

RESEARCH ON AGRICULTURAL SYSTEMS:

Accomplishments, Perspectives and Issues

**Jean-Philippe Colin
and
Eric W. Crawford**

This book provides an overview of research on agricultural systems that is both broad and selective. The focus is broad, by covering approaches used in a number of disciplines, as well as in multidisciplinary studies, and by defining agricultural systems to include cropping systems, farming systems, agricultural household systems, and agricultural systems at higher levels such as the agrarian system. The focus is selective by emphasizing key methods and ongoing debates.

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and
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CONTENTS

Preface	vii
Contributors	ix
Acronyms	xi
Chapter 1—Overview	1
<i>Jean-Philippe Colin and Eric W. Crawford</i>	
PART I: MULTIDISCIPLINARY PROBLEM-SOLVING RESEARCH ON AGRICULTURAL SYSTEMS	15
Chapter 2—Agricultural Systems Research and Technical Change	17
<i>David W. Norman and Peter J. Matton</i>	
Chapter 3—Recherche-Développement: Evolution and Perspectives	49
<i>Philippe Jouve</i>	
Chapter 4—Modeling of Agricultural Systems	69
<i>Scott M. Swinton and J. Roy Black</i>	
Chapter 5—Farm Models and Decision Support: A Summary Review	89
<i>François Papy</i>	
PART II: SOCIAL SCIENCE APPROACHES TO RESEARCH ON AGRICULTURAL SYSTEMS	109
Chapter 6—A Geographer's Viewpoint	111
<i>Jean-Yves Marchal</i>	

Chapter 7—Economic Perspectives in Agricultural Systems Analysis	127
<i>Jean-Philippe Colin and Eric W. Crawford</i>	
Chapter 8—Interactions Between the Agricultural System and Nonagricultural Activities of Farm Households in Developing Countries	163
<i>Thomas Reardon</i>	
Chapter 9—Production Systems and Agricultural Policy	179
<i>Bernard Delord, Philippe Lacombe, Jean-Marc Touzard</i>	
PART III: RESEARCH ON AGRICULTURAL SYSTEMS: CRITICAL PERSPECTIVES FROM OUTSIDE THE FIELD	203
Chapter 10—An Institutional Perspective on Farming Systems Research	205
<i>A. Allan Schmid</i>	
Chapter 11—Social Anthropology, Peasantry, and Agricultural Systems Analysis	223
<i>Jean-Pierre Olivier de Sardan</i>	
Chapter 12—African Farmers' Strategies: Knowledge, Politics and Ideology in Francophone Research	243
<i>Jean-Pierre Chauveau</i>	
Index	277

PREFACE

This book is the result of a collaboration between the Department of Agricultural Economics of Michigan State University and the *Institut de Recherche pour le Développement* (IRD). This collaboration, which developed over the past decade, originated in a shared interest in the topic of production systems research, and gave the opportunity to assemble in the same volume work done by French and American researchers.

Assembling an edited book with chapters prepared by researchers from different institutions and different disciplines, working in different countries, with different languages and under different professional constraints, has been a challenging task requiring a sustained effort. The majority of chapters presented here were drafted by the end of 1996, but putting them in final publishable form took quite awhile longer, primarily because of the time required to translate the chapters originally drafted in French, and to refine the initial translations. To the contributors who honored our (inevitably optimistic) deadlines, we express our thanks for their patience!

Throughout the conception and preparation of the book, we benefitted from the generous support of our respective institutions, which we would like to acknowledge with thanks here. The Department of Agricultural Economics of Michigan State University approved a sabbatic leave for the one of the editor (Eric Crawford) in the latter half of 1995, and hosted the other editor (Jean-Philippe Colin) as a visiting scholar during 1996-1997. Funding for translation of chapters from French to English was provided by IRD, then ORSTOM, and, for the chapter by François Papy, by the *Institut National de Recherche Agronomique* (INRA). This funding is gratefully acknowledged.

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Lastly, we want to thank our families for their understanding, forbearance, and support, without which we would have been unable to bring our project to a successful conclusion.

GIS	Geographical Information System
GRET	<i>Groupe de Recherches et d'Echanges Technologiques</i> (NGO/consulting firm, France)
IARCs	International Agricultural Research Centers
ICARDA	International Center for Agricultural Research in the Dry Area
ICRA	International Centre for Development-Oriented Research in Agriculture (Wageningen)
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ICTA	Instituto de Ciencia y Tecnología (Guatemala)
IIED	International Institute for Environment and Development (London)
IITA	International Institute of Tropical Agriculture
INRA	<i>Institut National de la Recherche Agronomique</i> (National agronomic research institute, France)
ISRA	<i>Institut Sénégalais de Recherches Agricoles</i> (Senegalese Institute for Agronomic Research)
IRAM	<i>Institut de Recherche Appliquée et de Méthodes</i> (Consulting firm, France)
IRD	<i>Institut de Recherche pour le Développement</i> (former ORSTOM, France)
IRRI	International Rice Research Institute
KIT	Royal Institute of the Tropics (Amsterdam)
LDC	Less-Developed Countries
NAFTA	North American Free Trade Agreement
NARS	National Agricultural Research Systems
NGO	Nongovernmental Organizations
OFA	Off-farm activities
ORSTOM	<i>Office de la Recherche Scientifique et Technique Outre-Mer</i> ; becomes in 1983 the <i>Institut Français de Recherche Scientifique pour le Développement en Coopération</i> ; renamed IRD (<i>Institut de Recherche pour le Développement</i>) in 1999
PRA	Participatory Rural Appraisal
R&D	Research and Development
RERU	Rural Economy Research Unit (Ahmadu Bello University, Nigeria)
RICA	<i>Réseau d'information comptable agricole</i> (Agricultural accounting information network)
RIMISP	<i>Red Internacional de Metodología de Investigación de Sistemas de Producción</i> (International network for research methods in farming systems, Latin America)
RNFE	Rural nonfarm enterprise
RRA	Rapid Rural Appraisal
SAD	<i>Systèmes Agraires et Développement</i> (INRA Department)
SEDES	<i>Société d'Etudes pour le Développement Economique et Social</i> (public consulting firm, France)
SL	Sustainable livelihoods
USAID	United States Agency for International Development

Chapter 1

OVERVIEW

Jean-Philippe Colin and Eric W. Crawford

1. INTRODUCTION

The purpose of this book is to provide an overview of research on agricultural systems that is both broad and selective. The focus is broad, by covering approaches used in a number of disciplines, as well as in multidisciplinary studies, and by defining agricultural systems to include cropping systems, farming systems, agricultural household systems, and agricultural systems at higher levels such as the agrarian system. The focus is selective by emphasizing key methods and ongoing debates, rather than attempting a comprehensive review of literature. Most previous reviews of research on agricultural systems have concentrated on a particular approach, e.g., farming systems research (FSR), including comparisons of anglophone and francophone variants of FSR¹, or on research conducted in specific geographical settings².

The special contribution of the book is twofold. First, it focuses on social science contributions to this field of research, which have been the object of much less attention than contributions from the natural sciences. Second, through its coverage of a wide array of approaches to agricultural systems studies, it gives readers a sense of the diversity of perspectives and methods involved in research on agricultural systems, and how they are influenced by research objectives, disciplinary background, and the social and historical context of the research.

By research on agricultural systems, we do not mean systems science applied to agricultural issues, but in a more usual sense, studies which deal with agricultural production, especially at the micro level (the farm, the village), and try to take into

¹ Fresco (1984), Jouve (nd), Merrill Sands (1986), Pillot (1985).

² E.g., Aubert *et al.* (1985), Bonnefond *et al.* (1988), Brossier *et al.* (1993), Escobar & Berdegué (1990), Eresue *et al.* (1990), Goldsworthy & Penning de Vries (1994), Malpartida & Poupon (1987), Navarro *et al.* (1993), Sebillotte (1994), Speeding *et al.* (1994); Upton (1996), Wilson (1995). See also *Journal for Farming Systems Research-Extension, Cahiers de la Recherche-Développement, Agricultural Systems*.

account complex interactions between different sets of variables. Focusing the book on this type of research is motivated by several factors. First, 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. Second, the need to understand agricultural systems at the micro level has received less emphasis recently, as structural adjustment programs have focused on macro-level policy instruments and on the reduction of state intervention in agriculture. Despite greater reliance on markets for coordinating agricultural activities, it remains important to understand the food and agricultural system at various levels in order to design and implement effective policies and to assess the impact of current policies. Third, a systems perspective is especially pertinent given the increasingly interconnected nature of human activity that results from globalization. Fourth, we are increasingly aware of far-reaching environmental impacts that can result from local-level agricultural practices. Lastly, current challenges such as poverty alleviation can be addressed in part through agricultural systems research. In summary, our experience with studying, and attempting to improve, agricultural systems offers many lessons that are relevant to solving the broader economic and social problems.

It might be useful, in order to avoid any misplaced expectations, to make clear certain limitations on the coverage of the book that were imposed by volume constraints and by the authors' areas of expertise. First, the book does not pretend to cover exhaustively the huge field of research on agricultural systems, either from a subject-matter perspective (e.g., one will not find a specific treatment of livestock systems), or from disciplinary or research-tradition points of view (e.g., demography and agronomy are not included), or in terms of geographical coverage (most, but not all, of the chapters focus on research conducted in Africa and Latin America). Second, while the book provides an opportunity to introduce readers to English-speaking and French-speaking research traditions, its purpose is not to cover them exhaustively or to compare them systematically. Third, while most chapters of this book contain an assessment of strengths and weaknesses of the approaches concerned, it is not our intention to recommend a particular approach. Fourth, research on agricultural systems has led to a profusion of concepts, usually bearing different meanings from one "school" to another. We suggested that each contributor define explicitly the concepts he was using, but we refrained from producing a glossary, or from trying to compare and contrast all concepts used. We did not wish to dwell on terminological debates. Finally, a discussion of empirical findings can be found in all chapters, but our primary objective is not to provide new empirical insights, but rather to contribute to theoretical and methodological debates in this area of research.

2. RESEARCH ON AGRICULTURAL SYSTEMS: MAPPING A DIVERSIFIED LANDSCAPE

2.1. A broad field of research

Many would associate "research on agricultural systems" with "Farming Systems Research", i.e., a type of research dealing mainly with agricultural technical change in developing countries. However, research on agricultural systems is not restricted to FSR, and can differ along several dimensions.

- The major factor of distinction is the aim of the research. Research on agricultural systems is most often problem-solving or "action-oriented" research. Here, one can distinguish four main focuses: (a) supporting technical change, as shown in the Norman & Matlon and Jouve chapters; (b) supporting local-scale institutional change through farmers' organization (see Jouve's presentation of *Recherche-Développement*); (c) improving the management of specific farms, especially through the use of decision-support models (Papy and Swinton & Black chapters); or (d) informing agricultural policy *ex ante* or *ex post* (Delord, Lacombe & Touzard). But research on agricultural systems might also aim at producing knowledge, without an immediate goal in terms of action³. This type of research is illustrated by Marchal with the geographical *terroir* studies, and by Colin & Crawford with part of French Africanist rural economics. The distinction between action-oriented and knowledge-oriented studies on agricultural systems can be found within a given discipline, as is shown for economics by Colin & Crawford.
- A diversity in the major research issues follows quite logically the diversity in the aims of the research: from technical change, resource management, and farm management (Norman & Matlon, Jouve, Papy, Swinton & Black, Colin & Crawford chapters), to agricultural policy analysis and/or support, and to the dynamics of economic structures within a rural society (Delord, Lacombe & Touzard, Colin & Crawford chapters).
- The organization of the research is another factor of differentiation: research on agricultural systems is often organized in multidisciplinary programs—a *sine qua non* of Farming Systems Research (FSR) and *Recherche-Développement (R&D)*—but can also involve a single discipline, e.g., geography or economics.
- Research on agricultural systems is often seen as particularly relevant for developing countries. Indeed, several chapters of the book have a specific LDC focus (Norman & Matlon, Jouve, Marchal, Reardon, Olivier de Sardan, Chauveau). However, the Papy, Swinton & Black, Colin & Crawford, and Delord, Lacombe & Touzard chapters demonstrate that the interest in agricultural systems research is far from limited to LDCs.

³ The distinction between problem-solving and knowledge-oriented research on agricultural systems does not imply that knowledge-oriented studies are of little use to private or public decision-makers, or that problem-solving research cannot generate knowledge. Although there is no sharp line between the two types of research, the distinction remains justified by fundamental differences in the research issues, methods, constraints, and modes of evaluation.

- Finally, one can mention the place and type of fieldwork in the research process. Most studies on agricultural systems are grounded in field work, but sometimes in very different ways. Some tend to favor light data collection techniques; others rely on a combination of heavier data collection methods, with a much stronger personal involvement of the researcher. Here again, these differences cannot be understood if one does not take into account the research aim and issues.

In short, awareness and understanding of this wide diversity may help avoid sterile debates about what constitutes "good" research on agricultural systems. In our view, these different approaches should be considered as complementary rather than mutually exclusive.

Of course, while research on agricultural systems is diverse, numerous points of convergence can be found. Anglophone Farming Systems Research and Francophone *Recherche-Développement* clearly share a criticism of what some scholars call the reductionist approach (Norman & Matlon), and others the modernist approach (Jouve, Chauveau) to agricultural development. They also share an emphasis on participatory research methods. Taking into account farmers' practices and rationality, within their agroecological and socioeconomic environments, is seen as fundamental. The failure of a development project can be explained by an inadequate perception of farmers' situation and needs, and from the lack of participation of the local population in the definition of the project, rather than from farmers' irrational behavior. The need to take into account local actors' views and situations is strongly argued by all contributors to this book for both action-oriented and knowledge-oriented studies. Another point of convergence is the necessity to broaden the scope of analysis or action. Both FSR and RD give a good illustration of this process, starting with a technical mandate, and then evolving towards broader concerns such as natural resource management, sustainable livelihood, and institutional change.

2.2. A wide range of pay-offs

The chapters contained in this book do not present an evaluation of the pay-off of research on agricultural systems. This issue would itself require a full-length book treatment. Some broad fundamental results, which emerge in most chapters, are nevertheless unquestionable:

- By putting farmers' practices in the center of the research agenda, research on agricultural systems has dramatically modified the perception of farmers by the scientific and development expert communities. The rationale of farmers' practices is clearly better understood now than it was some decades ago. In terms of technical change, it is now evident that the process of adoption of a new technology, even when available "on the shelf", is anything but natural. The former normative role ascribed to the scientist is rejected in favor of a partner-type role, which is one of helping to "catalyze farmers' empowerment" (Norman & Matlon) or of "encouraging the farmer's learning process, rather than suggesting the best solution" (Papy).

- These studies highlight the heterogeneity of local conditions (socioeconomic context, physical environment, heterogeneity among households) and therefore question any monolithic approach in terms of action-oriented as well as knowledge-oriented research.
- These studies tend also increasingly to take into account the internal complexity of rural households in terms of decision making, control over the products, etc., and the diversity of household members' productive strategies (e.g., off-farm activities or migration). Agricultural production is then seen as a component in a complex set of practices, and the logic of agricultural practices has to be looked for within this set.
- Research on agricultural systems has also often facilitated better communication and understanding between disciplines.

When all is said and done, these studies have undoubtedly improved our knowledge of rural societies and rural actors. They have dramatically changed our way of deciphering local phenomena, of disentangling the complex organization of agricultural activities.

2.3. ... And some limitations

Research on agricultural systems is often criticized as yielding results of little relevance or practical application. As shown in this book, this critique may result from a misunderstanding of what these studies are (e.g., thinking that they all fall in the category of action-oriented research), or from unrealistic expectations based on a simplistic techno-economic perspective. First, the sources of agricultural system improvement may be found outside these systems, therefore requiring changes in the economic or institutional environment. Second, problem-solving research on agricultural systems often deals with poor farmers in marginal areas where the necessary conditions for agricultural development are simply not in place. Last, the quest for simple solutions is doomed to failure; as Schmidt recalls (this volume) "... the process of development ... is a slow accumulation of co-evolving ingredients which are complements, no one of which is the magic lever which if pushed can cheaply energize the process."

It nonetheless remains true that some research on agricultural systems suffers limitations, underlined in several chapters of this book.

- The focus of most research on agricultural systems on technical change favored a reductionist approach, a limited research scope now questioned by most FSR and R&D practitioners (e.g., Baker, 1993; Berdegue & Escobar, 1995).
- Action-oriented research, being at the interface of two worlds, the world of action (i.e., of development) and the world of research (i.e., production of knowledge), is subject to a permanent tension and therefore to the risk of neglecting one mandate in favor of the other (Jouve, Olivier de Sardan).
- Agricultural systems analysis sometimes tends to replace old stereotypes by new ones that give simplistic and functionalist interpretations of the organization of rural societies (Chauveau, Olivier de Sardan).
- True interdisciplinarity is rarely achieved, due to inadequate communication among team members. Another problem sometimes arises when researchers attempt to

address multidisciplinary problems by expanding their sphere of activity into the territory of another discipline, without having sufficient expertise to do so effectively. The more research on agricultural systems gets opened toward new issues, remote from the technical and economic sphere of production (e.g., taking into account social, political, and cultural factors), the more this risk increases (Chauveau, Colin & Crawford, Olivier de Sardan).

- An "ideological populism" may lead to an idealized view of peasantry and to naive research practices, ignoring conflicting interests that permeate local societies and the multiples strategies that local actors might develop regarding any outside intervention (Olivier de Sardan, Chauveau).
- One sometimes considers that it is possible to define the problems and to discover their causes through rapid data collection. This may *sometimes* turn out to be the case, but it is surely not *always* true (Jouve, Colin & Crawford). The risk of misunderstanding farmers' socioeconomic and technical practices and environment is real and is rooted in a multiplicity of factors. One can give three illustrations of this. First, the lower the researcher's personal first-hand knowledge of the local society, the higher the risk of superficial analysis of the causes of observed phenomena and the greater the tendency toward *ex post* interpretation of results. Second, what people say about what they do has to be distinguished from what they actually do. In order to distinguish between the norm and the practice, it is questionable whether rapid information collection is the most appropriate field technique. Third, in some contexts, considerable time and effort may be required merely to define categories such as production, consumption, residence and accumulation units (Gastellu, 1980).

2.4. Perspectives

Various chapters in the book (Norman & Matlon, Jouve, Colin & Crawford, Chauveau) note a decline, during the 1990s, in interest regarding research on agricultural systems. This pertains especially to FSR and R&D, but also to more knowledge-oriented research. Several explanations for this waning of interest are offered, which might be boiled down to the following key factors:

- In an environment marked by the liberal ideology and a focus on macro-policy and globalization, the effective (i.e., fundable) "social demand" for local-oriented studies such as research on agricultural systems tends to shrink (see the chapter by Delord, Lacombe and Touzard).
- It is each day clearer that a narrow conception of "local studies" is misleading, as the rationale and dynamics of local agricultural systems have to be understood by looking outside these systems (public policies, country-town relationships, migration and so forth). The "legitimacy" crisis in research on agricultural systems partly reflects a questioning of restrictively oriented "rural" research.
- This initial hope that problem-solving research on agricultural systems would be effective in solving agricultural development problems has often been disappointed. Proponents of this research approach have tended to "oversell" it, and public decision-makers and funding agencies sometimes have a simplistic view of the functioning of

agricultural systems and therefore of the process of change (see chapter by Chauveau). At the same time, the problems being addressed are not easy to solve. Research on agricultural systems itself has shown that very often the major constraints on agricultural development are not located at the agricultural systems level, but find their roots in the economic and institutional environment of these systems.

Better awareness of the methodological, theoretical, and empirical pay-offs of research on agricultural systems noted above will, we hope, restore confidence in the utility of the approach. Among other things, agricultural systems researchers are in the best position to provide an empirically based analysis of the local impact of public policies, and more generally of globalization.

3. ORGANIZATION OF THE BOOK

Most chapters offer a historical review of research practices, locating them within a dynamic framework encompassing the lessons from past experiences, as well as the weight of fluctuating political, institutional and economic circumstances on the conduct of research.

The first part of the book presents the approach that comes most immediately to mind when one refers to research on agricultural systems, i.e., multidisciplinary problem-solving research. These contributions share the view that the problems of farmers must be understood from their perspective, and considering both biophysical as well as socioeconomic environments.

In chapter 2, Norman & Matlon summarize the evolution of Farming Systems Research over the last 30 years, from the farm management focus of the 1960s to early 1970s, to FSR with a "predetermined focus" (i.e., focusing on specific crops) in the late 1970s, FSR with a whole farm focus and FSR with a natural resource focus (1980s to early 1990s), and the present-day sustainable livelihood approach. The authors underline the limitations of each phase and how the attempts to overcome them contributed to the evolution of FSR. From an *ex post* evaluation of available technologies, the research issue evolved towards an *ex ante* assessment, grounded in the involvement of farmers in technology design, using participatory methods. The scope of FSR broadened to encompass a wider set of issues: cropping systems, interactions between household farm and nonfarm activities, management of risk and uncertainty, environmental degradation and resource base sustainability, and social equity. The goal is still to enhance efficiency through improved productivity, but it is also to insure environmental sustainability and to achieve greater social equity through poverty alleviation. In this process, institutions are no longer seen as black boxes. With the sustainable livelihoods approach, the scope explicitly includes macro policies and institutions as well as local institutions, in order to identify those that constrain local strategies and livelihood systems, and those that reinforce them, and to search for solutions at the community level.

"*Recherche-Développement*" is often seen as the counterpart of Farming Systems Research in French-speaking countries. Even if Jouve's chapter is more focused than the

preceding one regarding the presentation of research traditions, it makes clear the parallel, in many respects, between R&D and FSR as research methodologies oriented towards technical change: the need for location-specific rather than standardized technical packages in order to change the farming systems; the need for farmers' participation, from the diagnosis stage to the technology development and transfer processes; the positive impact of a methodology which induced many scientists to venture out of their research stations and discover the conditions of production and the richness of farmers' skills. Jouve emphasizes three other points. First, technical change experiments should be combined with organizational change experiments (improvement of the input supply channels, creation of joint guarantee credit systems, organization of processing and marketing services for agricultural products, etc.). The present evolution of FSR, with its focus on sustainable livelihoods, reflects the same concern. Second, he acknowledges possible biases in the participatory method, such as overvaluation of the opinions of the farmers, and acceptance at face value of what the farmers say (two points addressed in Olivier de Sardan's chapter). Third, the author sets forth the need to combine R&D-type research and more knowledge-oriented types of research on agricultural systems; even for problem-solving research it is not possible to gain adequate knowledge of complex situations based only on rapid reconnaissance field visits.

Almost any type of research on agricultural systems involves modeling, at least of a qualitative type. Based mainly on American experiences, Swinton & Black review the different types of models and their uses within the field of agricultural systems research. The aims of system modeling include description, prediction, postdiction (logical constructions that explain after-the-fact what system constraints caused a given outcome), and prescription. The authors also mention that the process of modeling by itself can improve knowledge of the system by shedding light on its lesser-known aspects (Papy's chapter expands on this insight). Three types of models are distinguished: iconic (visual representation of the system), analogue (system represented through analogies) and symbolic (mathematical models). The authors focus then on mathematical models of agricultural systems (simulation, optimization, and statistical models). The scale or level of modeling is also discussed. Swinton & Black envision a promising future for the modeling of agricultural systems at different scales and for different purposes, from computer models for farm management, to the modeling of environmental value, of agrarian structure, and of rural communities.

The chapter by Papy that follows focuses on one of the cases discussed by Swinton & Black, i.e., use of modeling to assist farmers in their decisions. Papy refers to research conducted in France on the application of business management theory to individual farm-level decision support models. This approach has explicit roots in Simon's work on bounded and procedural rationality, rather than substantive rationality, and satisficing rather than optimizing. These insights are combined with agronomic theory in order to link farmers' decision-making processes with farmers' practices and the agronomic results of these practices. Decision support then involves constructing a representation of the farmer's decision-making process in order to facilitate his/her learning process. This conception of problem-solving research does not have the objective of giving the farmer the best possible solution "ready to use", but rather of helping farmers produce their own

identification of problems and "satisfactory" solutions. To attain this, the expert must acquire a clear understanding of the decision-making situation and then analyze it from the farmer's perspective.

The second part of the book includes chapters presenting selected social science disciplinary contributions to research on agricultural systems.

Geographers have long studied agricultural systems. In fact, they have often been the pioneers in this field of study, in their analyses of the relationships between spatial and social organizations. In chapter 6, Marchal sketches the experience of French Africanist geographic research, beginning with intensive monographic studies made at the level of the *terroir* (i.e., the portion of land controlled by the population of a village). These studies have served as dramatic "methodological laboratories," whose lessons have reached beyond the community of geographers and have influenced all French Africanist rural researchers (see the Chauveau and Colin & Crawford chapters). However, it was soon shown that the organization and evolution of localized agricultural systems had to be understood taking into account the influence of many "external" factors, i.e., that the *terroir* was not a closed space, and that higher-level systems had to be explored. The geographical "entry" to the study of agricultural systems is through the spatial organization of production and more broadly, the use of natural resources as expressed in the agricultural system. Cartography and direct observation of landscape and land-use patterns are therefore the primary tools used in the "micro-localized" geographical studies of agricultural systems presented by Marchal.

Collin & Crawford's chapter shows the diversity of research on agricultural systems within the specific disciplinary field of economics. The discussion is organized around ideal-types defined in terms of their underlying conception of economics. "Neoclassically based microeconomics," which rests at least partly on the neoclassical paradigm, is illustrated with production economics (seen as typical of the standard neoclassical approach), agricultural household economics (defined as an "expanded neoclassical" approach), and modern farm management and the economic component of Farming Systems Research (characterized as "partly" neoclassical). "Heterodox Economics", characterized by an explicit or implicit distance from the neoclassical paradigm, in both its research issues and methods, is illustrated with French Africanist rural economics, and with a behavioral economics type of multidisciplinary research conducted with an explicit systems-science perspective. The diversity between these ideal-types is explored in terms of the aim of the research, its organization, the major research issues, the type of "systemic" approach followed, the use of formal theories and formal modeling, and the place and type of fieldwork in the research process. Reasons for the decline of interest in FSR and heterodox economics are discussed. The authors recommend explicitly integrating an institutional perspective in economic research on agricultural systems and defining a broader research agenda.

The two chapters that follow present economic contributions to broadening the scope of economic analyses of agricultural systems, as advocated by Colin & Crawford. The chapters focus on the relationships between agricultural systems and nonfarm activities (Reardon), and on the relationships between agricultural systems and agricultural policy (Delord, Lacombe & Touzard).

Rural households have long been seen as engaging only or mainly in farming, but the interactions between the agricultural system and the "nonagricultural system" are increasingly acknowledged (Chauveau, Colin & Crawford). Reardon's chapter explores some of these relationships from an economic perspective, in the case of African farm households. Income diversification strategies are used by these households to manage income risk, provide cash to buy food and farm inputs, and raise overall incomes. Different possible effects of rural nonfarm activities on the agricultural system are underlined. For example, nonfarm income affects a farm household's capacity to make farm investments; it can also lower the overall income variation of farm households, increasing their incentive to make risky farm investments and grow cash crops. The development of rural nonfarm activities affects factor and product prices facing farmers, hence farm profitability and crop mix. A very important consequence of nonfarm activities within the household is that their requirements for capital investment or labor use compete with farm-related uses of those resources. Therefore, any potential change in agricultural practices, as might result from an FSR program, has to be evaluated in terms of its profitability relative to nonfarm investments, rather than in absolute terms.

Agricultural policy is defined by Delord, Lacombe & Touzard as "a compromise reached by various social groups for the public management of coordination within the agricultural sector and between agricultural and nonagricultural activities." Research on agricultural systems more and more takes into account the effect of agricultural policies on those systems. The authors also point out the reverse causal linkage, i.e., that agricultural systems affect the formulation of agricultural policies. The links between agricultural systems and agricultural policies are illustrated with the Latin American and European cases. The different character of the links in these two cases is outlined in the last part of the chapter: the broad impact of systems research on how policy-makers see agriculture and the decision-making processes of farmers; explicit evaluation of the effects of public intervention on specific agricultural zones or types of farms; and research on agricultural systems that contributes to the analysis of agricultural policies by revealing the vested interests created by existing agricultural systems. The Delord, Lacombe & Touzard chapter places research on agricultural systems in a political context, and shows how the "effective" (i.e., supported by funds) social demand for research evolves in response to the concerns of policy-makers and to issues at stake in the political arena. This type of research can therefore be seen as a barometer of current economic policy.

The third part of the book offers a critique "once removed" of problem-solving research on agricultural systems, i.e., a critique by scholars who are not practitioners of research on agricultural systems. This is a turnaround for agricultural systems researchers; accustomed to examining farmers' practices, they are now in the position of having their own research examined by external observers.

While Schmid is not a specialist in the area of agricultural systems research, his message is nevertheless of considerable relevance for research on agricultural systems, as he urges researchers on agricultural systems to pay more attention to institutions, considered as "sets of ordered relationships among people that define their rights (opportunities), their exposure to the rights of others, their privileges, and their

responsibility." From the perspective of the Commons branch of institutional economics, Schmidt first discusses major institutions shaping access to production factors—land tenure, labor markets, credit. He then turns to issues such as coordination mechanisms within a subsector, technological and institutional change, and actors' rationality. Four messages should be of particular interest for agricultural systems researchers. First, institutions clearly do (should) matter in any analysis of agricultural systems and in any attempt to change them. Second, one can think of institutional change and technical change as substitutes; the potential for this substitution is worth exploring. Third, one person's constraints are another person's opportunities. Technical change often leads to changes in income distribution; FSR/R&D researchers cannot be neutral regarding this process. Fourth, technical change is often evaluated using benefit-cost analysis. Schmid notes, however, that institutions affect the type and level of prices used in the benefit-cost calculations. Prices are not neutral; they reflect the wealth distribution. Benefit-cost calculations are therefore not objective and ineluctable, a point that researchers should keep in mind. "Whose preferences count?" should therefore be a central question for FSR-R&D researchers.

Olivier de Sardan's historical survey highlights the limited interest shown by French Africanist social anthropologists, over the years and through different intellectual phases (from colonial ethnology to Marxist influence in the 1970s), in micro-localized studies of technical, economic and social interrelationships in African peasant societies. He then turns to a discussion of three major points regarding R&D-type research on agricultural systems. First, "systems analysis," when applied to the social dimension of agricultural systems, should not be seen as a paradigm, but rather as a metaphor, as most social processes cannot be viewed as systems. While a loose metaphorical use of the "systems approach" can be valuable, it entails some risks: use of stereotypical language that encourages simplistic interpretations; confusion of the systems model with reality; and placing too much importance on functionalism. Second, discovering peasant rationalities and decision-making processes requires specific knowledge and field research methods; "good intentions are not enough." Furthermore, a superficial understanding of local societies may lead to an idealized view of farmers. Third, collaboration between research and development is not a natural process, since the objectives and methods considered as appropriate differ in each case. For example, research needs to understand complex social phenomena, whereas development needs to reduce complex problems to simple choices.

The last chapter focuses on a methodological discussion, based on Africanist studies, of an issue that is common to most research on agricultural systems: taking into account and understanding peasants' strategies, i.e., their capacity for action in the face of uncertainty and environmental risks, based on resources and information at their disposal and on their way of seeing the world and their own interests. In the first part of the chapter, Chauveau underlines the undeniable contributions of this approach in helping to explain farmers' behavior (e.g., in response to development projects), their technical practices, and the complexities of their production systems and strategies for economic and social reproduction of the family. In the second part, the author places the development of this approach in the context of French studies of development during the 1970s and 1980s, and shows the influence exerted by Marxist anthropology, by

geography, by a heterodox field-research-oriented economics, and later by systems-oriented agronomy. He also notes that this school of Africanist research was somewhat closed in and cut off from academic debates. In the final part of the chapter, and in the same vein as Olivier de Sardan, Chauveau discusses several ways in which this approach has drifted off course: confusing a simplistic systems model with reality, "ideological populism" leading to a politically correct treatment of rural societies, worship of peasant common sense, the naive assumption that simply by contacting farmers one can elicit a spontaneous expression of their objectives and needs, etc. Lastly, Chauveau contrasts various ways to improve research on agricultural systems, such as local-level analysis of how farmer behavior evolves in response to external events, and collaboration between micro-level researchers and macroeconomic policy makers in order to design improved development interventions.

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