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Economic Perspectives in Agricultural Systems Analysis

Jean-Philippe Colin and Eric W. Crawford

The paper highlights the great diversity of economic research on agricultural systems, through the presentation of selected approaches: modern farm management, farming systems research, agricultural household economics, French Africanist rural economics, and behavioral and multidisciplinary systems studies. Major differences among these studies are highlighted, in terms of research aims, organization and issues, type of "systemic" approach followed, theoretical framework, use of formal modeling, and the role of fieldwork. Trends in popularity of the different research types are discussed. The authors recommend integrating an institutional perspective in economic research on agricultural systems and broadening the research agenda.

The history of agricultural development is littered with projects in which a naive view of the technical, economic, or social dimensions of farming systems led to optimistic expectations of productivity gains that were ultimately dashed against the hard, complex realities of those farming systems. Today, the era of development projects has been replaced by a strong push toward policies aiming to substitute private modes of coordinating agricultural activities for public ones. However, research on agricultural systems remains fundamental in our view, as no policy can be implemented, or its impacts evaluated, without a sound understanding of the local organization of agricultural production, and of farmers' actual behavior.

Economic research has long contributed to studies on agricultural systems. The objective of this paper is to highlight the great diversity of this research. Acknowledging this diversity would help avoid false quarrels within the economic profession—especially once the diversity in the aim of the research is recognized—and help improve the understanding of economic perspectives by the other disciplines working in the rural studies area. Indeed, researchers

■ *Jean-Philippe Colin is senior researcher, Institut de Recherche pour le Développement (formerly ORSTOM). Eric W. Crawford is professor, Department of Agricultural Economics, Michigan State University.*

from other disciplines tend sometimes to consider that the economist's contribution to research on agricultural systems consists only of basic economic calculations of production costs and returns. This paper, however, clearly shows that economists play a much broader and richer role in agricultural systems research.

The large volume of literature published in this area clearly precludes us from offering an exhaustive review. Our purpose is rather to illustrate, through the presentation of selected approaches, major differences among economic studies of agricultural systems in terms of criteria such as purpose of study, major research issues, theoretical framework, use of formal modeling, role of field studies, etc. In its objectives, our discussion resembles Merrill-Sands' 1986 paper on farming systems research, but focuses more on the economic dimension of agricultural systems studies and encompasses a broader range of research types, including problem-solving as well as knowledge-oriented studies (both subject-matter and disciplinary studies), and those conducted by agro- and socioeconomists as well as economists. As such, the literature reviewed, which includes both English-speaking and French-speaking research, also covers a wider field when compared with previous reviews of economic research on agricultural systems (Byerlee et al. 1979; Crawford 1981; Bonnefond, Couty, and Germain; Baker 1988, 1991; Crawford and Baker; Gastellu 1993).

Our discussion is organized around the following ideal-types defined in terms of their underlying conception of economics as a discipline[1]:

1. "Neoclassically based microeconomics" rests (implicitly or explicitly) at least partly on the neoclassical paradigm, which focuses on optimal allocation of scarce resources using private markets, with efficiency as the criterion. The core of this paradigm includes methodological individualism (in the variant assuming atomistic decision-makers); a decision-making process based on the rational choice model, stable preferences, and no power; a focus on equilibrium; and commodities and prices as the units of analysis.

   The neoclassically based microeconomics type of research on agricultural systems will be illustrated with (*a*) modern farm management and the economic component of farming systems research, which we characterize as "partly" neoclassical,[2] and (*b*) agricultural household economics, which is an "expanded neoclassical"[3] approach.
2. "Heterodox economics" is characterized by an explicit or implicit distance from the neoclassical paradigm in both its research methods and issues (rejection of the rational choice model, and empirical research focused on understanding the actual functioning of the economy and actors' behavior and institutions, rather than on testing a hypothetico-deductive theoretical model). This type of research will be illustrated by (*a*) French Africanist rural economics, itself subdivided into agroeconomic studies (characterized by non-theoretical economics) and socioeconomic studies (focusing on the socioeconomic organization of production and implicitly relying on an institutional methodology), and (*b*) the behavioral-type economic component of multidisciplinary research conducted with an explicit systems-science perspective.

For each ideal-type, we will consider, as shown in table 1:

- the type of the research: action-oriented/problem-solving versus knowledge-oriented,
- the organization of the research program which includes the economic analysis: disciplinary or multidisciplinary,
- the major research questions,
- the character of the systemic perspective: explicit systems science approach versus implicit or loose systems framework,
- the methodology and techniques used: relative importance of theory, modeling, econometric techniques; key concepts; importance given to field work.

This review may suggest a strong dichotomy between orthodox-Anglophone and heterodox-francophone economic research on agricultural systems. We do perceive French economic research in this field as globally more heterodox than Anglophone research, but the focus on French Africanist studies (the field of competence of one of us) has undoubtedly overemphasized these differences.[4]

Neoclassically Based Microeconomics

Modern farm management, farming systems research (FSR), and agricultural household economics are the major approaches used in agricultural systems studies whose conceptual underpinning is at least partly neoclassical.

Although farm management and FSR studies do not necessarily assume profit maximization as the sole objective, we consider them as partly neoclassical. FSR economists by training have a stronger production economics orientation than did the farm management economists who preceded them, and the budgeting and modeling techniques used by FSR economists reflect standard neoclassical assumptions. Farm management studies generally involve a descriptive analysis of a given agricultural system that is not circumscribed by the standard neoclassical assumptions. The conceptual framework underlying agricultural household studies clearly differs from the separate firm and consumer theories of the neoclassical model. As noted below, many agricultural household studies relax one or more of the standard neoclassical assumptions. However, these studies are more accurately described as extensions of the neoclassical conceptual model than as a fundamentally different model.

Farm Management Studies and the Economics Component of FSR

Farm management

Farm management research in the United States developed in the late 1800s, a time of falling prices and overproduction. The resulting economic crisis gave technical scientists a greater interest in the business side of farming (Baker 1988). Farm management research was initially multidisciplinary, holistic (examining the full range of farm household activities), and focused on descriptive empirical studies. Survey data collection, descriptive statistical analysis, and budgeting were the prevailing techniques. At U.S. land grant (agricultural) universities, farm management as a discipline developed in the early 1900s within crop and animal

Table 1. Types of research on agricultural systems

	Agricultural Household Economics	Economic Component of Farming Systems Research	Farm Management	Agroeconomics	Socioeconomics	*Recherche-système*
Type of economic approach	"Expanded" neoclassical	"Partly" neoclassical	"Partly" neoclassical	"Ad hoc"	"Implicitly institutional"	Behavioral
Type of research	Mainly knowledge-oriented	Problem-solving	Problem-solving	Mainly knowledge-oriented	Interdisciplinary	
Type of research program	Disciplinary	Multidisciplinary	Multidisciplinary	Multidisciplinary, or "one man band"	Disciplinary (soft)	Interdisciplinary
Major research issues	Policy impact	Technical change	Technical change	Technical change, resource management and use	Mainly the dynamics of economic systems	Decision-aid support (technical and economic farm management)
Type of "Systemic" approach	Implicit. System limited to few key economic variables	Explicit, but no systems science perspective. System encompasses economic and key agronomic variables	Implicit. System encompasses economic and key agronomic variables	Explicit, but no systems science perspective. System encompasses agronomic and socioeconomic variables	Implicit or explicit. System encompasses socioeconomic variables and a few key agronomic variables	Explicit, with reference to systems science. System encompasses agronomic and socioeconomic variables.
Formal theories	Yes	Rarely	Rarely	No	No	No
Formal analytical techniques	Yes	Rarely	Sometimes	Rarely	No	No
Researcher's personal involvement in field work	No	Strong	Strong	Fundamental	Fundamental	Fundamental

science departments, in an effort to identify how best to apply scientific advances in agriculture within the practical farm context. Separate departments of farm management were created, and the economics content of their work increased, until in the 1940s the more theoretically oriented production economics approach gained ascendancy (Heady). Johnson introduced and Jensen later used the terms "endowed" and "unendowed" to refer to farm management approaches that had or did not have their roots in economics, respectively; in our review, we focus primarily on the endowed farm management studies.

Most farm management studies have an action orientation. An important target audience for such studies therefore is extension agents and (at least indirectly) farmers. Farm management studies typically involve a descriptive analysis of a given agricultural system, and many studies, especially from the early and mid 1990s, contain little explicit reference to microeconomic theory or use of formal models.

Research questions addressed by farm management studies are virtually the same as those identified below for FSR and agroeconomic studies. Early studies by farm economists, at least in anglophone countries (Clayton), were devoted primarily to persuading general agriculturalists that economic measures of productivity (net returns) were more important than technical measures (maximum yield). Other common topics (Hall) were forward planning (identifying production plans for broad types of farm[5] that would increase output and incomes yet be feasible in terms of farm-level resource availability), single enterprise studies, and analysis of key resource constraints (focusing especially on measurement of agricultural labor requirements, and emphasizing the importance of family labor rather than land as a constraint). Techniques such as linear programming and factors such as risk were emphasized in studies during the 1960s and 1970s.

Most farm management studies incorporate no formal systems concepts. They commonly incorporate an informal or implicit systems perspective, however, by taking the full range of farm and household activities into account at some point in the analysis.

The methodology used in farm management studies bears a strong resemblance to that used in agro-economic studies, as described below (Dillon and Hardaker). The major difference is that farm management studies, at least those conducted by anglophone researchers in Africa since the 1950s, reflect the perspective of those whose primary training is in economics. As a result, somewhat less attention is given to agronomic variables. The majority of studies use only descriptive statistical analysis, based on formal surveys of farmer practices or data from farm record-keeping programs. Occasionally, linear programming may be used in order to handle multiple resource or behavioral constraints (Clayton).

Economic component of farming systems research[6]

FSR emerged independently, and nearly simultaneously, in several international agricultural research centers (IARCs)—primarily IRRI, CIMMYT, and IITA in the early 1970s. In 1980, Gilbert, Norman and Winch in their review of FSR could identify only about twenty FSR programs worldwide, many in the early stages of development. The primary location for FSR was still the IARCs, with only a handful of national programs. In the heyday of FSR later in the 1980s, there

were more than 250 projects worldwide (Brown, Chapman, and Castro), including many within or linked to national research institutes.

Despite considerable diversity, certain common features distinguish the FSR model: an action orientation, the primary goal being to develop improved technology adapted to local conditions, a focus on target farmer groups (recommendation domains), a concern with farmer objectives and constraints, implementation by researchers from several disciplines working as a team, direct researcher–farmer contact, emphasis on rapid, qualitative data collection rather than on formal surveys, technology evaluation from a whole-farm perspective, on-farm trials with farmer participation, and complementarity with commodity and disciplinary research.

The most significant difference between FSR and endowed farm management is that the overall research context of FSR is the development of new technology, while the research context of farm management is more one of optimizing the management of existing technology. FSR also focuses more on a multidisciplinary team approach, use of on-farm trials, and rapid, informal methods of data collection, at least during the initial diagnostic phase.

The primary role of the economist in FSR has been to carry out farm-level surveys. Reflecting this, economists often have had a leading position in FSR diagnosis, particularly at the beginning when there is an emphasis on rapid appraisal surveys and single-visit baseline surveys. Information generated by the economist, along with other team members, is used for setting priorities and for designing the technology testing program.

Once testing is underway, the economist normally splits time between budget analysis of trials data and administration of various types of follow-up single-visit subject surveys. In countries where FSR has been introduced by technical advisors from American universities, the role of the economist has also included resource monitoring and analysis of farm income, wealth, and market transactions. Economists have sometimes participated actively in trials design and implementation. The role of the economist in extension liaison and dissemination is difficult to delineate since relatively few FSR teams have devoted much time or resources to these activities.

Major research questions addressed in FSR studies include the structure and operation of the existing farming system (generally emphasizing crop production) and its relationship to the overall household, principal farm productivity constraints and opportunities for productivity improvements (as perceived by the farmer as well as by researchers), evaluation of existing and new technology options in terms of economic criteria and farmer goals, and assessment of the impact of new techniques once adopted by farmers.[7]

Although FSR does not reflect a systems science approach per se, it does use an explicit systems perspective and often refers to systems science concepts (Crawford and Baker).[8] The systems perspective used in FSR focuses on (*a*) farmers' multiple objectives and resource opportunity costs, (*b*) linkages among production enterprises, and competition for household resources, and (*c*) the importance of exogenous factors in determining farmers' opportunity sets. Concern with multiple objectives and enterprise linkages stems from an observation by Collinson (1981b) and others that farmers often make compromises in managing particular enterprises in order to better accomplish their overall goals.

Emphasis on external circumstances normally is attributed in the FSR literature to research by CIMMYT showing that technology adoption is strongly influenced by compatibility between technologies and farmers' circumstances (Perrin and Winkelman; Byerlee et al. 1980).

The level of system addressed in FSR studies varies considerably. Most focus on the cropping system (and perhaps on a single key crop), but the role of the cropping system within the larger farm or household system is generally recognized explicitly (Worman, Norman, and Ware-Snyder). Studies that focus on the mixed crop–livestock system include Chater, Dauji and Parasram, Delgado, and Wilson. Some FSR teams, especially those which include anthropologists, animal scientists, or geographers, explicitly consider the relationship between the farming system and higher levels of agricultural system, e.g., village or *terroir* (Walker and Ryan).

While most experienced FSR economists recognize the limitations of the neoclassical framework, simplified assumptions are often adopted to facilitate practical farming systems analysis. Although gender-specific roles and resources (e.g., male versus female fields) may be recognized by FSR researchers, FSR economic models often assume that the farm household can be treated as the unit of analysis. By focusing on the farm household, it is implicitly assumed that the household has a single preference function (i.e., one decision-maker). Another implication of taking the farm household as the unit of analysis is that higher-level systems (village, region) and the institutional and economic environment (rules and procedures, markets, policies) may not be explicitly considered.[9] Both of these assumptions—more common in anglophone FSR than in francophone "recherche–développement" (R&D) programs—represent a simplification of the systems perspective underlying FSR.

When analyzing the farm household, consideration is given in principle to allocation of land, labor, and capital to crop, livestock, and nonagricultural production activities. In practice, household maintenance activities are nearly always excluded from the analysis. In many cases, livestock and nonagricultural income activities have also been excluded, perhaps on the assumption that farmers primarily shift resources among cropping enterprises rather than between crop production and other household activities.

Most partial budget analyses of technologies implicitly assume profit maximization even though FSR studies often recognize that the farmer's objective function is not simply profit maximization (Collinson 1981b, p. 46). In practice, food preferences and self-sufficiency objectives are incorporated into FSR economic models by imposing minimum necessary production or consumption levels for staple food grains. Risk aversion is incorporated by specifying threshold benefit levels for new technologies, or target rates of return including a risk premium.

In contrast to conventional agricultural research, FSR teams in Africa have commonly assumed that labor is the most limiting factor, not land. Economic analyses have therefore emphasized returns to labor and estimates of the non-zero opportunity cost of family labor. Surprisingly little attention has been given to financial and real capital constraints. Instead, it is simply assumed that large investments are not normally possible. This has resulted in an emphasis on small, incremental changes.

Input and commodity markets are generally assumed to be imperfect. Under these conditions, purchased and home-produced goods are not perfect substitutes. Consumption preferences are therefore recognized to play a major role in production decisions. Nevertheless, although markets for inputs and outputs may be unreliable, it is generally assumed that farmers will adopt technologies which are financially profitable.

The majority of FSR studies use only descriptive statistical analysis and tests of treatment effects in on-station experiments or field trials. Economic analysis of trials has usually relied on partial budgeting, often following the CIMMYT format (CIMMYT). Some enterprise budgeting has been done using multiple-visit data, but rarely has there been whole farm income analysis, cash flow analysis, or assessment of household net worth. Mathematical programming and econometric or simulation modeling techniques are much less common in action-oriented FSR studies than in knowledge-oriented production economics studies, due to the abstraction from "real world" conditions that they entail, and their substantial cost in terms of the need for detailed quantitative data and researcher expertise.

In programs where FSR economists have formally analyzed sources of farm efficiency and productivity, or tried to identify determinants of adoption or non-adoption, data analysis has often involved multiple regression analysis. Estimation of production, cost, or profit functions by economists working in African FSR could be counted on one hand. Attempts at prescriptive analysis based on optimizing models or simulation models are equally rare. Analysis of decision-making under uncertainty has frequently been mentioned as a high priority but few economists have incorporated risk beyond doing sensitivity analysis or using various threshold levels or rules-of-thumb (Baker 1991).

FSR studies depend on primary data collected in the field. There is considerable emphasis on the importance of direct contact between researcher and farmer, reflecting both a skepticism about the ability of extension agents to communicate farmers' views to researchers, and a feeling that researchers would benefit from more contact with the "real world." Data collection techniques range from rapid, informal surveys and interviews with key informants, to one-shot or repeated-visit formal questionnaire surveys. As noted in Eicher and Baker (1982), much attention was devoted to survey data collection methods during the 1960s and 1970s (Ancey 1984, Collinson 1972, Kearl, Norman, Spencer), and to more informal, rapid reconnaissance techniques during the 1980s as FSR gained prominence (Collinson 1981a, Chambers and Ghildyal, Franzel and Crawford, Hildebrand).

Agricultural Household Economics

Agricultural household models, especially as applied to farm households in developing countries, were developed in the late 1960s (Jorgenson and Lau) and 1970s (Barnum and Squire), with a thorough exposition and set of case studies contained in Singh, Squire, Strauss. Early empirical estimates of agricultural household models include Kuroda and Yotopoulos. Agricultural household models have important roots in the work of Becker (1965), who looked at the allocation of time within households considered as both producing and consuming units. Other roots include the work of Chayanov in the 1920s on the peasant farm household (Chayanov et al. [sic]). Somewhat related is the neoclassically based

theory of farm households elaborated by Nakajima and summarized in his 1986 book.

Both problem-solving and knowledge-oriented studies of agricultural systems refer frequently to the farm household, but the vast majority of studies that use a formal agricultural household model[10] have a knowledge orientation, are intended primarily for an academic audience, and generally reflect an expanded neoclassical approach (Caillavet, Guyomard, and Lifran). Policy analysis studies based on the agricultural household model sometimes have an action orientation, however (de Janvry et al., Goetz).

Principal research questions addressed by agricultural household studies include:

(*a*) Analysis of the impact on farm households of development programs and policies. Since a major feature of agricultural household models is the incorporation of both production and consumption decisions, they offer a potentially more accurate tool (compared to models that treat only production or consumption) for estimating the effect of changes in taxes, subsidies, trade policies, introduction of new technology, etc., on household behavior.[11]

(*b*) Topics of disciplinary interest, principally: (1) conditions under which production and consumption decisions can be modeled recursively ("separable" agricultural household models) versus simultaneously ("nonseparable" models), and in the latter case methods for practical estimation of nonseparable models; and (*b*) characteristics of household decision-making, e.g., whether to model a single household-level utility function as opposed to multiple utility functions for different members within the household, and in the latter case whether and how to model decision-making as a bargaining process (Bourguignon and Chiappori; Doss; Haddad, Hoddinott, and Alderman).

(*c*) Inequality within the household in terms of differential access to resources and distribution of household income depending on gender and age characteristics. Feminist studies focus on access by women to household resources and the extent to which women influence resource allocation decisions and receive a fair share of increased household income (Folbre 1986).

Agricultural household studies rarely contain explicit reference to systems science concepts, although the agricultural household model by definition has a holistic orientation in that it treats a broad range of activities other than farm production, such as consumption, off-farm wage employment, and nonfarm and domestic household production activities. The degree to which all these dimensions of household activity are explicitly considered varies from study to study.

The basic mainstream theory of the agricultural household assumes that (*a*) the household has one objective function, namely to maximize utility as a function of goods consumed and leisure; (*b*) factors of production include time as well as material inputs; (*c*) goods consumed by the household include not only purchased market goods but also "Z-goods," which are broadly defined nontraded commodities such as "nourishment" or "healthy children" which the household produces by combining its own time, market goods, and other inputs;[12] and (*d*) complete and perfectly functioning markets exist (in particular the labor

market), and family and hired labor are perfect substitutes, which allows production and consumption decisions to be treated as separable.[13]

Typically, production and consumption functions derived from the model are estimated using econometric techniques. Some studies model production and/or consumption decisions using linear programming techniques (Bezuneh, Deaton, and Norton; de Oliveira; Roth, Abbott, and Preckel).

Problem-solving agricultural household studies may or may not employ the basic mainstream model. Some studies (Pradhan) provide a nontheoretical descriptive analysis of household activities,[14] while others develop and apply an idiosyncratic household model (Gryseels and Anderson), sometimes used only as a conceptual orientation.

Almost without exception, knowledge-oriented agricultural household studies use some sort of formal model. Studies using nonstandard agricultural household models include Lin, Nakajima, Chayanov et al. [sic], and Crawford (1982). Basic references on the standard agricultural household model are Singh, Squire, and Strauss and Ellis. Most studies have a static time frame; exceptions include Roe and Graham-Tomasi, Crawford (1982), and Saha.

Many agricultural household studies develop and apply extensions of the basic mainstream model. Common extensions, all of which imply the joint determination of production and consumption decisions, involve incorporation of risk (Saha and Stroud), transactions costs (de Janvry, Fafchamps, and Sadoulet), nonexistent or imperfect labor markets (Fafchamps), imperfect substitutability between family and hired labor (Low), and modeling of decision making in terms of bargaining instead of a joint household utility function (Udry; Doss; Caillavet, Guyomard, and Lifran; Haddad, Hoddinott, and Alderman).[15]

Studies of specific agricultural systems that use the agricultural household model require even more primary data than do neoclassical studies, given the need for detailed information on production, consumption, and wage employment activities, which may need to be disaggregated by gender and age category. Knowledge-oriented agricultural household studies often use survey data collected under other research projects (e.g., Fafchamps, Udry).[16]

"Heterodox" Economics

Heterodox economic approaches to agricultural systems studies will be illustrated by the French Africanist rural economics (FARE) tradition of research, in its agroeconomic and socioeconomic ideal-types, as well as by research with a behavioral and systems science orientation done in France.[17]

French Africanist Rural Economics

The approaches presented in this section under the labels of "agroeconomics" and "socioeconomics" are particularly characteristic of research conducted in rural Africa from the beginning of the 1970s to the beginning of the 1990s; as we will see, a recent evolution tends to make this dichotomy less relevant.[18]

Agroeconomics

This type of research originated in the late 1960s when it was observed how difficult it was to transfer into the peasant environment the results of agronomic

studies made on experimental research stations. It was later institutionalized, for example within the Department of Agrarian Systems of CIRAD (*Centre International de Recherche Agronomique pour le Développement*). In parallel, a specialization in agricultural systems analysis was added to the curriculum of educational institutions for agronomists. This approach had—and still has—a strong influence on development projects funded by French cooperation and by NGOs.

Agroeconomic research often is presented as a part, or a would-be part, of multidisciplinary programs. In reality, the leading role of agronomists remains very clearly marked (contrary to FSR, where the economist is often the leader).

The framework of agroeconomic studies, undertaken above all by researchers originally trained as agronomists, is that of agricultural development without reference to an academic disciplinary field and without worrying about an anchorage in such a field. The emergence of agroeconomics might, in a way, be interpreted as a means for agronomists to explore empirically the field of social sciences, in order to better understand peasants' technical behavior in the context of research and development programs. The strictly economic component of agroeconomics can be described as empirical or ad hoc (without attaching any negative connotation to the term, i.e., "what fits a specific situation"), because of this lack of a theoretical economic reference.

From an economic point of view, these approaches cover a variety of studies, ranging from simple techno-economic analysis of farm entreprises to studies of agricultural systems dynamics. The dominant research theme remains that of technical change and resource management and use. Because of their training, agroeconomists tend to follow a microeconomic approach, but this can evolve into a more global analysis. The influence of geography and, at one time, of Marxism, have helped with this evolution. For a whole generation of agroeconomists, Marxism has often led to a stronger sensitivity to economic issues, and to the inclusion of an historical dimension in the analysis. Consequently, some studies focus on the local level (e.g., Billaz and Dufumier; Benoit-Cattin and Ruf; David and Moustier; Goud), while others have a more regional reach (e.g., Clouet, Guilloneau, and Ruf; Cochet; Léonard; Ruf 1984). In both cases, the agricultural system per se is the object of study.

This system is defined in terms of technical rather than economical considerations. The conceptual grids associate concepts and levels in a nested "Russian dolls" approach: the cropping system at the plot level, the farming system at the farm level, and the agrarian system at higher levels. The agrarian system is defined by Mazoyer as the "mode of resource management and use, historically constituted and sustainable, adapted to the biological–climatological conditions of a given area, and answering the social conditions and needs of the time." In the research practices of agroeconomists, the agrarian system is often seen as the "catch-all" for all economic and social variables, from the relationship network that links together the farms of a small region to the possible integration of these farms into international markets.

Socioeconomics

The "socioeconomic" label is used to characterize a particular approach of economics, one which is heterodox and open to the other social sciences. Within French Africanist rural economics, the approaches we characterize as

socioeconomic refer (*a*) to knowledge-oriented research not directly aimed at "action," and conducted either within research organizations that do not have an exclusive agricultural mandate[19] or by academic researchers, and (*b*) to research with a more applied goal, which supports public intervention in the agricultural sector. We will focus here on the first type of research, which, among all the works on the economics of agricultural systems, is probably less well known by the English-speaking community.

Explicit consideration of agricultural systems in socioeconomic research began in the 1970s, but agricultural production was analyzed earlier in many studies with a similar concern—particularly economic research with an anthropological orientation dealing with the socioeconomic organization of agricultural production (Collectif 1985). This research often is monodisciplinary and has practically no links with natural sciences, which represents a major difference between socioeconomics and agroeconomics.

In a substantive conception (to use Polanyi's terminology), economics is understood as a discipline that considers the social relationships formed around the production and consumption processes as an important component of its research domain. Socioeconomic research usually explores the continuum linking the behavior of economic actors and the dynamics of economic systems: comparative analysis of agricultural systems and their evolution in Soudano-sahelian Africa, relationships between agricultural systems and migration, and peasants' strategies and the dynamics of the peasant plantation economy in Western Africa.[20] These themes are approached through the analysis of land tenure systems, social relations of production, intra-family relations of production and accumulation, conditions of the introduction and diffusion of technical innovations, relations between peasants and parastatals, and more generally, peasant strategies and practices seen in the light of the relations of production and distribution. The dynamic dimension of phenomena is often emphasized in the analysis.

This type of research does not make reference to systems science, and agricultural systems or production units are not themselves the objects of study. The agricultural system is a tool and not a focus of study, and it is used to explain, along with other factors, the practices of the farmers and economic dynamics. The goal of the socioeconomic approach is not to provide a detailed analysis of the operation of the farms, but to generate more aggregated qualitative models of the behaviors of types of agents and economic dynamics (e.g., Badouin 1985, 1987, Couty 1987, 1991). The logic behind the actors' practices is studied in their economic and social situation rather than in their decision models. The analysis remains "situational" rather than "behavioral."

The FARE's socioeconomic component does not adhere to an established body of theory. At one time, the neo-Marxist stream had some influence through the close contact with the French school of economic anthropology in the 1960s and 1970s, but Marxism was fundamentally questioned in relation to the place given to historic and structural determinism, and to conflict as the only driving force of history. More practically, the generality of the concepts proposed (e.g., "modes of production") was seen as reducing their relevance when the focus is on the diversity of peasant practices at the local level. Neoclassical theory, on the other hand, is less criticized than ignored, as its postulates consider as exogenous and therefore eliminate from the field of investigation[21] precisely that which poses

problems and makes up the object of FARE's research, such as the condition of access to productive resources, the rationale of actors' behavior, institutional arrangements, concrete mechanisms of exchange, etc.

This socioeconomic approach shares some methodological features with the Old American Institutionalism:

- a substantive conception of economics, and a similar type of research agenda, i.e., not restricted to the analysis of resource allocation, and giving considerable attention to the social conditions of access to resources;
- a type of research that aims to provide explanatory models which are valid locally, i.e., partial (as opposed to general) theories. Starting from empirical questions, the objective is to make a specific localized reality intelligible. To build up these locally valid models, it is considered necessary to immerse oneself in this local reality, to have a many-sided perception of rural society, and to accumulate contextual knowledge,[22] specific to that society, which explains the importance given to description;
- a holistic approach to observation,[23] meaning that to understand the elements of a system necessitates an overview of that system;
- a limited interest in mathematical models and econometric analysis.

Common features

Despite specific differences, the agroeconomic and socioeconomic approaches have several basic characteristics in common.

(*a*) *In situ* research. The specificity of FAREs as economists is less the collection of first-hand information—nowadays a common practice in rural economics—than the fact that data collection is rarely if ever delegated, in the tradition of anthropological research. The researcher's personal investment in field work is considered to be crucial.

(*b*) A common pool of data collection techniques. These techniques cover a wide range: questionnaire surveys, participant observation, informal interviews, kinship and biographic descriptions, follow-up questionnaires with a variable frequency (recording effective labor investments per hectare, work time per individual, expenditures, consumption, production sold), yields and area measurements, cartography, etc. (e.g., Minvielle 1978, Goud, Colin 1994). In comparison with socioeconomists, agroeconomists focus more on plot-level technical variables and they are often less interested in the understanding of social relationships. However, both types of economists do not consider data collection as a minor preliminary step to analysis, and they pay close attention to the quality of the data being collected. Few studies rely exclusively on a one-shot questionnaire survey or on data collected exclusively by interviewers.

(*c*) This concern led to elaborate methodological considerations on the definition of units of observation (in particular the production units, including an analysis of the complexity of agricultural households and the plurality of the decision centers they harbor), on the specificity of the economic roles depending on gender, age, and social status, and on higher organizational levels such as the village, the *terroir*, or the lineage.[24]

(*d*) A limited interest in mathematical models and econometric analysis,[25] justified by the classic problem of data quality (particularly acute in developing countries), and by a clear reticence toward mathematical modeling of qualitative information, of dynamic processes, or of uncertainty. In general, the stress is placed not so much on the sophistication of the tools as on a deep knowledge of the situation studied. The economic tools actually used are simple, e.g., descriptive statistics, regressions/correlations, enterprise budget analysis, sometimes linear programming. Taking into account the diversity of local conditions leads often to the production of farm typologies.

(*e*) An emphasis on dynamic and even historical analysis.

(*f*) Since the beginning of the 1990s, both agroeconomics and socioeconomics have undergone major changes. Researchers seem to have lost their interest in holistic studies of agricultural systems, and are now instead exploring more deeply specific features of these systems—labor or land issues, credit access, natural resource management, etc. They rely more and more on an explicit anchorage in the economic literature, with a growing interest in institutional economics such as transaction cost economics, rooted in the works of Coase, North, and Williamson (1985) or the French "*économie des conventions*" school (Orléan). That change can be related to the rejection of the systems research fad of the past decades, which often led to "systems mumbo-jumbo," to mechanical and superficial analysis, and to a "one-man-band" bias (where it is assumed that one broadly trained researcher can address all aspects of the agricultural system). In this process, agroeconomics tends to lose its ad hoc character, the distinction between agro- and socioeconomics tends to lose its relevancy, and economic research on agricultural systems tends to soften its "heterodox" character. This latter trend is obviously linked with the evolution within neoclassical economics, whose "expanded" versions (like New Institutional Economics) reduce the gap between heterodox and neoclassical economics.

"Recherche-système" on Agricultural Systems

Another type of economic research on agricultural systems, explicitly referring to systems science, will be illustrated with the economic component of some studies realized at INRA (*Institut National de la Recherche Agronomique*). Since the 1970s, INRA has developed within its Agrarian System and Development (SAD) department interdisciplinary research including social science and agricultural and animal sciences. The works of SAD mentioned here belong to problem-solving research at the farm-family system level. Technical and economic management practices are analyzed through an interdisciplinary study of individual behaviors, in order to support extension services in their objective to provide custom-tailored advice (*conseil de gestion*) for individual farmers. This actor-focused approach makes it possible to really open the farm "black box."

The farm is seen as an organized whole that does not respond to simple and uniform optimization criteria (Petit 1978, Osty), and a systemic conceptualization of the farm-family system is proposed (Brossier et al. 1990). The concepts of production system and agrarian system are sometimes used but are not central to the analysis.

The economic component of this approach obviously is based on behavioral economics, departing explicitly from the neoclassical model, in particular from

its postulates concerning the exogenous character of the objective function, and perfect information. The theory of adaptive behavior (Petit 1975, 1978, Brossier et al. 1991) is based on the postulate that there is a coherence between the actions of the farmers and their perception of what they can do and what they would like to obtain (satisficing).

The concepts of goals of the system, situation, and perception are central to the approach. The goals of the system correspond to a complex, somewhat ranked, set of objectives, pursued by a family or by some members of a family. The adjustment of the farm family's objectives and plans to the (dynamic) situation is part of the field of analysis; the objectives are not exogenous as they were in the neoclassical model. The situation defines the set of constraints that limit the possibilities of action of the actor, but also the resources at his disposal: environmental factors and factors linked to the structure of the system, e.g., the family situation. The perception the agent has of his situation determines his behavior, which means that the perceived situation must be distinguished from the objective situation.

As such, the theory of adaptive behavior is more a methodological framework than a theory in the sense of a conjectural model. The logic of the actors is established through a coherent, but general analytic framework, whose specific content comes from the situation studied.

The techniques of data collecting are not much different from those used by FARE,[26] but as this approach is applied mainly in France, it benefits from a much easier access to information: land records, farm accounting books, etc.

Comparison Across Research Types

While not exhaustive, this review, by highlighting the diversity of economic approaches to agricultural systems research, shows the wide range of contributions economists make to this field of research, regarding the following criteria (see table 1).

(*a*) The aim of the research: production of knowledge (agricultural household economics, socioeconomics) versus solving problems (farm management, economic component of FSR, agroeconomics, "*recherche-système*"). The broad distinction between action- and knowledge-oriented research needs to be further disaggregated. In terms of problem-solving research, the objective may be focused on improving the management of specific farms (*recherche-système*, farm management), or supporting technical change (FSR, agroeconomics). In the case of knowledge-oriented research, disciplinary-based approaches (agricultural household economics) and empirically based approaches (socioeconomics) are obviously very different: in the former case one starts with a theoretical question favoring the purity of simplification and abstraction; in the latter case, one tackles an empirical situation in all its messy dimensions.

(*b*) The organization of the research: economic research can be conducted within monodisciplinary programs (agricultural household economics, socioeconomics), or it can be integrated into multidisciplinary programs (FSR, farm management, agroeconomics, *recherche-système*).

(*c*) Major research issues: from technical change (FSR, agroeconomics), to resource management (agroeconomics), farm management (farm management, *recherche-système*), agricultural policy analysis (agricultural household

economics), and the dynamics of economic structures within a rural society (socioeconomics).

(*d*) The type of systemic approach: from the use of systems science conceptual framework (*recherche-système*), to limited borrowing of systems concepts and vocabulary (FSR, agroeconomics, socioeconomics), and no systemic reference at all (farm management, agricultural household economics).

(*e*) The conception of the economic discipline: "expanded" neoclassical (agricultural household economics), "partly" neoclassical (economic component of FSR, farm management), implicitly institutional (socioeconomics), behavioral (*recherche-système*), ad hoc (agroeconomics, with many parallels with the unendowed U.S. farm management of the beginning of this century).

(*f*) The use of formal theories: the decreasing gradient goes from a strong anchorage (agricultural household economics), to a much weaker one (economic component of FSR, farm management), and to no anchorage in formal (i.e., hypothetico-deductive) theories at all—which does not preclude a coherent methodological framework (*recherche-système*, socioeconomics, agroeconomics).

(*g*) The use of formal modeling and econometric tools: from an extensive use (agricultural household economics), to occasional use (economic component of FSR, farm management, agroeconomics), to no use at all (*recherche-système*, socioeconomics).

(*h*) The place and type of fieldwork in the research process. Some types of economic research on agricultural systems (agricultural household economics) are often conducted without the direct involvement of the researcher in the field work, if any. Collecting data is seen as a preliminary phase before the serious analytical task starts. This perspective is clearly related with the disciplinary orientation of these studies, which focuses sharply on a restricted set of quantitative variables linked to an *ex ante* hypothetico-deductive model. The other types of research are much more concerned with the field work, although in very different ways. The economic component of FSR (and FSR in general) tends increasingly to favor light data collection techniques; the main researcher's direct participation in data collection is then generally limited to *sondeos*, exploratory surveys, and quick informal data gathering, with occasional formal surveys. The farm management, agroeconomic, and *recherche-système* approaches would tend to rely on a combination of heavier data collection (e.g., formal surveys and direct observation), with a much stronger personal involvement of the researcher. The socioeconomic approach often adds to these techniques some anthropological procedures, such as long stays in the rural community.

Perspectives

A Decline of Interest

Beyond this diversity, all the "non-hard-disciplinary approaches" share the same characteristic of having lost their popularity, after being fashionable in the 1970s and 1980s.

In the general case of problem-solving research on agricultural systems, this decline might be explained by the fact that its initial promise as a tool for solving agricultural development problems has not been realized. It may have fallen victim to its initial tendency to "oversell" itself in its dealings with international agencies who long for simple recipes guaranteeing fast results. At the same time, while FSR projects are no longer common, the approach itself has been widely (if sometimes superficially) adopted within national research systems. New themes have appeared that now capture scholars' interest and international funding, such as sustainability, ecoregional development, participatory research and development, etc. The latter may be considered a descendant of FSR, sharing several of the features of FSR and giving even greater emphasis to the role and legitimacy of farmer knowledge and participation in the research process (Ashby and Sperling).

In the specific case of French economic research on agricultural systems, we have already mentioned a trend toward a stronger disciplinary anchorage of the research, especially in terms of conceptual and theoretical frameworks; but parallel to this evolution (which we consider positive), one observes a loss of 'legitimacy' of soft economic approaches, i.e., those more interested in in-depth empirical studies than in formal modeling, and more interested in starting from "real-world" situations rather than from theoretical considerations. This evolution is related to a strong shift toward more academic approaches in French agricultural economics, all the more pronounced since the institutional split between research institutions and universities is decreasing, with the academic norms of evaluation (i.e., sophistication in analytical tools used and publications in A-rated disciplinary journals) tending to permeate research institutions.

However, the current trend could result in "throwing the baby out with the bath water" by doing away with the undeniable methodological, theoretical, and empirical contributions of the FSR, farm management, and heterodox economic approaches:

(*a*) Methodological pay-offs. The importance given to field work through the researcher's direct involvement in data collection (through participant observation and/or close supervision of surveyors) remains a major novelty for economists, and has direct epistemological effects. The complexity of concrete situations makes one sensitive to the interrelations between the economic, technical, and social dimensions of the problems. Awareness of local specificity is an excellent antidote against the reductive oversimplifications of the great theoretical constructions that claim universal validity, especially when the purpose of the research is the understanding of peasant practices in a specific environment. This tradition also keeps one from sinking into what Hirschman calls the "visiting-economist syndrome": "... the habit of issuing peremptory advice and prescription by calling on universally valid economic principles and remedies—be they old or brand new—after a strictly minimal acquaintance with the 'patient'" (p. 93). Furthermore, only this closeness to field work can bring home how much collecting data on even the simplest variables—qualitative as well as quantitative—is at risk for gross errors, due to lack of trust, memory lapses, and other unintentional mistakes by the persons surveyed, or to ill-adapted categories and concepts. This obliges one to be prudent in using sophisticated analytical techniques, in interpreting the results, and in formulating recommendations for action.

(*b*) Theoretical pay-offs. The economic approaches used in FSR, farm management, and the heterodox studies all call orthodox economics into question, at least implicitly: observed behavior differing from the rational choice model, importance of non-market coordination mechanisms, market imperfections, uncertainty and information constraints, embeddedness of economic practices within the local society, etc. In short, these approaches have for some time taken into account issues that current developments in academic "expanded" neoclassical approaches are now incorporating formally.

(*c*) Empirical pay-offs. These studies have undoubtedly improved our knowledge of LDCs' rural societies. For example, to confine ourselves to a brief illustration, they have clearly shown that the access to and allocation of productive resources do not rely only on market mechanisms but also draw on social norms and relationships. To understand and predict farmers' responses to market or policy incentives, one must therefore look beyond costs and returns to alternative productive activities (Berry).

Economic Research on Agricultural Systems: Suggested Orientations

In our view, it would be beneficial for future economic research on agricultural systems, despite the present trend, to refrain from an unconditional use of formal mathematical models or quantitative analysis. By this, we do not suggest rejecting any attempt at formal modeling or any use of econometric analysis. We merely suggest not erecting these methods as ends in themselves and as the sole criteria for judging the interest and quality of an economic study. Moreover, those conducting modeling research must have a sound empirical knowledge of the system being modeled, and must always be aware of the limits of data utilized—a crucial issue in our field of study.

Regarding the theoretical framework, economic research on agricultural systems would have much to gain in drawing greater inspiration from the institutional economics stream, with the explicit addition of agrarian institutions to the research agenda.[27] Agricultural production cannot be understood, or problems of rural development adequately addressed, if we disregard the institutional environment (such as the formal and informal property rights) and the institutional arrangements (i.e., the specific modes of coordination within and between economic units). What are the "rules of the game" within the farm household, between farm households, between farm households and other economic agents? In other words, what are the conditions of access to (and use of) production factors and to the product markets; internal organization of the household; land tenure system; credit system; market organization and functioning; role of public policies in the rural sector, etc.? How do they evolve? What would be the conditions for their improvement?

This suggestion should not be considered as a radical shift, since there has been a burgeoning of theoretical and/or empirical studies along these lines (Hayami and Ruttan; Bardhan; Nabli and Nugent; Griffon; Platteau; Hayami and Otsuka; Hoff, Braverman, and Stiglitz; Allaire and Boyer; and World Bank, to mention only a few).

Of course, institutional economics is far from being monolithic, beyond a common interest in institutions. It is not possible, within the limited scope of this

paper, to argue in favor of this or that institutional approach.[28] We will only mention two facts that argue for a certain eclecticism on this point.

On the one hand, and somewhat upstream from most research on agricultural systems, the criticism by the Old Institutional Economics of a "natural" perception of prices and costs—whereas they originate in fact from a particular structure of rights and a particular distribution of wealth—should lead the economists who are studying agricultural systems to question the "objective" nature of their proposals, particularly for research that aims at changing these systems. A fundamental question remains "whose interests are to count?"

On the other hand, the present blossoming of studies on the margins of the neoclassical paradigm (e.g., transaction costs and imperfect information economics) or of a more heterodox nature (e.g., French school of Convention Economics) could benefit economic research on agricultural systems. Regarding these studies, we should note in particular:

(*a*) Their potential significant contribution to improving the relevance and realism of economic studies on the organization of agricultural production, with their focus on non-existent or imperfect markets, transaction costs, high level of uncertainty, information constraints, etc.
(*b*) Their methodology, which leaves room for field work, and sees the use of sophisticated analytical techniques as optional rather than indispensable for top quality research (Williamson 1988).[29] It is well worth noting that the founders of the International Society for New Institutional Economics (including Nobel laureates Coase and North), on the first meeting of the association (St. Louis, Missouri, September 1997), urged the economists working in LDCs to develop their research through a sound combination of institutional theory and deep empirical investigation, with a strong emphasis on case studies.
(*c*) The opportunity they provide to reassess in more theoretical terms an extraordinarily rich body of empirical material data.

Aside from this fruitful exploration of the institutional economics insights, the economist's contribution to the study of agricultural systems could be more effective if a broader research agenda was defined for both problem-solving and knowledge-oriented research,[30] proceeding in two directions:

(*a*) Opening up and expanding the agricultural system, first "vertically," with research taking into account more explicitly the relationships between agricultural systems and agricultural policy, and between agricultural systems and subsectors, and second "horizontally," in order to take into account major phenomena such as off-farm activities and migration, i.e., to place the organization of agricultural production within the broad set of activities of the economic actors.
(*b*) In the opposite direction, "zooming in" on the decision-making processes within production units. Including the representations of the actors, *à la* Simon, would help better explain farmers' practices and would offer a way out of the situational determinism that often permeates economic studies of agricultural systems.

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Endnotes

[1] This is not intended to be a framework for classifying economists into fixed categories, since the approach used by a researcher may evolve over his or her career.

[2] Although farm management and FSR studies do not necessarily assume profit-maximization as the sole objective, the economists working in these approaches by training have a production economics orientation, and the budgeting and modeling techniques used reflect standard neoclassical assumptions.

[3] By expanded, we mean an approach which, while retaining the core features of the neoclassical paradigm as stated supra, relax some other fundamental assumptions of this paradigm, such as the existence of perfect markets (no transaction costs) and perfect information; technology as given; factors of production are limited to land, labor, capital; firms are treated as production functions; institutions are given, and treated as constraints.

[4] Papers which compare or attempt to reconcile the Anglophone and Francophone approaches to systems-oriented research include Fresco, and Byerlee, Triomphe, and Sebillotte.

[5] Unlike programs in the U.S. and France that provide custom-tailored advice (*conseil de gestion*) for individual farmers.

[6] This section draws heavily on Crawford and Baker.

[7] The descriptive phase of FSR generally focuses on topics such as: household demographic composition, household resource endowment and institutions governing resource access, household income and expenditures, principal constraints on farm productivity, including those external as well as internal to the farming system, use of traditional and improved technologies, market participation, and contact with extension agents.

[8] FSR uses a systems perspective but is not systems science research in the holistic sense defined by Boulding, Ackoff, or Dillon; nor does FSR use the modeling and simulation techniques typically associated with systems research (e.g., Dent and Blackie). FSR differs from mainstream systems analysis partly because few leaders of the FSR movement had training in systems science (Baker 1988).

[9] In some cases, FSR studies evaluate the incentives and constraints associated with the economic and institutional environment, recommend needed policy changes, and examine the effect of such changes on the possibilities for productivity improvement (Fox et al.; Lev and Shriver; Martinez, Sain and Yates).

[10] Sometimes referred to as the "new household economics" or the "household production model."

[11] For example, consumption of a good is normally expected to fall when its price increases. However, increasing the price of a food crop may lead to an increase in household consumption of that commodity if the positive effect of the price increase on farm income outweighs the negative effect of the price increase on quantity demanded.

[12] Colman and Young (pp. 119 and 163); Becker (1971, p. 45).

[13] When production and consumption are separable, production decisions may be made without being constrained by the need to meet household consumption requirements, since food needs may be met with income from wage income or sales of agricultural products, and since the possibility of hiring nonfamily labor means that farm production does not depend solely on family labor. Separable models can therefore be solved recursively; the production side is solved first, and consumption decisions are then made based on the income thus generated. Nonseparable models require much more difficult econometric procedures.

[14] Such studies may therefore be indistinguishable from descriptive farm management studies that focus some attention on the household.

[15] In contrast to agricultural household studies conducted within an expanded neoclassical perspective, many agricultural household studies with a feminist and/or Marxist orientation depart further from orthodoxy. Often, they discard the assumption of a joint household utility function and, without necessarily employing a formal model, analyze decision making and resource allocation within the household in terms of a bargaining process heavily influenced by socially and culturally determined power relation (Folbre 1984, Geisler, Hart).

[16] Such a long period is usually required to collect and computerize the detailed household survey data that the original action-oriented project is likely to have expired before any formal modeling can occur! The data can often be accessed by other researchers at a later time, however.

[17] Again, these are merely illustrations of "non-orthodox" types of research on agricultural systems. One could find many more examples of this broad types of studies.

[18] For a more detailed analysis of French Africanist rural economics, see Colin and Losch.

[19] Such as ORSTOM (*Institut français de recherche scientifique pour le développement en coopération*), renamed IRD (*Institut de Recherche pour le Développement*) in 1999.

[20] See, for example, Ancey 1983; Colin 1990; Leplaideur; Le Roy; Losch, Fusillier, and Dupraz; Minvielle 1985; Ruf 1988; Weigel.

[21] At least, before the recent development of the New Institutional Economics.

[22] Or what Ramstad (1986, p. 1075) calls practitioner's knowledge: "One needs a theory capable of saying a great deal about a few cases, rather than little about all cases. ... to develop 'practitioner's knowledge', that is, knowledge directed to the understanding ... of the specific cases. This is in sharp contrast to the formalist's preoccupations with the development of knowledge applicable to aggregates even if it is of limited applicability to individual cases."

[23] Which does not mean a reliance on methodological holism. Rather than positioning itself on one of the extremes of the old holist versus individualist methodology debate, the socioeconomic approach tends to lean toward interactionism, defined as the simultaneous consideration of individuals and structures.

[24] See Ancey (1975a, 1975b), Collectif (1986), Couty and Winter, Gastellu (1980) and more generally the reports of the AMIRA network (Improvement of Investigation Methods in Informal and Rural Milieu in Africa, Asia and Latin America).

[25] As an example of studies which do use formal modeling, see Barbier; Benoit-Cattin; Temple and Fadani.

[26] See Deffontaines and Petit, Benoit et al., Brossier et al. (1990).

[27] As we saw, agrarian institutions have been part of the research agenda of FARE for decades, but in a relatively atheoretical way; incorporating recent developments in institutional economics would help strengthen these analyses.

[28] One commonly distinguishes the Old Institutional Economics from the New one, but neither of these broad approaches in homogeneous (see Rutherford).

[29] We refer here to the transaction-cost type of approach rather than to more formalized approaches such as the agency theory—even if such an approach does have heuristic value.

[30] Of course, broadening the research agenda for economic research on agricultural systems does not mean broadening the research agenda of each researcher. We do think that the current trend toward more focused individual research agendas is a productive one, even if some holistic perspective remains essential.

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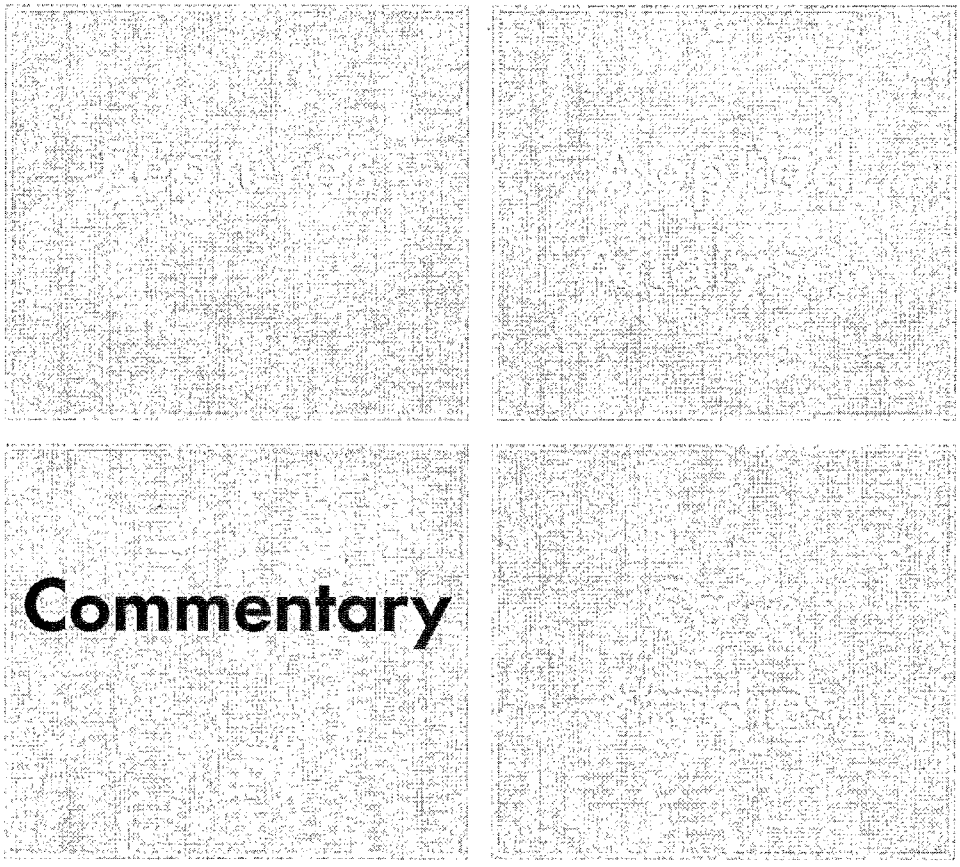
Commentary