" elements which have been put forth, as well as concrete operational aspects.

After several days of discussion, how would we now define systems? I know that RISPAL is concerned with livestock, but we should attempt to come up with a more global definition. Once this is done, we can touch on more specific aspects. If the definition is consonant with the plan, how can we contribute with elements from the social sciences for this purpose?

Manuel Ruiz

The following order is proposed: First, to revise the objectives set forth in the notice of the meeting, as recommended by Benjamin Quijandria. Second, to reach an agreement concerning what is understood by the systems approach, as suggested by several participants. Third, to define agricultural systems research.

A fourth element of the discussion, which comes about in response to the objectives set forth in the meeting program, is definition of the follow-up actions which should be pursued, in order for this meeting and its results to be more than an isolated effort.

Benjamin Quijandria

The proposal made by Manuel Ruiz is similar to one I set forth earlier; he is suggesting revising objectives, defining the approach, specifying problems, and, where appropriate, defining participation of each discipline, and lastly, asking ourselves where we are headed. The last is an important point, as we must go beyond a first approximation, particularly now that we are beginning to speak the same language. It is necessary to agree on follow-up activities.

Redefinition of the systems approach is necessary to revise the objectives of this general discussion. The objectives are not so ambitious or complex, but we could begin by discussing what we hope to achieve between today and tomorrow. The first objective is to discuss conceptual aspects of the application of the social sciences in farming systems research, leading to qualitative and quantitative information suitable for the design of technological alternatives; the second one is to review criteria for *ex-ante* social evaluation of technological alternatives and other changes affecting social organization and human welfare; the third objective is to analyze Peruvian experiences, as they relate to the previous objectives; the last objective is to contribute to the enrichment of the systems-oriented research methodology. The last two have been largely fulfilled during this meeting. Essentially, what remains is to focus on the first two objectives with a view to producing tangible results.

Enrique Nolte

I should like to propose systems characterization and identification of problems or constraints as preliminary steps for designing alternatives. Formulating alternatives implies that there is a clear understanding of the general characteristics of design, which should be part of the discussion topics. Linked to this, we can discuss a definition and description of the *ex-ante* social evaluation.

Benjamin Quijandria

This was already proposed. That is, the entire process will be reviewed for the purpose of defining the instrument that will be used as a guide, starting from the definition of the target system and ending with the final validation stage.

Cristina Espinosa

There are doubts as to whether it is possible to define the elements of an *ex-ante* social evaluation when there is still no consensus regarding characterization.

Enrique Nolte

Conceptually, we must arrive at some type of evaluation. The fact that we do not have the tools or that we are not quite clear on selecting criteria for this purpose does not mean that we should not decide where we are headed.

Benjamin Quijandria

Part of what Cristina Espinosa and Enrique Nolte are saying is envisioned in the second objective. If we are to review the entire process, then objective two, which concerns *ex-ante* social evaluation, is left outside of the picture, at least for the time being. What is important is to review the participation of the different disciplines from the social science areas in the entire systems process, which includes *ex-ante* analysis. Now the discussion will center on the conceptual aspects of the application of the social sciences to research with a systems approach, leading to quantitative and qualitative information. A second aspect entails conducting a rapid review of the entire process. This often leads to major conceptual discussions; but perhaps at this stage in the game all the participants have the same ideas about systems. It is possible, however, that some of you have changed your understanding of systems.

Manuel Ruiz

We should proceed on the basis of something which is already written. The paper I presented contains elements we could use, making the necessary additions or deletions. At least we will be basing ourselves on something already proposed. Enrique Nolte has made a suggestion regarding the need to define an agricultural system; exercises such as this one are a more expedient way of getting to the point and producing concrete results.

Cristina Espinosa

There is no problem with the more theoretical formulation of the systems approach. However, problems do appear to exist, and perhaps some adjustments must be made, in connection with tailoring this concept of an integrated or holistic approach to the problem with a methodology which involves a specific treatment. What we have seen --and not only in this meeting, but in others as well-- is that people from other countries manage systems in very different ways. In some cases there is neither an integrated nor a quantifiable appraisal (weights, indexes, measurements); in others, it is dealt with as a matter exclusively within the domain of the biological sciences, and little or no consideration is given to the social sciences, economic evaluation, profitability, and returns, among other aspects.

Benjamin Quijandria

Based on Manuel Ruiz's proposal, I suggest we look at his document, where we have a working definition: "The production system is a combination of factors and processes which function as a single entity, interact among themselves, and are administered by the farmer, to consistently obtain one or more products and which are viable and harmonious with his goals and needs, although affected by the society and the physical, biological, economic, cultural and political environments."

Enrique Nolte

The definition of the system by Manuel Ruiz in his paper speaks of interrelationships between elements which are in harmony with the ecological and social environment. The only problem is whether this harmony actually exists; for example, consider the case of a goat production system where there is a process of forest degradation or growing impoverishment of the families living or working in that system.

We must recognize that the system, as a concept, includes almost all possible human undertakings; from there we must seek to connect the concept to productive activity. When we refer to the rural inhabitant as a peasant or a producer, are we being biased? Are we ignoring the other activities which he performs that have nothing to do with farming? This is understandable, as the system concept is actually taken from the biological sciences. In contrast, the systems concept can also be employed from the perspective of the social sciences, and anthropologists have been using it

successfully for some time. Biologists, on the other hand, work with problems of a technological order. But biologists have returned to man and have then attempted to go rapidly from man to technology again. That explains the impasse; an extremely complex universe has been discovered.

In the definition, it is also necessary to categorize and prioritize, to determine what is indispensable and what is not. For example, the contribution of the social sciences can vary, depending on the nature of the actual system and its degree of modernization as an enterprise. These aspects usually require much less emphasis in the analysis of social problems than the complex situations experienced in peasant communities; there, the strictly profit-oriented enterprising spirit is much less important than culture and survival. Consequently, there may be instances when some of the social sciences (particularly sociology and anthropology) will have a much more important role to play than others (such as economics).

Benjamin Quijandria

Here we are dealing with a conceptual aspect, and perhaps we should reconsider in light of the presentation made by Enrique Nolte. Conceptually speaking, we should accept the term harmonious. The fact that the system is not harmonious means that there is a bottleneck or a problem in the system, but in theory, if we refer back to the conceptual aspect, then what we are seeking is a harmonious balance of these elements.

Manuel Ruiz

In other words, according to Benjamin Quijandria, what we have at this time in the northern coast of Peru, in Chiclayo (goat project), cannot be considered a system.

Benjamin Quijandria

It is a system in disharmony and the bottleneck is this disharmony between the conservation of natural resources and the maintenance of the system. With this definition, it is evident that the agricultural system not only responds to factors which are endogenous to the farm, but to exogenous ones as well. One of the first aspects which should be included in the definition is the object of the system. This is the combination of factors and processes which operate as a whole, which

interact among themselves within an agricultural resource-based production unit. The unit is defined as such because later we will clearly touch on the factors which are endogenous and exogenous to the farm, or man and his productive context. And here, when we address its aspects of physical, biological, economic, cultural and political environment, we reach the junction that Orlando Plaza was referring to.

What is most important is to include the object of the system in the definition. If we refer back to the first definition, right away, in the second paragraph, there is mention of the farm as a unit.

Mercedes Bracco

The problem is one of context, of different levels. We can look at the regional unit as a system, but we can also look at the community. The hierarchy of the systems is a point that has been made by Robert Hart. However, in practice it would seem that there is a tendency to equate system with farm.

Benjamin Quijandria

The objective of the production systems approach is the search for solutions to the farmer's social and production-related problems. The difference between the researchers and the planners or politicians is that the planners look at the national agricultural system, whose context is the country's agriculture. Farming systems research is an approach that looks at the man and his production unit, that is the actor and his stage, through the work of specialists who are, by definition, microsociologists, microeconomists, microbiologists. This helps to understand why, while the rural development planning process may use a systems approach, it cannot apply the concept of production systems at the farm level.

Cristina Espinosa

This becomes clear if we agree that it is in fact possible to work at different levels of resolution. We speak of the farm, but we can also speak of a group of farms, or of a region.

Sergio Ruano

Normally we do not work at all of these levels. It is obvious that most of the work is done at the level one has chosen, but very little is done at other levels.

Benjamin Quijandria

The problem is one of semantics, because the word "work" does not mean "research in detail," but rather to be familiar with the framework. It means conducting research so as to be able to explain the relationship between the large framework and the small. Perhaps it is necessary to rework this definition and explore other interpretations, unless there are other pertinent comments.

Sergio Ruano

Did the question of harmony resolve itself? Because if we analyze any agricultural production system, in any part of the world, we will never find one which is truly harmonious. There is something to be gained by this concept, but there is also something that can be lost. For example, in the developed systems in the industrialized countries today, there are serious questions being raised about soil degradation and environmental degradation, despite the fact that the systems are highly productive and harmonious in terms of their objectives.

In the case of the peasant economies, the systems often require a source of fuel (the forest system), which is deteriorating as a result. Sometimes, there is no other alternative, making it difficult to achieve harmony.

Benjamin Quijandria

That is what I meant by my comment to Enrique Nolte; that is, that the objective is not that the word harmonious be included or not in the definition. If there is disharmony, it will be revealed in the farm diagnoses.

Cristina Espinosa

There are some practical elements that make up the goat production systems, and disharmony is a basic element. Therefore, it would not be correct to say that the system is harmonious.

Enrique Nolte

Every system goes through a process of entrophy, and this is valid for all the parts of the system. Later, once resources are exhausted, the tendency of the system, in the short or the long term, is to disappear.

Mercedes Bracco

In theory, the system is harmonious, but at a given point in time it may go through a dynamic process of change. We should not make the mistake of thinking that the word "harmonious" is synonymous with "stable".

Manuel Ruiz

Dynamism may just be the precise word. If a system is dynamic, there are times where complete harmony can be achieved. But if that which is stable changes --and this can be due to an exogenous influence-- disharmony is created in the system; so, if we are aware of this, what we aim for, through social, political or technical action, is to restore the harmony of the system. Therefore, the word "dynamism" should be included in the definition, in addition to the word "farmer".

Enrique Nolte

Do systems age? Do they appear one moment, develop, evolve and then disappear? Can it be that the systems we have identified over the last ten years are the same as those of 100 years ago? Or are they other systems?

Sergio Ruano

They differ from what they were 100 years ago, but it is not due to aging; those systems actually evolved.

Enrique Nolte

It seems to me that some type of relationship that characterized the system has been exhausted.

Benjamin Quijandria

The fact of the matter is that only in the case of the dinosaur can we speak of absolute extinction. In the case of farming systems, there is an evolutionary process; there is change which is not due to old age, but simply due to a continuous flux, an interaction with ecological, social and political factors. In other words, the systems, over time, adjust to these external factors.

Enrique Nolte

What happens to a system in which one of the primary resources or elements is in an active process of deterioration?

When defining a production system, it is logical to ask whether the system must be harmonious and if harmony is defined as something which in some way prevails, which stays as is, using all the elements in the system. If, as a consequence of the system, one of the elements deteriorates, there is no longer harmony. Moreover, there could be systems in which the human factor is also deteriorating. The social unit maybe breaking down, certain factors maybe leading to disorganized migrations; in short, anything which affects any one of the elements which forms part of the system, may cause disharmony. Maybe what is needed is a definition of an ideal system, which should be harmonious, even if it does not exist.

Manuel Ruiz

What is the real objection to the use of the word "dynamism" instead of harmonious? After all, dynamism contains, or can contain, harmony. This would cover both situations: We would accept that there can be times when the system achieves a balance, perhaps *quasi* perfect with all the factors mentioned. And, if this is not the case, the system eventually has to evolve until such time as it reaches *quasi* perfection or a *quasi* balance with the factors.

Benjamin Quijandria

In reality, we are touching on different aspects, but we have not yet elicited an overall response. The word "harmonious" could probably be replaced by "dynamic", because we are talking about a process. But here we must take another look at what Mercedes Bracco was talking about,

because the viable and "harmonious" part of the definition is not related to the product, but to the operation of the system. So, the basic term to define, when talking about "agricultural systems," the work which Orlando Plaza and some of the groups who were analyzing this approach were looking for, is "approach". What is the definition of the "systems approach?" This is basically the study of agricultural problems through analysis of the farmer and his production unit. In order to assess such factors, equilibrium and dynamism should be words qualifying the system acting as a whole, all of its components, instead of its outputs. This would be a minor adjustment to the definition.

Enrique Nolte

Orlando Plaza was opposed to using the term "approach." He spoke more of the "notion" or "idea." In conversations held prior to this meeting he spoke at much greater length about the "notion of the system." He said: "They speak of an approach. Why is it an approach? What is that is being approached?" His question regarding terminology began there.

Benjamin Quijandria

Then we are back to basics. Here we are dealing with systems and the obvious definition we should arrive at is that of the systems approach. And the systems approach is the search for solutions to agricultural development problems, through analysis of the production unit as a whole and the interaction between the dynamic internal factors which make up the system and the external influences impinging on it.

Manuel Ruiz

In direct relation to the definition of agricultural system, one of the very first words Benjamin Quijandria used when talking about approach was "search". Or, better yet, "research." Farming systems research is based on two premises: (a) The development of pertinent and viable technology for farmers with limited resources should be based on a thorough knowledge of the farm's real system; (b) the technology must be evaluated not only in terms of its technical performance, but also in terms of its suitability to the socioeconomic conditions surrounding the farm system. This is what research with a systems approach consists of.

Benjamin Quijandria

I agree. Now it's time to draft the definition of systems based on the terms we have been discussing.

Otto Flores

System is a conceptual or functional unit with specific structures. Structure is the position of the parts within the whole. For exampie, this table is structured in such a way that the smokers can sit on this side and the non-smokers on the other. We can also speak of a social structure, or rather its characterization in classes. The system is the dynamic aspect of the structure; it refers to the relationships between the parts within the whole.

Benjamin Quijandria

According to the classical definition, a system is a set of structures and parts which function as a whole.

Otto Flores

This question of harmony must be resolved. Harmony could mean, for example, that the deaf-mute learns to communicate in another way; consequently, we can say that he finds his harmony within his deficiency.

Benjamin Quijandria

What we are looking for now then, is a definition of "systems approach."

Enrique Nolte

In the proposed definition, while referring to very general systems, one element which should be prioritized is the role of man. This is not clearly indicated.

Otto Flores

Why then is there no mention of an agricultural production system? Because when we talk about production, we are saying that the man is going to produce. By saying that a production system is a conceptual and functional unit, we are affirming its operation, that the parts are interacting

and have a function, an objective, an action, whose structures are derived from the interactions and interdependence of their parts at different levels of organization.

Manuel Ruiz

What Otto Flores has just said is more a definition of a system than of an agricultural system.

Cristina Espinosa

When man produces he establishes relationships. In the final analysis, society is a product of interactions which come about as part of the production process.

Mercedes Bracco

Here is a definition: Agricultural Production System: a set of structures, functions and interactions between men and their means of production, which may be changed and which contribute to the production process.

Benjamin Quijandria

The definition must include the term "output" inserted in a framework of factors such as the physical, biological, economic, social and cultural environment, which are the exogenous factors. The endogenous factors are agriculture, its functions and interactions and the principal actor, which is man and his means of production. The definition may state that it is the set of structures, functions and interactions of man, the family and their means of production which contribute to the production process, inserted in a framework of such factors as the physical, biological, social, economic and cultural environment. The word insertion is a social concept that goes beyond its formal definition.

The term "insert" is used to denote that something is inside something else. The word insertion has a much broader meaning. It means both linkage and interaction. For the social sciences, the term insertion means being inside of and functioning in. Thus, the interpretation is much broader. There seems to be a consensus regarding one part of the definition: an agricultural production system is a set of structures, functions and interactions of man, the family, and their production resources...

Enrique Nolte

Instead of "of," it should be "between" man.

Sergio Ruano

For the purposes of many biologists, the definition should be in a language they can understand.

Manuel Ruiz

For example, a biologist might interpret the word "insert" as putting something in a box or cell instead of what has just been suggested: interrelation.

Cristina Espinosa

The verbs to link, or to connect would be more appropriate.

Benjamin Quijandria

Fine. So the definition shall be: "... articulated with factors of physical, biological, social, economic and cultural nature." Now, from a social perspective, the word articulation is understood to mean interrelation. Enrique Nolte was suggesting that we use "between" man instead of "of" man.

Enrique Nolte

When we speak of the structure of man, or the function of man, or the interaction of man, we are turning man into an object. By using "between," he is acknowledged as being a subject.

Benjamin Quijandria

So the definition of agricultural production system shall be as follows: A set of structures, functions and interactions between man, the family and their means of production, which contribute to the production process, articulated with factors of physical, biological, social, economic and cultural nature. Now one basic question remains: What is the output of this system?

Cristina Espinosa

Man produces because he must reproduce himself. The objective of the production system is to produce, to satisfy the farmer's needs.

Benjamin Quijandria

I agree. Then we must find an intermediate concept, because the term "production" is bound to create problems because it makes us think only about the attainment of goods. If we speak exclusively about satisfying needs, we would be introducing a bias with respect to what is essentially subsistence. But as it happens, the farmer also has a role to play in the society.

Otto Flores

Obviously the subsistence farmer is satisfying his subsistence needs. But he may also have higher aspirations.

Sergio Ruano

The man who produces for the market is also satisfying his needs.

Otto Flores

They all seek to satisfy their needs, depending on their aspirations.

Benjamin Quijandria

There is a relationship here: The more a system deals with subsistence, there is a greater degree of participation from the social sciences. The more market-oriented a system is, social science participation declines correspondingly; in fact, the role of the social sciences is limited to a very general one. Let us now discuss the relative participation of the different social sciences, by stages, referring to Fig. 1 as shown by Manuel Ruiz.

Farmer participation takes place independent of the social sciences. The farmer participates. The model is always linked to the market in some way. The farmer belongs to a certain stratum and enjoys a certain status, where economic pressure is not excessive. The farmer should participate in the formulation of the model, but the social analysis will be limited to only certain aspects of this farmer's activities.

Let us take the case of El Salvador, with subsistence animal production as well as other, more market-oriented systems. In the first case, the participation of the social sciences is more intense, but the farmer must take part in both. The advantage of the systems approach is that the biologists are obliged to maintain direct contact with the farmer. The difference is that a farmer with technological training tends to be more defined, avoiding a series of social filters.

Otto Flores

When we are dealing with the modern capitalist farmer, the factors of production and market factors are more clearly defined. The symbolism, the modes of communication correspond to levels of abstraction proper to social psychology. No other language is required to communicate with them. However, when working with peasants, especially in other cultures, a series of filters are required to be able to communicate, as Benjamin Quijandria suggested. The levels of abstraction are different.

Manuel Ruiz

I would like to make two observations on Fig. 1. First, this is a diagram for discussion purposes; and this discussion should be carried out bearing in mind that we are talking about agricultural systems, thus we should prevent the discussion from becoming too general. Second, this particular diagram gives the impression that it is linear. However, it is not a sequential, step-wise methodological scheme; several of these phases may take place simultaneously. Let us bear these two things in mind in the ensuing discussions.

Enrique Nolte

That explanation also reflects changes which have taken place in the RISPAL focus over the past two years.

Perhaps, beneath it all, we still think that methodology is the responsibility of people in the biological sciences and that the social disciplines are being used as a support tool, according to need.

Otto Flores

If you put it that way, then it is more a problem of organization. It seems to me that RISPAL is in the hands of biologists, but it does not have to be so, particularly if the question is only a conceptual one.

Cristina Espinosa

The fact that the social sciences take part in all stages of the process is already very different from participating exclusively, let us say, in the characterization diagnosis, as was the case initially.

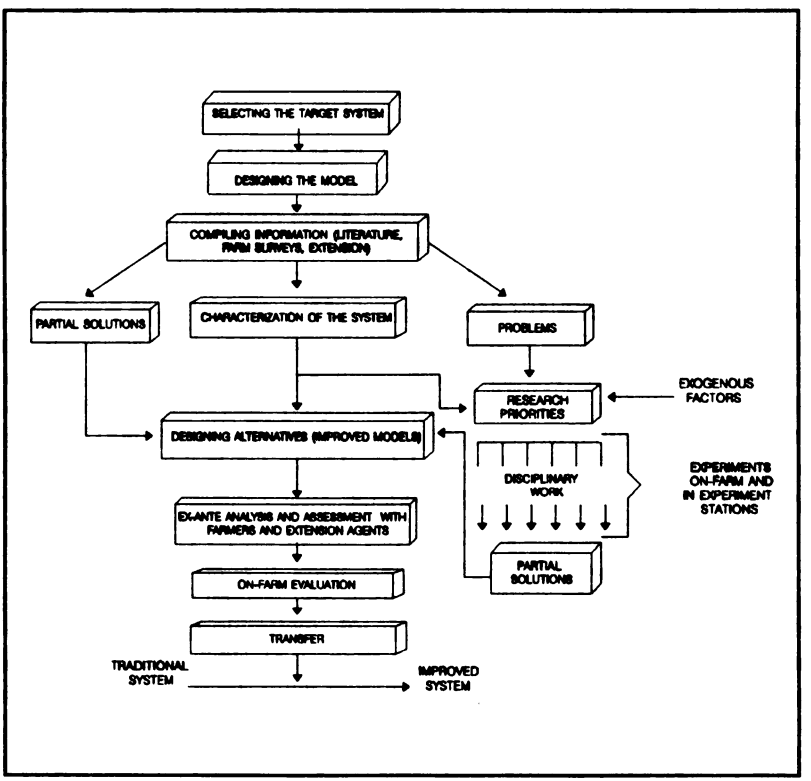

Fig. 1. Simplified diagram, without feedback loops, for agricultural production systems research methodology.

Manuel Ruiz

When Cristina Espinosa began to take part in systems work, the only thing the projects had in hand was the farm survey data; only a few projects were already involved in component research and fewer still were entering the design stage.

Cristina Espinosa

This is true; but the point I was trying to make is that I do not agree with Enrique Nolte, because now it is evident that everyone, social and biological researchers alike, are participating in the process. So there is no reason for concern about the fact that RISPAL is in the hands of biologists. This is no longer important.

Otto Flores

Independent from the conceptual and methodological needs of both groups of disciplines, it does not matter who handles this, or whether or not it remains in the hands of biologists. It does not matter who the directors of RISPAL are; what is most important is to define what is required, both conceptually and in terms of the problems at hand.

Manuel Ruiz

In light of Enrique Nolte's suggestion, it could be interesting to assess the degree of participation of the biological sciences in this process, as we have been doing with the social sciences.

Otto Flores

We are dealing with different levels of abstraction. The fact is that biologists operate at levels of abstraction very similar to those of the modern farmer. These levels of abstraction differ dramatically in the case of the peasant farmer, where an intermediary filter is required, which is the social scientist.

Benjamin Quijandria

It is true. In the case of production systems, the role of the social scientist, up to a certain point, is that of an intermediary.

Manuel Ruiz

To illustrate this further, more participation is required of the biologists in the design stage. In the *ex-ante* analysis, their participation is relatively limited and mainly concerned with component research.

Benjamin Quijandria

It is important to come up with a very short, very brief description of each of the methodological steps, so that everyone interprets Fig. 1 the same way. Those who are familiar with systems will have no problem; nevertheless, it would be useful to define each stage to ensure that we are all on the same track.

Manuel Ruiz

(Note: Please refer to Fig. 1) With the stage *Selecting the target system*, an attempt is made to take into account the ecological and socioeconomic context where all research efforts occur. It is what the economists call the "universe of study." It involves the definition of a set, made up of a group of farmers who may be relatively homogeneous, as in the case of Nueva Concepcion and Cuyuta, in Guatemala. This leads to a definition of the recommendation domain or adaptation domain, as it is often called. This definition is important because other similar groups (with other geographical locations) may also be benefited by the information produced. The definition of the recommendation domain can be as specific as the project, program or institutional objective permits.

Normally, 10% percent of the population is selected as a sample and various mechanisms are used for selecting the farmers who will be surveyed to obtain information about the target system. The survey may be unnecessary if there is already a wealth of information on and experience with the universe under study.

The next step is to *build a model*; it can be very schematic, along very general lines, dependending on the quantity and precision of the information available. It is a first attempt to characterize the reality of the region. Then, an attempt is made to *characterize the system*, based on the information compiled, the surveys, and secondary information.

What is meant by characterizing the system? This is one of the major problems usually found in newly formed research teams where system

characterization has been interpreted as a simple description of the components of the system. For example, we say: the average age of the farmers is 49 years; the family has an average of four children, four years of primary schooling; x percent of labor is used in x agricultural activities and x percent in livestock activities; x amount of labor is performed outside the farm. But it goes no further than that; there is no attempt to assess the functionality of the system's resources.

What is really needed is a diagnosis of the systems with he information already compiled. In many instances, with the available information, it is even possible to identify solutions which the farmers themselves have generated. Although we are looking at the farmers at a given point in time, we must recall that they have been accumulating information and experience, over the course of the years, based on "research" they themselves have been conducting. For this reason, Fig. 1 includes the *partial solutions* which have been generated by the actual farmer or which have resulted from the disciplinary research. But concrete *problems* are also identified, including areas in which information is incomplete or nonexistent, in order to solve the problems at hand.

The explanations provided thus far are based on problems of a biological nature, because until now there has been a virtually absolute predominance of the agricultural sciences in this entire process. Returning to Fig. 1, the problems detected are *prioritized* and presented to colleagues who are working primarily by discipline, doing their *experimentation* on-farm and/or at the experiment station. Accordingly, farming systems research neither takes the place of nor rejects disciplinary research. On the contrary; it helps to orient and to strengthen it. Raul Hopkins also stressed this point.

Cristina Espinosa

The question of rationale should be well noted, specifically for the purpose of tackling the problem of the descriptive dimension of characterization; that is, rationale in the sense of understanding the logic of the system and the interactions which also help to focus problems and any possible solutions which the systems approach may have.

Manuel Ruiz

(Returning to the explanation of the steps in Fig. 1). Once a certain degree of confidence and sufficient information have been acquired to

even dare to think of an alternative to the system (to try to change it or improve it), it is time to begin the *design* stage.

What is meant by *design*? On the basis of the farmer's situation, and using the model first constructed, a series of alternatives can be developed. In Guatemala, for example, people from different disciplines are brought together to discuss the experimental results, the results of the literature, the results of the surveys, and there is an effort to identify where the system will be affected. The basic criterion is that the design of the alternative is technological. The objective is to see to what extent the proposed intervention minimizes the use of inputs external to the farm and to what extent greater efficiency is achieved in the use of resources.

It could be that, in the long run, optimal design means higher income for the farmer; but perhaps, even though the investment is not very big in terms of the farmer's available income, it could be that this alternative is truly beyond his investment capacity. It could also be that the alternative is biologically sound and in keeping with all the elements surrounding the farmer's environment, but is beyond the family's financial capabilities.

Once the alternative is designed, the next step is to conduct an *ex-ante analysis*, which estimates what impact on the system will be attributable to the designed alternative, and how it is expected to behave. In this stage, the scientist plays a more important role than the economist.

Cristina Espinosa

In the design itself, it is important to be aware that a number of technological alternatives are going to be ruled out. There is also a selection or ruling out of alternatives during the actual design process.

Manuel Ruiz

This is true, but it usually occurs in the discussion stage, without precise evaluation tools. It should also be mentioned that in the universe under study there are always more advanced farmers who could almost serve as demonstration modules, with examples of technologies which have been introduced by the farmer, without the aid of the project. This is the big advantage of discovering alternatives already in place on the farms. They can give us an idea of the behavior of that alternative over the course of the dynamic diagnosis.

Sergio Ruano

Two things usually happen here: Either this modern farmer is truly an innovator, who belongs to the group and is the most experienced of that group, or he is someone outside the social group who simply has more resources.

Manuel Ruiz

Cristina mentioned that were there three strata of farmers in the community: a group with abundant resources, a group with average resources, which remains virtually unchanged, and a marginal group. This should naturally be borne in mind.

Carrying on with the explanations of Fig. 1, the *ex-ante* analysis applies evaluation techniques better known at the farm level, although in actual fact many questions remain. Something is being done in Panama regarding evaluation of technological alternatives which have already been designed.

Some have been ruled out because the findings of the *ex-ante* analysis were negative or because the alternative was not viable and would require too much time or money to implement; others were discarded because they were too risky (in other words, they were technologically interesting, but the risk factor was also high; for these reasons, it is better to avoid these options). The *on-farm evaluation* essentially seeks to carry out an assessment similar to that sought will the *ex-ante* analysis, no longer at the drawing board, but rather in the field, with the actual farmer.

Prior to this evaluation, meetings are held with farmers, extension workers and credit agents, to study the feasibility of accepting the alternative and the parallel measures which can be taken concerning the granting of credit, technical assistance, etc. If it turns out that the farmers are capable of financing the adoption or implementation of the alternative on their farm, then the evaluation aims at studying the real behavior of the improved system, already modified by this technology. The evaluation can be effected by any one of the following procedures.

Information prior to the intervention can be compared to subsequent information collected after the alternative is introduced; the biggest problem is how to separate the effect that different seasons or years have on the observed performance of the alternative; thus, extreme caution should be exercised. This problem can be overcome, to a certain degree,

by selecting and monitoring farms where no alternative will be introduced. Another procedure consists of selecting a group of farms out of which some will apply the alternative but others will not; in this way, the effect of "year" is controlled and behavior is compared and contrasted, productivity studied and economic analysis conducted all at the same time.

In practice, the problem is the following: If an alternative is tested on a group of farms and the control farmers discover what is occurring, the latter may rapidly absorb all or part of this alternative, if it proves beneficial. Or, they may begin to demand support from the technical team. What should be done is to try to compensate, by helping the farmers in other aspects which are totally unrelated to the subsystem being intervened, or, conversely, by providing help in the subsystem of interest, but ensuring that its performance is largely unaffected. The importance of farmer participation in all the phases of the research process is an aspect that cannot be overemphasized.

Cristina Espinosa

Wouldn't it be more realistic, in the long run, and perhaps more interesting, to return at some point, after the design and the adoption stage are complete, to evaluate the whole, to assess the impact in depth, rather than in a complementary fashion?

Manuel Ruiz

That is precisely what should be done. In the evaluation stage, if we introduce a given alternative on a farm, the systems approach should include farm monitoring.

Let me take the opportunity to stress one final point, which has to do with technology transfer. Once an alternative has been introduced on a farm, a neighbor invariably comes along to ask questions and to take seed of a new pasture species to his farm; others may talk with the farmer and ask who he is working with, why, and to what end. Clearly, what is taking place is a transfer of the alternative being tested; the project researchers should converse with the farmer and ask who is visiting, from how far away, and what information is being solicited. They should also visit these farmers to confirm what they have learned and adopted. Is this not an adequate way to evaluate the alternative?

In another case, (Río Frio, in Costa Rica) a project with a group of farmers was terminated (because the funds had run out) and the technical team left the working area. After several years, with the procurement of new funds, the team returned to the project, wanting to know which level the farmers were at.

A new survey was conducted and analysis was made of what actually occurred with those farmers who had adopted the technology. Here we have another way to assess the effectiveness of the technological alternative and of the transfer process in projects that existed, but have now ceased. This could be done with a minimal investment.

Not all projects have the support of a neighboring experiment station. There are projects in remote areas where experimentation is conducted exclusively on the farms of participating farmers. There, it is advisable to conduct experiments with large farmers, with ample resources, whose farms share certain ecological and edaphological features with those in the target group. But, as these farmers have resources, they can collaborate by letting the researcher conduct experiments on their farms.

Benjamin Quijandria

Apparently, there is a consensus that the evaluation of alternatives is one of the longest stages in the methodology discussed here. Beginning is complex and lengthy, and time is one of the key problems. What is most important is that, in a project, particularly if this project entails cattle systems, the transfer of two elements (for example, pastures and genetic improvement) could take three years to be evaluated. It takes one year for the pasture to be well-established and several years for its impact on the animal progeny to be evaluated. The issue is worthy of further discussion, since farming systems research is often seen as a time-consuming endeavor.

Mercedes Bracco

It could also be assumed that that is the case for the disciplinary approach as well.

Benjamin Quijandria

No, not always. For example, in international projects we have what are called screening tests, where as many as 5,000 varieties are tested, six or

seven of which are released each year. Therein lies the difference. The disciplinary researchers claim their style of work generates technologies faster than production systems research. To demonstrate this, they show how, in the international centers in the member countries (there is no institution in Latin America not associated with CIP, CIMMYT or CIAT), tests are conducted from the mountaintops in Peru to sea level in Costa Rica. This basically applies to improving species; even though these centers have their socioeconomic units, their strength is in the linear program in genetics.

Mercedes Bracco

Perhaps it would be more efficient to move from the diagnostic stage to that of the alternative design and *ex-ante* analysis, which would provide some sort of estimation of the behavior and effectiveness of the alternative designed.

Manuel Ruiz

The entire methodology serves to pinpoint problems and discover areas where participation from the social sciences is needed. In the case of the evaluation stage, more socially oriented criteria are required to know whether an alternative which has already gone through a series of biological and economic filters is really applicable.

Cristina Espinosa

This is true as long as there is effective characterization of the system and total participation, especially in the exercise of designing a series of alternatives. Using common sense and the data from the surveys will contribute to keeping the process closely linked to reality.

Manuel Ruiz

The farmer must be involved in all these stages, especially design and technology assessment. In the letter stage, it is the farmer who conducts the analysis; he tries to imagine the alternative already implemented, its implications, and whether or not he can play a role. In this way he is essentially conducting an evaluation. The problem is whether the evaluation should be effected via the application of statistical techniques; perhaps another quicker method should be used.

Cristina Espinosa

The greater the number of variables, options or elements the researcher looks at, the more farms under experimentation will be needed. If this is accomplished, then we can be sure that the evaluation will be solid.

Enrique Nolte

In connection with the need for evaluation, the more differentiated the systems at the peasant community level, the greater the need for validation, greater than at the level of an enterprise conceived as strictly profit-oriented. It is easier for the farmer-entrepreneur to make abstractions, but the peasant is much more pragmatic; he analyzes what he sees and it is more difficult for him to imagine proposals coming from outside.

Benjamin Quijandria

At this point in the discussion, we already have a potential general model. Now, if we consider each stage and look at Table 1, it is reasonable to conclude that sociology and anthropology play an intermediate role in terms of participation in the definition of the target system. Their participation falls off somewhat in the design stage; they participate very actively in the characterization stage, and only modestly in the formulation of the partial solutions, or rather, in the first selection of technological alternatives.

Economics plays a minor role in the definition of the target system and the formulation of the model. Its participation is greater when it comes to characterizing the system, and greater still in designing alternatives and the *ex-ante* analysis. There is the risk that the economist's vision will make the process overly complex. This has occurred in the past, but perhaps the biologists were at fault for allowing the economists to apply their traditional economic variables, which did not lead to a true characterization of the system.

The economist also participates in defining problems. Where research is concerned, his participation tends to be dispensable and his function is mostly that of a filter. Where design is concerned, his participation is minimal because this is of more concern to biologists. At the evaluation stage, the economist participates actively; at the transfer stage, he only acts as a final filter.

Table 1. Relative participation of the most common social disciplines by methodological stage.

Stage	Sociology/ Anthropology	Social psychology	Economics	Communications
Defining the target system	**	*	*	–
Modeling	*	*	*	–
Characterizing the system	***	**	**	–
Biological problems	**	*	*	–
Partial solutions	*	*	**	–
On-farm and on-station research	**	*	*	–
Designing alternatives	**	*	*	–
Ex-ante analysis	*	***	**	–
On-farm evaluation	**	***	**	–
Technology transfer	**	*	**	***

* Limited participation ** Moderate participation *** Extensive participation

Note: There is a direct correlation between the participation of the social sciences, working with a systems approach, and the type of production system. The less market-oriented the system (more peasant agriculture) and the greater the cultural differentiation, the greater the need for more intense and permanent participation of the social sciences.

Social psychology has a role to play in the characterization of the system, as well as in the definition of farmer attitudes and the technology-assesment-by-farmers exercise.

Benjamin Quijandria

In the so-called technology-assessment-by-farmer exercise, the role of the social psychologist is well defined; the perception of the technology, man's attitude toward what he sees as a possible change, is purely psychological.

Sergio Ruano

At the experimentation stage, there should be greater participation from sociology and anthropology, for one reason: When defining the sample, sociological and anthropological criteria are the most important. Moreover, when measuring change, partial evaluation tools can be elaborated for assessing what is being done at the experimental level; these are clearly the tools of sociologists and anthropologists.

Ana Maria Montero

Social psychology is also important in the modeling and experimentation stages. The social psychologists can participate in the typing of control and experimental groups.

Cristina Espinosa

I think that social psychology should play a bigger role in the design stage, since it is in this stage that many things about the characterization are assumed.

The design should not be formulated by biologists alone and later assessed by farmers. For example, relating a type of pasture or a different variety will have implications for the labor force, work organization, and work outside the farm. In other words, it is possible to rule out something because it is not in keeping with the general logic, and time could be gained by looking for more suitable solutions, without waiting for an *ex-ante* analysis to be conducted. The design stage should include greater interaction from different perspectives, taking into account the interactions which take place on the farm.

The actual experimentation with the design should have the support of the social sciences.

Manuel Ruiz

Where does the farmer's technology assessment fit in the scheme we are discussing? In the on-farm evaluation or in the *ex-ante* analysis? In any case, it is important to recognize the key role played by communications. The farmer who is market-oriented normally uses a more modern technology. His social relationships and values are more characteristic of the urban areas and his capacity for abstraction is similar

to that of the technician. On the other hand, at the peasantry level, the method of abstraction generally differs from that of the technician and, as a result, the role of the social scientist as intermediary is vital.

What is interesting about all this is that we are already identifying areas where it is advisable to begin to emphasize the interactions between specializations. For example, until now, no one has ever considered social psychology; only recently are we beginning to recognize the need for this discipline.

Benjamin Quijandria

The next step for us now should be to take each one of the disciplines and indicate the pertinent problems and the respective tools employed by the discipline in its solution. So, to choose one example, we have farmer's technology assessment as part of the *ex-ante* analysis. The problem is measuring farmer reactions, and the tool is the interview or the survey. In the case of economics, the evaluation should include an economic analysis; the problem is determining the economic merit of the technology, and the tool is calculating the profitability and the cost-benefit ratio.

The process generally begins with people from the biological sciences. What we encounter, in effect, is the problem of understanding and managing the social environment. If the approach was a systemic one in the social area, then there would be no problem for the social scientists. But we are dealing with a system in the realm of biology, in which an understanding of social, economic and psychological issues is required. One logical question is: Who has the tools,to conduct *ex-ante* analyses? The economists or the social psychologists?

Ana Maria Montero

The proposal from the social psychologists' point of view, to study the logic (of the system) would be the following: A correlation between the farmer's basic objectives in life, the socialization process, his family and his approach to the production system.

Benjamin Quijandria

This is very interesting. In the two SEPIA seminars (in Peru), this subject has always been dealt with in generic conceptual terms, and there is a consensus. The problem is that there is not a single case of applied work

and we have already reached a point where field work is required in this regard.

SEPIA is going to award research grants, and it would be interesting to use one of them to conduct some work on the application of social psychology to farming systems research or, in the case of SEPIA, agricultural development.

Ana Maria Montero

Regarding model-building, I propose that we construct a model of the human resources in the family; that is to say, a diagnosis of the family's basic objectives in life, with respect to production or whatever production system under study. The tool would be the Basic Objectives Test, which includes a list of characterization parameters.

Benjamin Quijandria

If the diagnosis of human resources is conducted at the secondary generic level, then the basic objectives in life will definitely play a predominant role in the characterization process.

Ana Maria Montero

In biological problems, there would be adaptative constraints, between the basic objectives in life and the actual production setting.

Benjamin Quijandria

It is important that the social psychologist include the researcher in his or her analysis, because systems research should address three angles: The first is the state or government; the second is the farmer's basic objective in life; the third is the basic objective in life of the researcher. The latter introduces his own bias, causing distortions of reality. A paper by Jere Gilles on agrostologists discusses this matter. The matter is important, because it covers everything from attitude to the way the professional treats the farmer, even the fixation of the ideas of the researcher who believes he is working in systems but, in the long run, is only describing his own problems.

Ana Maria Montero

There is a test dealing with basic objectives carried out in the rural sector. It consisted of a list of the farmer's basic needs, as well as pertinent constraints, discussed as follows. The objective of the test was to identify the type of adaptative constraints the farmer has vis-à-vis his basic needs, constraints which can be analyzed in terms of his productive creativity versus his set of beliefs, his attitudes, fantasies, observance of rules and regulations and personal values. I am of the opinion that the partial solutions would entail correcting certain habits in order to benefit production which, where women and production are concerned, would mean that women no longer carry their babies on their backs and that they be provided another alternative.

The process ends, perhaps, with training, based on existing needs and previous experiences. Our task, in this meeting, could include compiling a list of training schemes, their limitations and the opportunities they offer for future activities. As for the analysis, it is proposed that the participants indicate the indices for social cost/benefit regarding perception and opinion and whether they are satisfied or not with those indices. In this respect, there is a worker satisfaction scale which can be applied to any given situation. Also, psychosocial cost/benefit can be measured in terms of satisfaction or lack of it.

There is also another type of questioning: Have we expressly selected a type of farmers with a viable future, who have a given set of basic objectives in life with respect to their production system? If so, we must measure how true our hypotheses are with respect to the farmer's real basic objectives and how acceptable are our technical proposals with respect to their basic objectives.

Sergio Ruano

I think that in this phase the anthropologist and the sociologist should conduct a study to determine whether or not the technology is acceptable, whether it has potential.

Cristina Espinosa

Yes, but the social psychologists approach this from the point of view of the farmer and his acceptance of the new technology. Ana Maria

Montero is looking at this in terms of the farmer's degree of acceptance of the technology by comparing it to his basic objectives in life.

Ana Maria Montero

If we assume that the biological researcher makes a technological proposal, then the social psychologists would have to verify whether the farmer's basic objectives in life have been identified and agreed to. Then, and only then, would it be possible to proceed with the typology and state, for example, that the plot works like this because it responds to these basic objectives with respect to this goat production system. It is also necessary to determine whether these basic objectives in life are shared by all the different production systems in the target area.

While the foregoing analysis is being conducted, you may wish to compare and contrast it with a study conducted by anthropologists and sociologists, in order to come up with a typology. What results is a comparison between the proposed technology and the farmer's basic objectives in life, the results of which will allow us to foresee acceptance or rejection of the proposed technology. In other words, in order for the proposal to be accepted, it must be weighed against the family's basic objectives in life.

Sergio Ruano

The communicator should also take part in this stage, so that he becomes acquainted with what is happening and can play an effective role in the final dissemination stage. The extension agent must convey the technology which proved to be the best, but only after the communicator has decided on the methodology to be used for this purpose.

Mercedes Bracco

The role of the communicator is twofold. One role is to motivate; the other is to communicate, or rather elaborate, transfer codes. Motivation can be provided throughout the entire process or simply toward the end.

Benjamin Quijandria

A distinction must be made between the communicator and the extension agent. The extension agent may not be a permanent communicator. The communicator is the translator who has to understand

the complexity of a technology and translate it to simpler terms. He also designs the appropriate way to transfer such technology for the benefit of the extension agent.

Sergio Ruano

In some cases the communicator will be the extension agent.

Benjamin Quijandria

When we speak of a communicator, we are not referring to the extension agent. We are talking about a specialist in the use of media. The fact that the extension agent should have media experience is another matter, but the communicator is the one who will do the packaging of the product (the technology) and will even choose the clientele. He takes the product, which is the improved system, from the factory, and he has a salesman, who is the extension agent, and a customer, who is the farmer.

The anthropologist says: "These people listen to the radio, these other people read the newspaper, 20% watch television, they only buy such and such a newspaper." So he already has these tools available. What the communicator does is define the program that will be broadcast. Early incorporation of the communicator facilitates communication, but the actual output for farmer consumption is beyond our capabilities. The bridge is the communicator, who will package the information in a certain way, for use by the extension agent, with specific means for a given type of media. To change the subject, the results of the discussions we have had thus far can be diagrammed as seen in Tables 2, 3, 4 and 5.

Benjamin Quijandria

The only thing that remains unresolved is the follow-up of this meeting.

Table 2. The role of sociology and anthropology in the different stages of the farming systems research methodology.

Stage	Degree of particip.	Issues and/ or problem	Procedure or tool	Methods or techniques
Defining the target system	**	Socio-anthropological framework	Secondary information	Desk work
Modeling	*	Roles of the family and the farmer	Rapid rural appraisal	Interview
Characterizing the system	***	▹ Region ▹ Farmers organization ▹ Study of the rural family	Survey	Interview and observation
Biological problems	**	Social-cultural production constraints	Data analysis	Desk work
Partial solutions	*	Identification of relevant indigenous techniques	Identification of innovators	Observation and interview
On-farm and on-station research	**	According to farm diagnostic vectors	Note: Selection of representative collaborators for biological trials	On-farm and desk studies
Designing alternatives	**	Socio-cultural compatibility	—	Desk work
Ex-ante analysis	*	Collaboration	—	—
On-farm evaluation	**	Acceptance and potential	—	Observation
Technology transfer	**	Definition of users, attitudes, media	—	Desk work

* Low; ** Medium; *** High

Table 3. The role of sociology and social psychology[1] in the different stages of the farming systems research methodology.

Stage	Degree of particip.	Issues and/or problem	Procedure or tool	Methods or techniques
Defining the target system	*	Social context	Secondary information	Desk work
Modeling	*	Family as a human resource. Diagnosis of the family's basic objectives in life	Basic objectives Test + allied research	
Characterizing the system	**	Are there adaptative constraints in the basic objectives in life vis-à-vis the technological alternative?[2]	Basic objectives Test	Interview
Biological problems	*	Degree of perception and organization with respect to production constraints and opportunities for change	Basic objectives Test	
Partial solutions at the farmer level	*	Differential analysis. Is the farmer an innovator or not?	Survey	
On-farm and on-station research	*	According to needs: selection of promoters		
Designing alternatives	*	Compatibility between objectives and the improved proposed systems		Interview
Ex-ante analysis	**	Cost benefit of psychosocial satisfaction or dissatisfaction		
On-farm evaluation	**	Accpetability and potential of proposal		
Technology transfer	**	Guide of basic objectives for the communicator		

* Low; ** Medium; *** High

1 Psychosociology's objective is to establish correlations between the farmer's basic objectives in life, his socialization process, his family, and the production system under study.

2 What are the basic needs? What self-constraining attitudes does the farmer have? Does he accept or reject the proposed technological alternative? Is his attitude submissive? Creative? Innovative? What is the typology of symbolism, norms, values, morals, ethics and shared successes?

Table 4. The role of economics in the different stages of the farming systems research methodology

Stage	Degree of particip.	Issues and/ or problem	Procedures or tool	Methods or techniq.
Defining the target system	*	Marketing context; political context	Secondary information	Desk work
Modeling	*	Factors of production; use, distribution. Production processes and economics	Rapid rural appraisal	Analysis of cost structure
Characterizing the system	**	Production factors and flows. Economic rationale		
Biological problems	*	Production factors, constraints and impact		
Partial solutions at the farmer level	**	Economic feasibility		
On-farm and on-station research	*	Economic/financial analysis of technologies		
Designing alternatives	*	Economic compatibility		
Ex-ante analysis	***	Feasibility, impact and short and medium-term projections		
On-farm evaluation	***	Micro and macro-economic impact		
Technology transfer	*	Definition of users. Investment requirements		

* Low; ** Medium; *** High

Table 5. The role of communications in the different stages of the farming systems approach research methodology.

Stage	Degree of particip.	Issues and/ or problem	Procedure or tool	Methods or techniques
Defining the target	-	-	-	-
Modeling	-	-	-	-
Characterizing the system	-	-	-	-
Biological problems	-	-	-	-
Partial solutions at the farmer level	-	-	-	-
On-farm and on-station research	-	-	-	-
Designing alternatives	-	-	-	-
Ex-ante analysis	-	-	-	-
On-farm evaluation	-	-	-	-
Technology transfer	***	-	-	-

*** High

Manuel Ruiz

Over the course of the last three days, many of the observations, particularly those of Orlando Plaza, revealed the need to discuss general concepts such as the farming systems approach and other basic concepts which govern systems work. These discussions also shed light on the need for carrying out other tasks, such as defining some of the topics and terms employed herein. Another aspect worthy of consideration is that of

specific tools for carrying out all of the above. What can be said about the interviews? Are they effective as conducted at present? Should there be different ways of conducting the interviews? This is surely a function of the characteristics of the population, and of the researcher himself or the research group.

What can be done from here on in to define a methodology that will reflect the participation of social and biological disciplines? May this group also serve to generate future projects where it will be possible to test the hypotheses put forth in this discussion, since the projects currently underway in RISPAL are in no condition to do so because they were not designed to test hypotheses of this type. This is the first time, at least within RISPAL, that a discussion has taken place on the participation and role of areas other than biology in research with a systems approach. Surely there are other ideas which could be entertained here, but a most pressing question is: What should the next step be? Particularly because we have not yet arrived at a detailed definition of a highly specific methodology regarding the way in which the systems approach should be applied, as defined in this meeting.

Orlando Plaza stressed the need to address conceptual aspects, general aspects. This proposal means that better definitions and further discussions are required. It is one thing to accept the recommendations made in this meeting; it is another to prescribe actions. Another proposal, that of Raul Hopkins, was that a discussion take place regarding the meaning of these interactions between exogenous and endogenous factors, and the interactions within each one of those factors.

Enrique Nolte

There are two aspects that require follow-up. We have not pursued the question of conceptual aspects at this time, because this would have required an entire month. An effort should be made to continue working in this direction, perhaps commissioning a person to work on this. Perhaps Orlando could elaborate a little more, writing a document on the questions he raised the first day of the meeting.

The other is to view these methodological aspects which are in the Tables as proposals. Some of them are based on experiences, while

others resulted from the application of a certain rationale; these need to be tested. Benjamin Quijandria mentioned several times that farm surveys are usually very general, but now, in the process which has been followed, more important, high-priority aspects have been identified, which would help define more precisely problems which are part of what be done in farming systems research. Each one of the proposals, be they stages, topics, tools or techniques, would have to be reviewed and discussed by several persons or teams. With the experience acquired so far, it is feasible to determine whether a given technique works or not, whether a given problem requires another analytical tool, or whether the technique has yet to be created. This process requires extensive research. Another suggestion is that these discussions be enriched by the opinion and viewpoints of an anthropologist.

Manuel Ruiz

Once the proceedings of this meeting are published, pertinent critiques will be solicited. Then another meeting will have to be organized to work more extensively and in greater detail on the methodology, going beyond what has been achieved here. We might even set dates, identify participants and begin right now by drawing up a general agenda of the next meeting.

Benjamin Quijandria

One important aspect is that of the terminology. Each discipline uses certain expressions, on a daily basis, which other disciplines do not understand. For example, the reproduction of the family, basic objectives in life, etc. This understanding among the disciplines is indispensable if we are to work more efficiently.

We must be very clear here. There is always a risk of turning an essentially technical proposal into a social one, and this could be fatal. When the sociologist or anthropologist is requested to work on technology transfer, sometimes the results are counterproductive. For example, there could be a case where an anthropologist in an interdisciplinary research team spends his time picking potatoes with the farmers. This is fine and dandy, because in the final analysis he can speak, with authority, about the role, let us say, of the woman, but he does not develop a technology.

Situations like these must be avoided. Emphasis should be placed on the need to grant each area a fair share; otherwise we could end up with a team of 25 social scientists and only two biologists, and this would be a serious mistake. So it is important to make an effort to define this balance. For example, among the various schemes being worked on, it is evident that the need for participation from the social sciences increases substantially in subsistence economies and decreases notably in market economies on the road to modernization. In the latter, the problem is more a biological-communicative one, not a social one, because a farmer who has a small dairy, car or pick-up and a television, practically speaking, does not have the same aspirations; so it would be possible to work with him without encountering any communication problems.

Therefore, it is important to avoid either overrating or downplaying the role of the social sciences. There is an extreme case in Central America where a RISPAL project is led by a veterinarian, even though the real problem is of a social nature. Each project is bound to have different needs, given the homogeneity or heterogeneity of the population, the environment which prevails, and the type of research required. In many cases, the technology being researched and developed becomes secondary, particularly in the case where technology portfolios already exist; the question is how to introduce, transform or adapt the technology, and that is where social and economic considerations come into play.

The need for a mixed system increases as resources diminish or are depleted. What happens in certain dual-purpose systems, particularly in Panama and Costa Rica, is that they have been largely livestock-oriented. In Guatemala, we find a mixed system in the settlements; this is also the case in Pucallpa, and interaction is relatively simple because there are only three or four elements which interact almost linearly. But the more complex the economy, the more complicated the situation, and there will be a moment when the researcher will not know what to do with so many factors. For example, potatoes may be grown as a cash crop (with good technology), but there are five other crops grown for household consumption and the researcher does not know whether or not he should recommend stepping up the investment in these crops or not. Therein lies the complication. On the basis of a clear definition of the relative weight of each farming activity, some prioritization must be done; surely this will mean that different types of systems will require different treatments.

Sergio Ruano

The important topics worthy of further discussion are countless. A meeting of this type rarely takes place. There have been several in the biological camp, but next to none in the social sciences. An effort should be made to establish some sort of program schedule, since many opportunities of this kind will present themselves in the future. Among other things, perhaps the follow-up should be a little more methodological than conceptual, because a theoretical discussion is very time-consuming.

Benjamin Quijandria

By definition, problems of a social order are infinite; there are countless ramifications and untold complications. The advantage is that the systems approach helps to bring these problems into focus.

Mercedes Bracco

The use of the systems approach does not always lead to the development of a technological alternative. This is the case of social scientists who may apply this approach for economics research.

Benjamin Quijandria

The economists have reached a point where they know they are not resolving much. Discussions with Adolfo Figueroa, Raul Hopkins and other groups of economists indicate that they have been very descriptive. Peasant economy, as we understand it, is something that is only descriptive or interpretative. On the other hand, there are economists who have already succeeded in making proposals concerning fertilization or use of improved potato seed; that is, they have gone beyond the descriptive stage and started to move into the biologists' territory.

Otto Fiores

Where are we headed now? There are different paths to take. These are: Either to stress the conceptual aspect or the methodological one. Accepting the saying that learning is in the doing, we should begin with the problem, because until now we have been addressing the viewpoints of the different disciplines. The leaders of RISPAL are thinking of using as case studies a completed project, or ongoing projects they already have. For example, we could begin to formulate concrete case studies and see how the different disciplines interpret or handle each one of the cases theoretically and methodologically. If we are thinking about another meeting, I suggest we include case studies such as the one on goats in Piura.

Benjamin Quijandria

Perhaps at the next meeting we should arrive at a better definition of interdisciplinary language. In three days, this group has come to recognize the urgency of a common language. If we analyze the dynamics of the meeting, the first day was clearly too generic. Each participant spoke for himself. The second day we started to build bridges, and from there went on to make concrete progress. In all this, there is a sort of conceptual interaction, more in operational and methodological terms. We are beginning to employ new terms, such as the reproduction of the family. At the beginning of this exercise, the biologist would no doubt have associated this with childbearing. For this reason, an intermediate stage of mutual understanding and learning must continue.

In the case of the goat project on the northern coast, there are several media types used in the different information stages. In the goat project in Piura, once we had the diagnosis in hand, sociologists, anthropologists and biologists with different areas of specialization sat down to discuss the problem. What is important is proving that it was possible to see the problem from different angles and to provide feasible solutions. There are descriptive documents such as the Salas Community Economic Study, but we still need to bring together this study and others, in different fields, and make some sense out of all this.

There is also the case of Guatemala, where various concrete studies which show a good fit in certain respects. But Guatemala has a very special characteristic, namely considerable territorial and individual

homogeneity, which minimizes isolated investigation so important in other cases. But this particular situation is not the rule; most cases show much complexity. Two such cases would be enough for a workshop, followed by a report to be circulated in biological and social science circles. On three consecutive occasions here in Peru, FOMCIENCIAS and the two SEPIAs have conducted meetings which brought together groups from the social and the biological sciences to look at a specific project.

Otto Flores

Then I would suggest that instead of holding another meeting such as this one, we look into a concrete case such as goat or pig production in Chincha, and devote two entire days to looking at concrete problems, analyzing them, and then meeting for an additional three days to discuss the matter, using secondary information. But we would also have to see the case in situ. We could even go so far as to design an alternative.

Manuel Ruiz

Let's agree on something concrete. First, for the purpose of efficiency in future discussions, it is advisable to look upon the participants of this meeting as the nucleus of a group which will hold one or two more meetings, with some additional participants. Second, we shall make a commitment to draft the minutes of this meeting and to send them to the participants for revision and stylistic changes; naturally, this is a tedious and time-consuming task. In addition to these proceedings, a glossary of terms will have to be prepared. To that end, each of the participants will have to make a pertinent contribution. It does not matter if the contributions are redundant in the sense that one person drafts a definition of a particular thing, and Ana Maria Montero, for example, drafts a definition on the same subject. In the end, the definitions will be consolidated. This second document would be a working document for discussion at the next meeting, among other things. If we accept the proposal made by Otto Flores, we would need to have a written case study made available for this future meeting. We will have to think of what project or experience could be used for this case study, making sure that it includes social data.

Enrique Nolte

The Goat Production System Project in Lambayeque contains all the social aspects worked out in depth, beginning with the preliminary discussions of the Small Ruminants Collaborative Research Support Program in 1980, which later gave rise to the work of Avi Perevolotski.

Manuel Ruiz

If we decide to work with the Goat Project in Lambayeque, then it would be wise to hold the next meeting in Chiclayo; there too we could make quick field trips and perhaps review the majority of these methodological steps over a two-day period, for subsequent discussion and comparison with the case study already at our disposal.

Sergio Ruano

It would be necessary to have the present workshop's proceedings beforehand, as well as a description of the experience in Lambayeque.

Manuel Ruiz

Agreed. The minutes of this meeting, including the tables developed here, will be sent to certain key people from both the biological and the social sciences for study, analysis and comments. If we proceed in this manner, the prime objective of the next meeting would be to continue working on methodology and revising terminology, all on the basis of the case study of the Goat Production Project in Chiclayo. It is agreed that the Second Workshop on the Application of the Social Sciences in Production Systems Research be held in 1990. It is proposed that Benjamin Quijandria coordinate this meeting (proposal approved by the participants).

As time is running out, I would like to express my sincere appreciation to all the participants for their brilliant contributions over the course of the last three days of discussion. For RISPAL, this represents a first step in uniting the roles of the social and biological sciences in a common methodology for farming systems research. The results achieved in this forum should be extremely gratifying for all the participants, and is something I think we all feel. The display of enthusiasm, interest, professionalism and experience here has been extraordinary.

APPENDICES

APPENDIX 1
Definitions

Production systems approach

The production systems approach is an interdisciplinary strategy for agricultural development through generation, testing, validation, communication and adoption of appropriate technologies, based on a comprehensive understanding of the farmer's conditions and his environment, with farmer participation throughout the process.

Agricultural production systems

This is the dynamic interaction between the elements which make up the production unit, the center of which is the farmer (family), whose ultimate objective is agricultural production, conditioned by the physical, biological, social, economic, political and cultural environment.

APPENDIX 2
Acronyms and Abbreviations

CATIE	Tropical Agriculture Research and Training Center, Costa Rica.
CE&DAP	Center for Studies and Agricultural Development of Peru
CIAT	International Center for Tropical Agriculture, Colombia
CIID	Spanish acronym for IDRC
CIMMYT	International Maize and Wheat Improvement Center, Mexico
CIP	International Potato Center, Peru
CIPA	Agricultural Research and Development Center (Decentralized agency of the former INIAA, now the Regional Experiment Station), Peru
FOMCIENCIAS	Peruvian Association for the Promotion of Social Sciences
IDRC	International Development Research Centre, Canada
IEP	Institute for Peruvian Studies
IICA	Inter-American Institute for Cooperation on Agriculture, Costa Rica
INIA	National Agricultural Research Institute, since 1991, formerly INIAA, Peru
INIAA	National Agricultural and Agroindustrial Research Institute, Peru
RISPAL	Latin American Research Network for Animal Production Systems, IICA, Costa Rica
SEPIA	Permanent Seminar on Agricultural Research, Peru

APPENDIX 3
List of Participants

Mercedes Bracco	Sociologist, National Planning Institute, Peru
Antonio Chavez	Agronomist, Formerly Executive Technical Director of INIAA, Peru
Cristina Espinosa	Sociologist, CE&DAP, Peru
Otto Flores	Sociologist, Dean of the School of Economics and Planning, Universidad Nacional Agraria, Peru
Myriam Granados	Sociologist, Pontificia Universidad Católica, Peru
Raul Hopkins	Economist, Institute for Peruvian Studies
Sixto Ibarra	Veterinarian, Research Director, Universidad de San Luis Gonzaga de Ica, Peru
Ana Maria Montero	Sociologist, Universidad Ricardo Palma, Peru
Enrique Nolte	Animal Nutritionist and Rural Sociologist, Formerly Coordinator of the Small Ruminant Program (University of California at Davis, INIAA). Presently, Private Consultant
Orlando Plaza	Rural Development Specialist, Organization and Management for Rural Development Program, IICA, Costa Rica
Benjamin Quijandria	Geneticist, Executive President, CE&DAP, Peru
Sergio Ruano	Rural Sociologist, Coordinator of the Maya Project, IICA, Guatemala
Manuel E. Ruiz	Animal Nutritionist, Coordinator of RISPAL, IICA, Costa Rica

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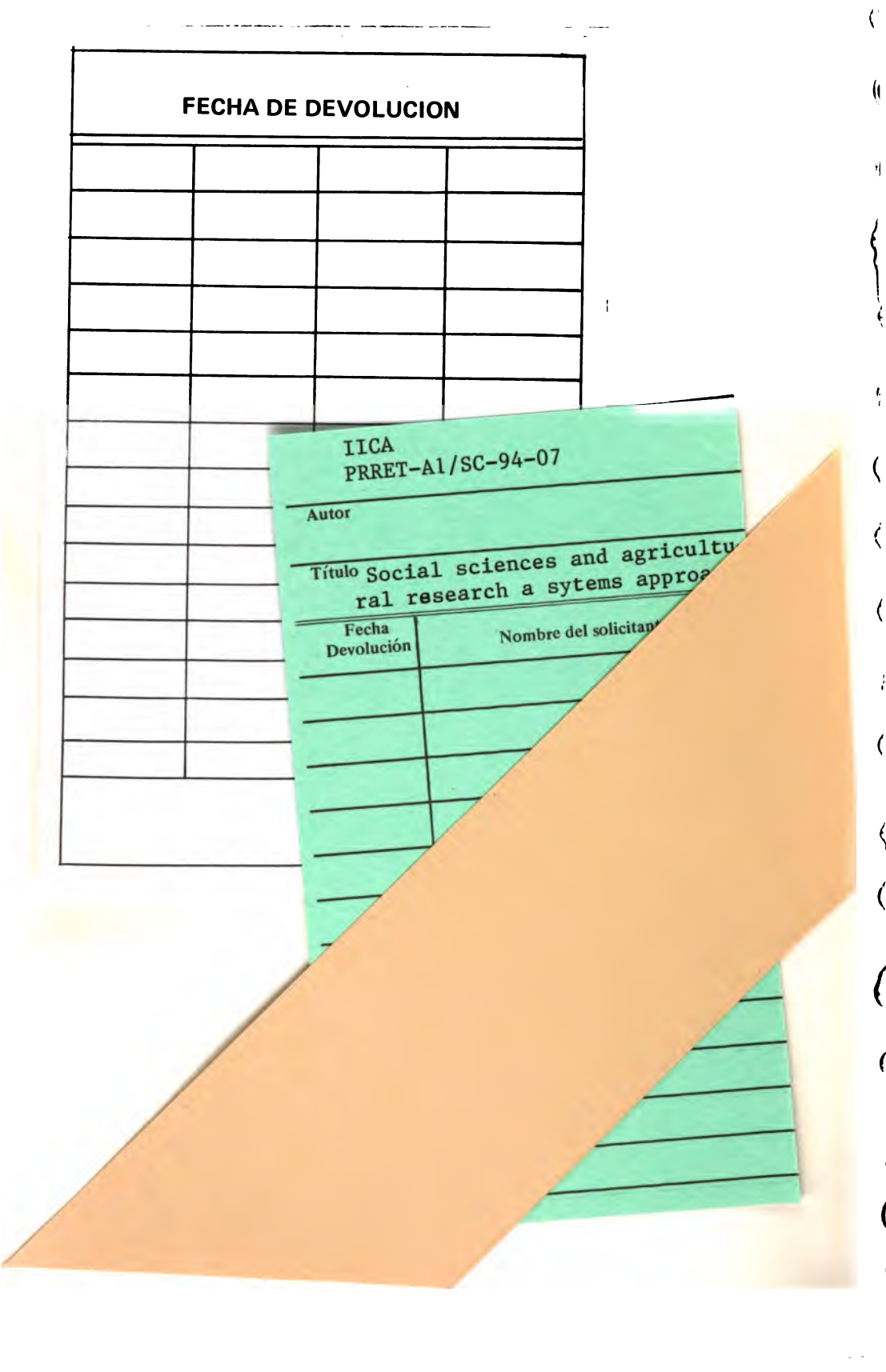
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Informe de la VII Reunión Anual de RISPAL: M.E. Ruiz and A. Vargas (eds.)

Informe de la VIII Reunión General de RISPAL: M.E. Ruiz and A. Vargas (eds.)

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[redacted]

[1] Canada, Canada, prior to the formal creation of RISPAL.

[2] [redacted]ation with CATIE and the University of San Carlos (Guatemala).

The Latin American Research Network for Animal Production Systems (RISPAL) was established in 1986 in order to promote, among the projects and institutions affiliated with the network, the exchange of technology and the development of research methods for animal production systems. It operates under an agreement between the International Development Research Centre (IDRC) and the Inter-American Institute for Cooperation on Agriculture (IICA). Member institutions of RISPAL are the Centro de Estudios y de Desarrollo Agrícola del Peru, the Winrock International Institute for Agricultural Development, IDRC and IICA. Also participating are livestock production system projects in Colombia, Costa Rica, Chile, Guatemala, Guyana, Mexico, Panama and Venezuela.

The Inter-American Institute for Cooperation on Agriculture (IICA) is the specialized agency for agriculture of the inter-American system, and was founded in 1942. The Institute's purposes are to encourage, facilitate and support cooperation among its Member States so as to promote agricultural development and rural well-being. The Institute's work is aimed at making changes in three aspects of agriculture: production, trade and institutions, using an integrated approach to development based on sustainability, equity and competitiveness.

The National Agricultural Research Institute (INIA) of Peru seeks to contribute to the technical improvement of the agricultural sector, while increasing profitability, competitiveness and the participation of national and international, private and public sectors. Its goals are sustained agricultural development, increased rural profitability, increased food security, and improved rural well-being.

The International Development Research Centre (IDRC) is a public corporation founded in 1970 by the Canadian Parliament. Through its financial support of researchers attached to universities, governments, commercial enterprises and non-profit organizations in Africa, Asia, Latin America, the Caribbean and Canada, the IDRC invests in scientific knowledge and technology, with a view to improving the quality of life in the areas of: human health, economic and social well-being, food and nutrition, environment and natural resources, and information and communications.

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