

# Introduction: Anthropology, Sociology, and Agricultural R&D

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This volume has multiple messages for a diversity of readers. At one level, it serves to document some of the many scientific achievements of an innovative approach to agricultural R&D—the Collaborative Research Support Programs, or CRSPs.<sup>1</sup> Five of these dynamic programs are represented here: the Bean/Cowpea, Sorghum/Millet, Nutrition, Peanut, and Small Ruminant CRSPs.

The book's primary aim, however, is more ambitious. By drawing on research from these five CRSPs, it outlines the wide-ranging kinds of contributions that the most "social" of the social sciences, anthropology and sociology, make to both the concept and the conduct of agricultural R&D. Of course, other social and behavioral sciences have important roles to play in this arena, e.g., political science, human geography, social psychology, communications, and especially economics and agricultural economics.<sup>2</sup> But within the development community, anthropology and sociology have taken the lead in the delicate task of relating agricultural R&D to the overall well-being of its intended beneficiaries. This is the final test of success in any development endeavor.

In the pages that follow, CRSP scientists, biological/technical as well as social, spell out the many ways that input from anthropology and sociology can and does directly enhance the focus, design, implementation, and evaluation of agricultural R&D. More broadly, they document the imperative need for social research in any efforts at directed change and development.

At the same time, the chapters that follow illustrate how anthropology and sociology have grown in scope, relevance, and maturity through their engagement in agricultural R&D, as these disciplines have ventured forth from the halls of academe to confront the problems of rural peoples throughout the world.

A final, further aim of this book is to share some of the hard-won lessons learned about working in a collaborative, cross-national, and cross-disciplinary mode. Both present and future professionals in any field that is

active in international development can profit from the candid retrospectives and hands-on insights tendered here.

## THE SOCIAL SCIENCES IN AGRICULTURAL R&D

While the place of sister social sciences like economics is now well recognized in international agricultural R&D, the value of anthropology and sociology has often been poorly understood. As relative latecomers, the roles of these disciplines have sometimes been subject to misapprehensions among biological/technical coworkers. Understandably, few non-social scientists are familiar with the specialized methods, theories, or even the long-standing subject matters within anthropology and sociology that relate to agriculture. In consequence, they are often uncertain as to how social research can profitably inform development programs, as Rhoades (1983, 1986), McCorkle and Gilles (1987), and many others have observed. And with some exceptions (e.g., Cernea 1985, Colfer 1987, DeWalt 1985, IRRI 1982, Lacy 1985, McCorkle et al. 1989, Michael Butler 1987, Nolan 1985, Rhoades 1984, and especially Zambia/CIMMYT 1986), until recently neither have social scientists been particularly adept at explicitly and systematically enunciating their hands-on relevance to agricultural R&D.

Along with tight R&D budgets, uncertainty about social science roles has led to complaints that inclusion of social research is a superfluous expense. It has even been argued that "socially sensitive" members of other disciplines can perform any necessary social analyses just as well as anthropologists or sociologists (see the exchange between Simmonds 1985 and Cernea and Guggenheim n.d. and accounts in Hamilton 1973, Rhoades 1983, and van Dusseldorp 1977). At worst, social research has been seen as an impediment to technological progress, with what some consider excessive emphasis on such issues as equity, empowerment, risk, and sociocultural appropriateness. (For exceptionally forthright discussions, see Horowitz 1988 and Hammett 1973).

An even more pervasive and pernicious notion of anthropologists' and sociologists' roles in agricultural R&D is that they are solely facilitators (Flinn 1988) and "farmer convincers." Typically, social scientists have been assigned service functions. They perform various administrative and statistical chores, ex ante diagnostic studies, and ex post evaluations of project outcomes. Frequently, too, they are assigned the job of finding ways to increase the adoption rates of new agricultural technologies—technologies that may have been devised with little or no input either from social scientists or from producers themselves (see Chapter 6 in this volume). In this capacity, anthropologists and especially rural sociologists<sup>3</sup> are charged with cajoling recalcitrant human "software" into adopting project-generated "hardware."

Fortunately, such myopic views of social science roles have been expanding in the face of evidence that technology cannot be indiscriminately designed, developed, delivered, or sustained in ignorance of the specific human ecologies in which it is to be used. As the contributors to this book point out, assigning anthropologists and sociologists only fragmented functions as facilitators and extension strategists is of limited utility. The real value of social research is obtained when it is included in the R&D process from start to finish.

It is noteworthy that a careful study of 68 World Bank projects found that attention to social issues pays off in financial as well as human terms. Projects that incorporated proper social science inputs yielded economic rates of return more than twice as high as those without such inputs (Kottak 1985). Drawing on the wealth of CRSP experience, the contributors to this volume spell out what these inputs are, and where, when, and how they should be integrated into all phases of the R&D process so as to best advance development goals. In broad terms, their observations can be summarized as follows.

### *Planning and Research Design*

Anthropologists and sociologists have critical roles to play in preproject planning and design. They help to ensure that a good fit exists between the social ends of development and the proposed technological means; that data collected by diverse disciplines are analytically compatible; that project site selection is well reasoned; that plans for field operations are socioculturally feasible; and that still other design and start-up needs are met. Authors Anne Ferguson, Dorothy Cattle, and Michael Paolisso and Michael Baksh in particular present some telling examples from the Bean/Cowpea and Nutrition CRSPs of how omitting social inputs at this phase would have meant costly redesign later on, loss of client credibility and cooperation, and possibly project failure.

### *Targeting*

To be successful in both human and technical terms, development projects must accurately conceptualize, define, and locate beneficiary populations. As specialists in the delineation of human groups, anthropologists and sociologists bring to this critical task unique skills and sophisticated methodologies. They can therefore translate the often vague initial definitions of target groups into workable socioeconomic, cultural, sex, age, etc., categories.

Chapter 11, by Keith Jamtgaard, offers a dramatic example of this targeting function. Jamtgaard describes how, by applying powerful statistical tools to a national database, sociologists on the Small Ruminant CRSP/Peru

were able to operationally clarify the program's mandate to focus on small-holder stockraisers. The benefits to the program were multifold. Research was reoriented to incorporate what was in fact the nation's largest group of stockowners, a group that was not initially slated for study or assistance! This resulted in a reallocation of resources that was simultaneously more efficient and more comprehensive, with broader potentials for outreach and impact. Moreover, by utilizing an existing data set, the analysis was performed at a very modest cost. The savings to the program in terms of time, money, and possible embarrassment are incalculable.

Similarly, anthropological analyses of biosocial and socioeconomic characteristics of study populations on the Nutrition and Sorghum/Millet CRSPs were critical for determining which rural groups were at greatest nutritional risk and therefore required priority program attention (Chapters 5, 6, and 7). Moreover, as documented throughout this book, careful targeting is equally important in ensuring that a new technology or practice can realistically be disseminated to those for whom it is designed. In sum, a clear understanding of target-group composition and dynamics is a necessary first step in identifying interventions appropriate to different producer and consumer categories. This is the domain *par excellence* of the social sciences.

### *Fieldworking*

As a rule, sociologists and especially anthropologists conduct their investigations in more intimate, sustained contact with rural communities than do scientists of other disciplines. This research strategy generates a wealth of in-depth information useful for understanding producers' current practices and the rationales behind them.

In the process, fieldwork often leads to discoveries of "lost" or unappreciated local knowledge and practice. Examples include the folk veterinary skills and pharmaceuticals of Quechua Indians in highland Peru (Chapter 12), the acumen of Ecuadorian farmers in manipulating complex interrelationships among agricultural variables like plant spacing and weed control (Chapter 8), and the unsuspected diversity and creativity in rural Hondurans' diet and cuisine (Chapter 5).

Often, too, fieldwork reveals important factors that have been overlooked in a priori planning and research design, as Paolisso and Baksh (Chapter 7) discovered in investigating links between nutritional status and biosocial or socioeconomic status in Kenya, or as Gerald Wheelock et al. (Chapter 10) found in assessing competing biogenic and sociogenic hypotheses about the causes of aflatoxin contamination in Caribbean peanuts.

As these and other contributors indicate, when brought to the attention of biological/technical colleagues, such field-based insights can reorient agricultural R&D in profitable ways. Ground-breaking basic research may be

stimulated by the need to scientifically validate producers' own ethnoscientific practices or by new, unanswered questions. Applied research may be rerouted in more context-sensitive and sustainable directions.

### *Integrating*

Like producers themselves, anthropologists and sociologists generally take a more holistic view of the agricultural enterprise than do other scientists. Failure to integrate complex and sometimes competing components operating at multiple levels of agricultural systems runs the risk that development projects may end up "robbing Peter to pay Paul," with no real net benefits to the intended beneficiaries.

Thus, a major social science contribution consists of ensuring that, while focusing on one commodity or development need, the *whole* agricultural system is addressed, including the complex tradeoffs that producers make among plant crops, livestock, and other productive activities (Chapters 1 and 5). Similarly, in the realm of consumption, social scientists integrate biomedical information with the social and economic roles, cultural beliefs, cropping systems, etc., that generate the nutritional behaviors and outcomes under study (Chapters 5, 6, and 7).

Generally, too, social scientists are more keenly aware of the need to look beyond the farm gate to community, regional, national, and international contexts in which producers and their farming systems are embedded, to assess whether proposed interventions are workable in these, as well as purely technological, terms. A good example is the careful socioeconomic studies by Peanut CRSP sociologists to predict both potentials and problems posed by domestic and international markets for Sudanian and Caribbean peanut products (Chapter 10).

### *Translating and Brokering*

Closely related to the two preceding activities is anthropologists' and sociologists' ability to effectively translate or broker communication among different disciplines, institutions, and policymaking and donor entities, and between scientists and producers in all phases of agricultural research, technology development, and transfer. In this capacity, they constitute a conduit for productive dialogue—often as not serving as "researcher convincers" rather than "farmer convincers"—in the iterative feedback and feedforward necessary to successful R&D.

Virtually all the contributors speak to this task. To give just a few examples, Bean/Cowpea CRSP sociologists in Ecuador noted the simple need to get local cultivar names straight so as to collect accurate and comparable baseline data (Chapter 9). More subtle complexities of translating be-

tween emic and etic, between anthropological and biological, knowledge systems were tackled by social scientists on the Small Ruminant CRSP/Peru in promoting cooperative research between village stockraisers and CRSP veterinarians and animal scientists (Chapter 12). On the Sorghum/Millet CRSP in Sudan, sociologists and anthropologists worked to define information networks among producers, extensionists, and national and international R&D establishments (Chapters 3 and 4). And on the Nutrition CRSP in Kenya, anthropologists played a key role in establishing interactive forums for dialogue among community participants, village leaders, and junior and senior field staff, as well as between social and biological scientists (Chapter 6).

Social scientists' translating and brokering roles have high payoffs in terms of smoother project functioning and greater project success, the result of giving a voice to all stakeholders in the R&D enterprise. Perhaps Joyce Turk's "Foreword" and Hendrik Knipscheer's closing commentary most clearly enunciate this very real, albeit sometimes less tangible, contribution of the social sciences.

### *Monitoring, Guiding, and Evaluating*

As Knipscheer, Tommy Nakayama (Chapter 14), Michele Lipner and Michael Nolan (Chapter 1), and others note in this book, monitoring, guiding, and evaluating constitute one of the most visible and immediate rationales for including social scientists on R&D teams in the first place. Timely social science inputs from ongoing data collection, analysis, and monitoring are essential for deploying project resources efficiently and appropriately and for making in-field course corrections.

For example, social scientists on the Bean/Cowpea CRSP in Ecuador (Chapters 8 and 9) saved program time and money by helping to pinpoint regions where these crops were most prevalent; by guiding research toward problems most important to producers (improved seed storage techniques) and away from inappropriate technology (fertilizers); and by reorienting breeding agendas to varieties that readily fit into existing crop rotations. Similarly, anthropological studies on the Sorghum/Millet CRSP in Honduras were instrumental in redirecting breeding research to focus on sorghum varieties instead of hybrids. Drawing on livestock R&D in Africa, R. E. McDowell (Chapter 15) also describes a number of compelling cases of how timely social scientific advice forestalled problems in, for example, distributing crossbred animals, assisting women in dairy production and marketing, and training producers in the use of new ox-drawn technologies.

Because of these kinds of insights and skills, CRSP social scientists are frequently charged with coordinating and monitoring the interdisciplinary field testing of new technology. Drawing on baseline data, which they have played a major role in collecting, they have primary responsibility for monitoring

and evaluating the flow of benefits to the intended beneficiaries. As Matt Silbernagel (Chapter 13) candidly observes, this information often determines whether a project is cancelled or continued. Evaluation information is equally if not more important for improving the formulation of future development programs and policies (Chapter 5).

### *Training and Institution Building*

Anthropologists and sociologists have played a variety of roles in training CRSP participants in techniques for teamworking, field interviewing, and meeting farmers (Chapters 1, 6, and 9); recommending training needs for groups as diverse as extensionists, merchants, and women; and mounting workshops and conferences (Chapters 3 and 8). Interestingly, several authors observe that one of their most important, if less explicit, "training" contributions may have been in urging both U.S. and host country scientists out of their labs and research stations into direct dialogue with rural producers and consumers.

As noted earlier, anthropologists and sociologists are experts in delineating human organizational and institutional structures. Therefore they play key roles in interpreting the operational and training needs of entities like national agricultural research centers, extension services, universities, etc., and in planning for their growth and strengthening (Chapters 9 and 10). These roles are exemplified in Chapter 4 on the Sorghum/Millet CRSP's study of the Sudan Agricultural Research Center and in the Small Ruminant CRSP's work to establish or reinforce social science research units in host country institutions (Chapter 1).

### *Policymaking*

With insights gained from exercising all the roles and skills listed above, social research can make decisive contributions to the formulation of development policy and to bringing the R&D process full circle to the conceptualization of future programs. Illustrating from the disappointing, even distorting, history of U.S. policies for agricultural development in Mexico, Billie DeWalt (Chapter 2) cogently argues the case for building a more "macro," theoretically informed, and politically conscious level of social analysis into the policy process itself, above and beyond the relatively micro-level application of social analysis *in* specific projects and programs. There is urgent need for a theoretically grounded and critical social science of agriculture to examine the underlying assumptions, values, and social risks behind policy agendas and to inform agricultural policy reform in an ever-shrinking globe. Ultimately, this is the most important contribution of the social sciences to agricultural R&D.<sup>4</sup>

## VICE VERSA: AGRICULTURAL R&D IN THE SOCIAL SCIENCES

Although this book's overarching aim is to determine how anthropology and sociology contribute to agricultural research and development, the converse question is equally important. That is, how does agricultural R&D contribute to research in, and the development of, anthropology and sociology? Biological/technical scientists have not been the only ones to harbor confusions and misgivings about the place of anthropology and sociology in this arena. So have many social scientists.

Their concerns have centered on a variety of moral, political, and intellectual issues, including the humanistic implications of interfering in the lives of others; ethical qualms about supplying information to powerful agencies that may misuse it; compromised scientific objectivity by virtue of direct involvement in action-oriented programs; restricted scientific freedom due to client demands; and loss of professional prestige, funds, and promotions, given the often "second class" status of development or applied studies in academia and the historical stereotypes of such work as "the shabbier side" (Schaedel 1964:190) of the discipline or even as "virtual academic prostitution" (Miniclier 1964:189).

This is not the place to recapitulate the lengthy history of debates surrounding such issues.<sup>5</sup> Suffice it to say that these views have been rapidly changing (Almy 1977) as growing numbers of anthropologists and sociologists have enlisted in initiatives like the CRSPs. Strengthening and broadening their fields' concepts, tools, subject matters, critical perspectives, and functions (Bowen 1988, Chambers 1987) and sometimes placing development specialists "at the cutting edge of the discipline" (van Willigen 1986:xiv), this move has benefited nearly every facet of disciplinary activity.

### *Empirical and Theoretical Resources*

Participation in development initiatives has provided social scientists more and more varied opportunities to exercise their craft. This has made for an invigorating infusion of comparative data from every part of the globe—data that would have gone otherwise uncollected. These fresh empirical resources can be (and have been) marshalled by the academic community to refine or expand existing analyses of nearly all aspects of social change and development, as well as to fashion new theoretical constructs responding to the needs of a social science of agriculture (Chapter 2).

To list but a few examples that come immediately to mind: global theories of change and development; explications of the role of risk, uncertainty, and "peasant rationality" in such theories; macro-micro linkages; advances in cultural ecological theory and investigation of the social control



and management of natural resources; decision-making modeling; the relatively neglected study of agricultural transformation and consumption as versus production and distribution; and the sociopolitically sensitive analysis of research institutions and development assistance bureaucracies and policies. Some of these contributions of agricultural R&D to the social sciences are reflected in this book; many more are detailed in a literature too vast to reference here.<sup>6</sup>

### *Methodology*

Perhaps inevitably, new methodologies and new uses for old methodologies can be expected to arise in the course of data collection and fieldwork in any discipline. But there is evidence that the demands of interdisciplinary, problem-solving or programmatic R&D (Chapter 1) add considerable impulse to this process (Appleby 1988).

For example, in response to basic information needs on the Nutrition CRSP, program anthropologists helped pioneer the addition of a new technique, time allocation studies, to their disciplinary toolkit (Chapter 7). Sociologists on the Bean/Cowpea CRSP created a new microcomputer program to measure landholding inequities among small farmers (Chapter 8). Confronted with an empirically unanswered research question on the Small Ruminant CRSP, program sociologists devised a novel use for a familiar methodology by applying cluster analysis (commonly employed in marketing research) to features of agricultural production systems (Chapter 11).

### *Research Approaches*

Collaboration in such R&D enterprises as the CRSPs enhances disciplinary knowledge in anthropology and sociology by stimulating innovative research approaches (Chapter 1). This volume illustrates a few of the many new perspectives that have emerged in the social sciences as a result of their engagement in agricultural R&D initiatives—like the participative research paradigm discussed by Knipscheer (Chapter 16), the interdisciplinary study and application of indigenous agricultural technical knowledge highlighted by McCorkle (Chapter 12), or the formulation by DeWalt and DeWalt (Chapter 5) of an NSR (nutrition systems research) framework to complement FSR (farming systems research) models (Chapters 3 and 8).

### *Subject Matters*

Although some of the authors (for example, Coughenour and Reeves, Ferguson, and Lipner and Nolan) note understandable difficulties in relating

their CRSP work to orthodox research themes within their academic fields, in fact one of the most vital contributions of such R&D programs to anthropology and sociology (or indeed, any discipline) is the discovery of exciting and important new *nontraditional* subject matters. The very nature of these R&D endeavors, interdisciplinary and problem oriented, offers rich opportunities for expanding the intellectual horizons and the "real world" relevance of all participating disciplines, guiding them into territories heretofore systematically unexplored.

A good example of the new directions that can arise from interdisciplinary synergisms is the Small Ruminant CRSP's definition of two novel subject matters: veterinary anthropology (see Mathias-Mundy and McCorkle forthcoming and McCorkle 1986, as well as Chapter 12 of this volume) and the sociology of range management (Gilles 1982a,b, in progress). Collaborative work in these areas has changed the way that both social and biological/technical scientists view the conduct and content of their disciplines. Similarly, problem-solving demands on the Bean/Cowpea CRSP and many other projects have led to the recognition that development goals cannot be achieved without serious scientific attention to a new, pandisciplinary research theme—the vital roles of women in agriculture and other development arenas (Chapter 8).

### *Disciplinary Definition*

The emergence of such hybrid subject matters is hardly surprising in disciplines that already nurture subfields like medical anthropology and sociology, cultural ecology, economic anthropology, and so forth. But again, the more intense and sustained cross-fertilization of scientific fields in R&D programs like the CRSPs accelerates and amplifies the evolution of research approaches and domains.

It is no accident that the mid-to-late 1970s witnessed the redefinition of anthropology and sociology to incorporate the subdisciplines of agricultural anthropology and the sociology of agriculture. Spanning the developed as well as the developing world, and now formally recognized with their own professional organizations, newsletters, and sessions at national meetings, these subdisciplines testify to the contributions of agriculturally oriented research to the social sciences. At the same time, they represent a major step forward on the road to a social science *of* agriculture and all that this implies for more astute development policy and praxis.

### *Training and Curricula*

Neither is it any accident that throughout the United States, departments of anthropology (DeWalt and DeWalt 1985) and, to a lesser extent, sociology

and rural sociology (Hansen et al. 1982, Koppel and Beal 1983) are redesigning their instructional programs to include agricultural and other development studies. Some have followed the advice of McDowell (Chapter 15) and Silbernagel (Chapter 13) and encouraged students to take courses in other disciplines relevant to international development. These new training options will better prepare future social scientists to grapple with the debates with which this section began.

## DISCIPLINARY AND INTERDISCIPLINARY R&D

The final aim of this book is to share some of the lessons that CRSP scientists—social and biological/technical alike—have learned about the professional rewards and difficulties of doing interdisciplinary,<sup>7</sup> collaborative R&D. The contributors to the book are not the first to note the many challenges of such endeavors; numerous authors have tackled this subject.<sup>8</sup> With relatively few exceptions, however (e.g., Byerlee and Tripp 1988, Cock 1979, Heberlein 1988, Horton 1984, Knop et al. 1985, Rhoades et al. 1986), this large and growing literature rarely integrates views from both social and biological scientists on the often uneasy interaction among disciplines teamed together in agricultural development.<sup>9</sup>

In a conscious move to go beyond such narcissistic dialogue to a more balanced perspective, CRSP biological/technical scientists were asked to contribute their critical commentary on this as well as other issues. Their reactions in Part 6 offer one of the most candid discussions to be found in print. Together with their colleagues in anthropology and sociology, representatives from the fields of agricultural economics, agronomy, animal science, and food and nutrition science outline a number of problems, and some solutions, in the conduct of interdisciplinary, applied research.

### *Mutual Ignorance*

The four authors in Part 6, along with Lipner and Nolan in Chapter 1, aptly identify mutual ignorance of the workings of one another's fields as one of the paramount barriers to interdisciplinary R&D. They cite differences in professional terminology, research methods, publication styles and audiences, research topics, and even philosophies. Drawing on their CRSP experiences, they suggest some immediate solutions to this problem, including sustained interdisciplinary interaction across all program phases, mutual education, and even "semispecialization" in one another's disciplines. A longer-term solution lies in restructuring graduate training curricula for practitioners of all disciplines, to make their programs of study more cross-departmental.

*Applied Versus "Pure" Research, and Professional Advancement*

Development-oriented research is distinct from discipline-specific, "pure" research. It is problem oriented, applied, and, if it is to have a positive impact in the "real world," of necessity interdisciplinary. Unfortunately, as Knipscheer, Lipner and Nolan, Silberman, and others point out, this is not the kind of research that wins kudos within traditional disciplinary and academic structures.

In consequence, scientists of any discipline who tackle development problems often find themselves professionally penalized. They must serve two masters simultaneously if they are to advance in their careers. Perhaps the most realistic, immediate solution to this problem is to leave room for disciplinary research within the development agenda. A longer-term but less likely solution is to build into university and other research institutions new kinds of reward systems, appointment structures, and subcenters that give full support and recognition to outstanding applied research.

*Balancing Social and Biological Research*

The question of how to allocate scarce resources between social and biological research is glossed as a "territoriality" or "turf" conflict by some of the contributors. Biological/technical scientists are notorious for their tendency to commit massive resources to designing and promoting a technology without adequate evidence that it will in fact meet producers' needs. Social scientists are infamous for their proclivity to conduct endless surveys and field studies that may not supply this evidence in a clear or timely fashion. For both groups, these tendencies are exacerbated by the applied vs. pure quandary.

To achieve a balanced allocation of resources between technology design and the social research necessary to target and validate it, the contributors urge equal structural status and joint decision-making powers between social and biological/technical components; continual interaction among all disciplines to cooperatively identify problems and information needs arising in ongoing research; periodic program reviews, both internal and external; and maintenance of a tight focus on project goals to ensure that *all* research activities advance the entire team's efforts (Chapters 1, 6, 14, 15, and 16). Most of these suggestions are not new, but the CRSP experience adduces evidence that they work.

**CONCLUSION**

As a number of contributors observe, resolving the tensions between social and non-social sciences in agricultural R&D takes time, effort, negotiation,

compromise, and a new way of thinking about research and development. But, based on a decade of experience with the CRSP model, the firm consensus is that it is well worth the effort. The ultimate reward is better research, whether social or non-social, and certainly better "development" for the human groups to whom these efforts are directed.

The hope is that this volume will promote increased understanding of the value of anthropology and sociology/rural sociology, not as disciplinary isolates but yoked with other concerned sciences to combat the ever more pressing problems of global hunger and malnutrition.<sup>10</sup> Our aim will have been achieved if this book speaks in comprehensible and actionable ways to those who formulate, design, and direct development assistance; to biological/technical scientists who are members of interdisciplinary teams; to academic social scientists who would like to better understand the work of their development-oriented colleagues and to instruct their students in this exciting and growing area; and to individuals of all fields who may be planning careers in international development.

## NOTES

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1. Throughout this chapter, *agriculture* should be understood as referring to four component areas: production, transformation (processing for storage, consumption, sale, etc.), consumption (including nutrition), and distribution (marketing or other forms of exchange). Also note that, when used in reference to a CRSP, *project* and *program* denote distinct levels of operation; in other contexts, however, these terms are used interchangeably. Finally, *R&D* signifies the full range of scientific activity, from basic through applied research to technology development, assessment, and dissemination, as well as the intellectual, planning, or policy decisions that give rise to these activities.

2. As in any agricultural R&D effort, economics has formed an indispensable part of the CRSPs, often working in close conjunction with anthropology and sociology. Hence, many of its contributions are documented here (see especially Chapters 8, 10, and 16). However, for the purposes of this volume, economics has been classed as a technical science. This heuristic finds a precedent in the Rockefeller Foundation report (1977:2) that "for the sake of simplicity . . . adopts the frequent Latin convention of classifying the 'social' sciences as separate from the 'economic' ones." (Of course, anthropology and sociology are "technical sciences" as well, in that they have their own methodologies, subject matter specialities, and so forth.)

3. In large part, this is a result of sociologists' early and extensive

attention to the study of adoption and diffusion of agricultural technology. The classic example is Rogers 1983.

4. Although policy analysis and disciplinary theory building are not a central theme of this book, in the broadest sense they constitute the ultimate mandate of the social sciences in truly international (i.e., domestic as well as foreign, First as well as Third World) agricultural R&D. Rural sociologists in particular have spoken to this urgent need for a global and policy-relevant "sociology of agriculture." For a sampling of some of this cutting-edge work, see Bonanno 1989; Busch and Lacy 1983, 1986; Buttel et al. forthcoming; Christenson 1988; Friedland et al. forthcoming; Friedmann and McMichael 1989; Goodman and Redclift 1982; Kloppenburg 1988; Newby 1983; van der Ploeg 1989; various publications of the Institute for Food and Development Policy; and the journal *Agriculture and Human Values*, notably 4(1) and 5(1-2).

5. For anthropology, see, e.g., Eddy and Partridge 1987, Grillo 1985, or Hoben 1982. Falk and Gilbert 1985 reference some of these tensions for rural sociology, although that discipline's origins as an applied science generate different concerns from those of anthropology.

6. A large and growing collection of anthologies, monographs, and articles present studies that illustrate the contributions of agriculture to social science research and theory. At the same time, this body of literature also suggests many of the contributions of anthropology and sociology to agricultural R&D, albeit often only implicitly. These studies are far too numerous to list here. However, a few representative examples of recent anthologies focusing exclusively or largely on anthropology and agricultural development include Barlett 1980, Bennett and Bowen 1988, Brokensha et al. 1980, Grillo and Rew 1985, Jones and Wallace 1986, Smith and Reeves 1989, and the monograph series of the Institute for Development Anthropology and of the Society for Economic Anthropology. Many sociologists have also published in these volumes. For some suggestive syntheses and useful bibliographies, see Bennett 1988, Buttel 1987, 1989, and Campbell and Campbell 1986.

7. A distinction is commonly drawn between multi- and interdisciplinary R&D. In the former, disciplinary research is conducted more or less independently, with results then aggregated or merged in some fashion across disciplines. In the latter, teams of scientists from diverse fields work together in a specific locale or on a specific problem. The CRSPs offer examples of both approaches (see Chapter 16). For the sake of simplicity, however, "interdisciplinary" is employed throughout this introduction.

8. Specifically for the social sciences in agricultural and natural resource development, see, e.g., Brady 1984, Brush 1986, Campbell et al. 1981, DeWalt and DeWalt 1985, Esslinger and McCorkle 1985, McArthur 1987, and Messerschmidt 1988, along with the references cited at the outset of this chapter.

9. It is noteworthy that at least two international conferences on interdisciplinary R&D have been held, and a new multidisciplinary association devoted to this subject is planned (see, e.g., Chubin et al. 1986 and Epton et al. 1983).

10. Although the focus here is on agricultural R&D, virtually all of the social science roles and contributions outlined in these pages apply *mutatis mutandis* to other development arenas as well.

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