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Social Science in INTSORMIL's Attack on Hunger in Sudan

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In the International Sorghum/Millet CRSP's publication titled "Fighting Hunger With Research . . . A Team Effort" (1985:8), two purposes are outlined for INTSORMIL. The primary one is "to organize and mobilize financial and human resources necessary for mounting . . . a collaborative effort [to provide] the knowledge base [to alleviate] the principal constraints to improved production, marketing, and utilization of sorghum and pearl millet." The second is to "improve the capabilities of host country institutions to generate, adapt, and apply improved knowledge to social conditions." This chapter discusses the role of social science in fulfilling these objectives on INTSORMIL's Sudan project. The discussion is organized in three sections: (1) the context and record of INTSORMIL's Sudan work; (2) social science research goals and accomplishments; and (3) social science impacts on INTSORMIL's achievements.

THE CONTEXT AND RECORD OF INTSORMIL IN SUDAN

More than four-fifths of the Sudanese population works in agriculture, and sorghum and millet are the principal cereals. However, the rate of growth in cereal production is lower than the rate of population growth, and the annual change in cereal yield is declining (IADS 1981). Sudan is rated as a "food crisis" country, yet its potential for increased food production through improved technology seems high.

In 1980, INTSORMIL developed a working relationship with Sudan and its research institutions. The existence of a relatively well-developed agricultural research establishment in Sudan provided an important source of potential collaborators for INTSORMIL scientists—though this establishment unfortunately included no social scientists.

As enunciated in INTSORMIL's first objective, the principle of collaboration requires the mobilization of both U.S. and host country

scientists. But, it was recognized from the beginning that a complete disciplinary match could not be attained in the Sudan project. Although this was not clearly and widely articulated, U.S. scientist resources in INTSORMIL were greater and more diverse than could be expected in any developing country. Thanks to flexibility in the "collaborative" model, INTSORMIL social scientists were nevertheless able to undertake research in Sudan despite their lack of counterparts. Ultimately, however, this lack had critical negative consequences for social science participation in this CRSP.

Also evident in INTSORMIL's first objective is the focus on sorghum and pearl millet. Although agronomic and biological scientists, and even agricultural economists, are often closely identified with particular commodities, sociologists and anthropologists usually have a broader orientation to agricultural and/or socioeconomic development. As will be seen, this difference in professional orientation can also have negative consequences for the role and contributions of social scientists.

Finally, biological scientists typically differ from social scientists, and especially sociologists, in their approach to institution-strengthening—INTSORMIL's second objective. While the former primarily define "strengthening" as training other scientists, the latter are likely to think that the institutions themselves need to be altered. This was the case among social scientists on the project in Sudan, and the consequences have been mixed.

The majority of INTSORMIL social scientists have been associated with the University of Kentucky, which has received the bulk of program funds for social research. During the first six years of INTSORMIL's operation, the University of Kentucky played a prominent role in this CRSP's research program in general, and in Sudan in particular. Throughout, the Administrative Board—which makes all final budgetary and project policy decisions—included a Kentucky representative. A Kentucky team member also served continuously on the Technical Committee, which makes annual recommendations on projects and funding levels. In addition, team members participated in all program planning committees for the annual INTSORMIL workers' meetings.

As with most INTSORMIL projects, the general research objectives of the Kentucky project had to be specifically adapted to Sudanese conditions. The project's first objective was to understand the goals, resources, strategies, and constraints in the "sociocultural complex" of production, marketing, and consumption of grain sorghum and pearl millet. This came to be defined as the farming systems research (FSR) component of the Sudan project. The second project objective focused on the structure and process of, as well as constraints to, communication among agricultural scientists. When the Sudan research was begun, a broader "sociology of agriculture" research perspective was adopted. The third general focus was on the linkages between

farmers and change agents and the constraints to diffusion and adoption, taking into account the conditions and priorities of agricultural administrators in Sudan.

There was some initial difficulty in identifying possible host countries. The CRSPs were unprecedented. USAID missions were accustomed to supervising projects that they had proposed, whereas the CRSPs were created by USAID/Washington. Moreover, CRSPs bore the additional onus of academia. However, in November 1980 an INTSORMIL team, which included a Kentucky social scientist, visited Sudan and developed a memorandum of understanding (MOU) with the Agricultural Research Corporation (ARC). A wider working relationship also was established that included the University of Khartoum and the Western Sudan Agricultural Research Project (WSARP), an arm of the ARC. Started in 1979, WSARP was funded for six years by the government of Sudan, USAID, and the World Bank. Since its principal mission was to establish four research stations in western Sudan, WSARP provided important logistical support to INTSORMIL research teams operating in North Kordofan.

These initial negotiations revealed that Sudanese government officials and agricultural scientists wanted to help the poorer farmer but had little understanding of the goals and constraints characteristic of limited-resource farming systems. One provision in the ARC-INTSORMIL MOU authorized Kentucky sociologists and anthropologists to begin field studies of farming systems in North Kordofan. These were conducted between 1981 and 1982. In June 1981, an amendment to the MOU provided for a study of the ARC research system (Lacy et al. this volume), as envisioned under the second objective of the Kentucky project.

In March 1983, plans were developed with officials of the Kordofan Regional Ministry of Agriculture, the USAID agricultural officer, and the WSARP director to study change in traditional agriculture and networks of agricultural communication. Fieldwork for this phase was carried out during 1984. Findings from the three phases of research have been published, but analysis and reporting of the results of all three field projects continues. Each of these social science research projects and their contributions are described below in greater detail.

SOCIAL SCIENCE RESEARCH GOALS AND ACCOMPLISHMENTS

The FSR Studies

The FSR method fit INTSORMIL's needs in the early years of the program. FSR is well suited to determining how limited-resource farmers cope with the social, economic, and ecological conditions under which they make a

living (see Uquillas and Garret, this volume). With such information, INTSORMIL agricultural scientists are better able to direct their research to the problems of dryland, limited-resource farmers. The FSR method has additional advantages. First, it operationalizes the holistic perspective that economic anthropologists commonly use in field research. Second, it underscores a philosophy of agricultural development that emphasizes the importance of maintaining a dialogue between farmers and scientists in developing appropriate technology. Third, its core concepts are familiar to agricultural scientists; it therefore facilitates interdisciplinary work. Fourth, agricultural development agencies regarded the approach favorably at the time.

The FSR team was composed of two anthropologists. In selecting the target area and defining specific research objectives, the team worked with other INTSORMIL scientists and with officials in ARC, WSARP, ICRISAT, and especially the USAID mission in Khartoum. The FSR work was carried out in 18 villages around el-Obeid, the capital of Kordofan Region and the dominant marketing center in western Sudan. The investigation focused on the constraints faced by limited-resource farmers in two respects: the agricultural production system and household economy, stressing the knowledge system and decision strategies of farmers; and institutional aspects of land tenure and local market organization, stressing problems of access to and distribution of resources. Instead of isolating sorghum and millet production and distribution, a systems viewpoint contextualized these crops in a set of biotechnical, economic, and institutional relationships. The FSR team conducted in-depth interviews in the villages prior to surveying 166 limited-resource farmers and 58 village merchants and middlemen.

This fieldwork resulted in three technical reports (Reeves 1984; Reeves and Frankenberger 1981, 1982) and a number of papers and other publications. The reports describe a complex multicrop and livestock farming system coupled with local and migratory agricultural wage labor, merchandising, gum arabic collection, handicrafts, and numerous other income-generating activities. Almost all Kordofan farmers grow millet, and three-fourths raise some sorghum; all also raise one or more cash crops (sesame, groundnuts, and/or roselle). Most cultivate various vegetables, including watermelon, cucumber, okra, and cowpeas. Cattle, sheep, goats, and donkeys are the principal livestock, although a few households also own camels. Livestock are important as a mechanism of savings/investment and as a reserve in bad crop years.

Self-sufficiency is the basic strategy with respect to farm inputs. Farmers save their own seed, if possible, and provide their own labor. If their own resources are inadequate, kin are the first source of both these inputs; markets are the last resort. Most important are the strategies of mixed cropping, intercropping, and opportunistic replanting. These serve to

optimize production, reduce labor and other input costs, and offset environmental and market risks. The availability of land is not a constraint *per se*, although the availability of good-quality land within commuting distance is limited. The system of land tenure tends to result in a family's having widely dispersed fields. However, this landholding pattern may be adaptive in view of the sporadic rainfall. To optimize the allocation of management and labor, mature family members of both sexes commonly have responsibility for the separate fields. Crop selection for near and distant fields is determined to some extent by the family's mix of market and subsistence production goals.

A complex system of village, district, and urban markets exists for cash crops, as well as for staple food crops. A number of market alternatives are available to farmers. These include local middlemen in the village; the government-administered village auction market, and outside agents and transporters. Crops can also be marketed in bulk at the large urban auction market, or directly (and often illegally) to wholesale buyers and warehousers in el-Obeid. As compared to smallholders, the larger producers more often take advantage of these external opportunities to obtain higher returns.

From INTSORMIL's standpoint, identification of production and marketing constraints and strategies was the most important contribution of the FSR studies (Reeves and Frankenberger 1985). Natural constraints identified include wind erosion, particular pests and diseases, low soil fertility, and inadequate rainfall. Labor and seeds, chemicals for controlling pests, and the availability of drinking water are also constraints. Most such constraints can be addressed through research, while credit and commodity auction procedures and pricing policies can be improved through institutional reforms.

Since this information was available early in the collaboration with Sudanese scientists, it had considerable influence in shaping subsequent research objectives. For example, the INTSORMIL agronomist stationed at el-Obeid in 1982 used the social science findings in developing his own research on drought tolerance; intercropping; early-maturing varieties of sorghum and pearl millet; labor-saving technologies for land preparation, planting, and weeding; control of *senta* (a major pest of millet); bird resistance; the fodder quality of sorghum stover; and the construction quality of millet stalks- all the while bearing in mind the extremely limited financial resources of Kordofan farmers.

The ARC Study

The ARC study identified constraints on research for the benefit of small, limited-resource farmers. An important assumption here is that successful R&D is closely linked with the capability of the research system as a whole.

The problems of the entire ARC thus had to be examined. A sociological perspective for understanding research systems had already been developed in Busch (1980) and Busch and Lacy (1983) for the United States. This framework was applied in Sudan, coupled with an earlier study of agricultural research capabilities there (Joint Team Report 1977).

The results of this study are summarized in Lacy and Busch 1985 and Lacy et al. 1983; details of the research are also discussed in Lacy et al. this volume. Briefly, however, the principal recommendations emerging from this work centered on increased financial and other support of ARC personnel and activities, the development of an overall agricultural research policy committee, concentration of personnel at fewer research stations, greater emphasis on FSR in the research program, and stronger linkages with extension.

Unfortunately, changes in governmental and ARC administrations and a further decline in the Sudanese economy have not been conducive to implementing the recommendations. Moreover, since opportunities to directly assess implementation of the recommendations have not been forthcoming, the impact of this study is largely unknown. However, with regard to a greater research emphasis on FSR, the visible success of INTSORMIL's FSR studies led to the sponsorship of two FSR training workshops for WSARP and ARC scientists, and to more active involvement in on-farm research by Sudanese scientists recruited for WSARP since 1984.

Studies on Communication and Change in Agriculture

The principal purposes of the 1984 studies on communication and change in North Kordofan were to determine the nature and extent of recent change in agricultural technology and to identify the channels through which new information flows to farmers, both men and women. Secondary objectives were to assess change in the villages since the 1982 FSR study, to measure the impact of a new farm program broadcast on el-Obeid radio, and to evaluate farmers' knowledge of different varieties of sorghum and millet.

Research was carried out in two phases. In the first, male and female farmers in 15 villages were interviewed regarding recent innovations in agriculture, farmers' sources of agricultural information, the basis of farmers' interests in new technology, general characteristics of the villages, and farmers' varietal knowledge of sorghum and millet. In the second phase, two villages were selected for intensive study of the communication networks for agricultural information and the diffusion of three innovations. The results of the first phase have been published in Coughenour and Nazhat 1985. A dissertation has been written on one of the two village studies (Nazhat 1986); analysis of the data from the second village and comparative analysis of both villages are still under way.

Primarily as a result of inflation and drought, living conditions had deteriorated between 1981 and 1984, and they became much worse after the 1984 season. In 1984, millet and sorghum were still the most important cereal crops. Roselle had increased and groundnuts had decreased in importance as cash crops. During the 1981–1984 period, farmers had done considerable experimenting with new seeds. In all, 24 new "varieties" were mentioned, along with several new kinds of implements. If a new variety is believed superior to existing ones, most village farmers (both men and women) begin using it within three years. Men obtain information about most new varieties first; women obtain information from men. Both groups believe that sorghum and millet varieties differ in their utility for various types of food, housing, and forage purposes. However, farmers are most interested in early-maturing, drought-resistant, and high-yielding varieties. Both men and women are willing to make some sacrifice to obtain such seed. Thus, the motivation to try new seeds is high, and substantial change is occurring in response to environmental pressures. Still, the farming system *per se* remains the same.

Most of the new seeds that people had experimented with were "farmers'" varieties, although a few had been developed by research scientists for use on large mechanized farms. Seed innovations had spread from their origin along kinship networks to villages in the el-Obeid area. Merchants are also important in the spread of new seeds. Kinship ties, which constitute the informal networks of communication, also structure information flows along tribal lines. Merchants had also been instrumental in spreading new seeds. The extension service had not been influential in any of the innovations studied. Moreover, since the radio signal from the el-Obeid station is too weak to be heard in any of the villages visited, newly instituted farm broadcasts had had no impact. The FSR/E agronomist was viewed favorably by villagers. However, relatively few villagers knew about new, research-generated seeds that were being tested, because of the suppression of information about these seeds on the part of the demonstrator farmers who were collaborating in on-farm trials.

These findings led to recommendations that more on-farm trials be attempted, extension workers make use of periodic market days to optimize farmer contacts, special institutional arrangements be made for farmers to exchange grain for hybrid seed, the linkages between research and extension be strengthened, and a seed distribution system be developed, including an education and training program for merchants so as to improve their reliability and trustworthiness. Although these recommendations were discussed in seminars with research, extension, and USAID personnel in Sudan, there has been no opportunity to assess their institutional acceptance.

SOCIAL SCIENCE IMPACTS

Because of the lack of information, it is impossible to make a full assessment of the impact of the work of INTSORMIL social scientists. It is apparent, however, that the unique organization of the project made their impact both more and less than it might have been—"more" in that, under the relatively decentralized management of INTSORMIL, social scientists were able to chart their own course and to capitalize on the available opportunities as they saw them; and "less" in that social science impacts depended almost entirely on the willingness of agronomic and social scientists to make use of each other's findings.

Nevertheless, a number of positive impacts can be identified. The FSR work definitely encouraged INTSORMIL and the Sudanese government to allocate more resources to projects to help limited-resource farmers. The social scientists' baseline information on farming systems was used in planning research at the new agricultural experiment station at el-Obeid. In fact, the INTSORMIL agronomist was posted to el-Obeid *because* of the success of the FSR group's diagnostic analysis. The agronomist arrived before the anthropologists had left the field, and he used their findings to design and develop his own research.

The FSR team influenced INTSORMIL priorities and directions by helping to organize conferences and workshops. It also bolstered the effort to get more overseas involvement among INTSORMIL's U.S. scientists. By establishing a research site and providing important baseline data, social scientists were also instrumental in convincing INTSORMIL to conduct field research, both in Sudan and other CRSP country sites.

The impact of the FSR team is evidenced in other ways, too. As a result of the information it developed, INTSORMIL collaborated with other organizations in Sudan to fund long-term breeding and agronomic research emphasizing alleviation of the constraints on limited-resource farmers. Two major goals of these collaborative efforts are improved intercropping and better stand establishment (i.e. successful germination and growth of the crop). The FSR team had found these were very important to farmers for assuring adequate yields with the least expenditure of labor. Also, the breeding of early-maturing and drought-resistant varieties was encouraged by the FSR work.

Although it is too early to demonstrate significant gains in sorghum and millet utilization as a result of the FSR and agronomic studies, the importance of on-site testing is now more widely recognized by Sudanese researchers. The el-Obeid agronomist field-tested early-maturing varieties of sorghum and millet, as well as the new hybrid sorghum developed under INTSORMIL, ICRISAT, and Sudanese government auspices. The field testing demonstrated the superiority of several new varieties in rainfed areas.

However, it is not known how well they may be accepted under ordinary farming conditions. This could be assessed in carefully designed farmer-managed trials.

Another way to assess the impact of social scientists is to ask how INTSORMIL might have been different without them. This question directs attention to some of the mistaken ideas that have been exploded. One is the notion that limited-resource farmers are irrational and homogeneous. In describing the many different types of cropping and livestock systems and farmers' finely tuned strategies to cope with variation in rainfall patterns and income opportunities, the field studies essentially destroyed this myth. The record of innovations considered by farmers during the past five years alone, plus their documented interest in new, early-maturing and higher-yielding varieties, also demolished the notion that traditional farmers are uninterested in agricultural innovations and that their technology is static or unchanging.

Similarly, many Sudanese officials and expatriate experts alike believed that the small farmers of western Sudan were poorly integrated into the market economy, and that, to the limited extent they did participate, they were being severely exploited by rural middlemen. Moreover, it was assumed that market infrastructure (e.g., transportation and storage) was primitive and inefficient. The evidence collected by social scientists working in the field, however, demonstrated that all these ideas are largely unfounded. Production of cash crops is virtually universal and is critical to farmers' livelihood. Rural middlemen are rarely able to exert monopoly power over farmers. Transportation and storage methods offer farmers a range of alternatives that are highly effective in view of the adversities of climate and geography. These findings argued all the more strongly for the importance of technical innovations and food-crop improvement as a means of enhancing both agricultural yields and the welfare of the rural population.

As the designers of the Kentucky project had hoped, the entire technological development process—from the laboratory, to production on-farm, then marketing and consumption—was studied. Constraints at all levels were identified. As is often the case, the findings have been most relevant to agricultural scientists, research planners, and extension administrators. Results have provided guidance for technical research. They also indicate that some institutional reform of both the research and extension systems is needed for more efficient technology to develop. Social scientists could be of great assistance in making these reforms.

Some of the primary clientele – limited-resource farmers—have directly benefited from the FSR team's assistance in local development projects in the field, and from on-farm trials of new seeds that the team encouraged. Limited-resource farmers have also benefited indirectly from the research, to the extent that improved sorghum and millet seeds have become available more quickly and with greater confidence in their relative advantage than would have been

the case without INTSORMIL's social science studies. It is hoped that these indirect benefits will continue to multiply.

In addition to the positive impacts outlined here, several factors have limited the impact of social science in the Sorghum/Millet CRSP. The contributions of social research have been recognized by most INTSORMIL agricultural scientists, administrators, and program evaluators. However, it is our impression that all parts of the Kentucky project have not been seen as equally valuable. The importance of the FSR study was widely heralded, but the studies of the ARC and of changes in agricultural technology and the communication of agricultural information among farmers seem to have been much less used. Of course, many of the recommendations emanating from these studies are more difficult to implement. They require additional financing, restructuring, or the resolution of conflicting interests. Also, the studies identify constraints that INTSORMIL cannot deal with by itself. Sudanese officials must be the actors, and such action often is resisted by various groups.

A related problem has been the lack of social science collaborators within ARC, WSARP, or the Kordofan Regional Ministry of Agriculture. This has been critical in several respects. Without collaborators, U.S. social scientists had to start from zero, as it were, in each field investigation. After the field study, the team and its resources disbanded, leaving little in the way of accumulated expertise. This defect becomes more important, even critical, in implementing recommendations. No one was on hand to follow up in working with other scientists and/or local officials. The social scientists thus have been forced to "make their own waves"—a difficult task at best.

Another difficulty relates to the fact that INTSORMIL's structure is multidisciplinary, yet it lacks clear goals and firm program management. It is not surprising that biological scientists might be slow to recognize the importance of social science, but we discovered that social scientists themselves had to learn how their work might be relevant to the research decisions of biological scientists. Social scientists were slow to recognize the importance of their participation at all levels in the research planning process. Moreover, despite the presence of social scientists on the Technical Committee of INTSORMIL, interdisciplinary coordination for program development has been poor.

This problem has become especially acute under INTSORMIL's new organizational plan, which aims to overcome the earlier lack of a geographic research focus by establishing research coordinators for designated ecogeographical zones. For example, Sudan is the prime research site in INTSORMIL's East Africa Eco-Geographical Zone. Although social scientists are members of the zonal groups, they have been systematically excluded from the planning process. The rationale varies, but typically host countries argue that since they have no social science research directed toward

agricultural development, social scientists should not attend the planning workshops. INTSORMIL's Management Entity has not insisted otherwise. Nevertheless, this is precisely where important social science input might best be made and the need for social research debated and planned.

Lack of collaborators and interdisciplinary coordination has had another deleterious consequence: INTSORMIL's failure to recognize the need for the iterative and/or monitoring aspects of FSR and social science research. The present feeling within INTSORMIL seems to be that, although FSR is important in providing baseline information, once this task is accomplished any problems arising in the course of future technical development will require only economic assessments at most. Issues of who adopts what technology, and why or why not, are largely ignored, as are the broad range of noneconomic impacts of technology development. Consequently, the failures associated with earlier programs of technological development are likely to be repeated. For example, initial reports indicate that the widely heralded hybrid sorghum mentioned above is not fully acceptable to consumers, but the reasons for its rejection are obscure.

Additional research on farming systems and on the acceptance of new seeds and agronomic practices has been planned. However, as part of a general budget readjustment necessitated by the Gramm-Rudman act, the Administrative Board of INTSORMIL did not fund Kentucky's research project in 1986–1987. A change of government in Sudan, armed rebellion in the south, and general reductions in USAID programs also have substantially increased the difficulty of collaborative research, and further work under the Kentucky project is problematic. Fortunately, other INTSORMIL projects are conducting some limited social science research. For example, agricultural economists at Purdue University are developing a linear program model of farming systems and evaluating new technology.

One can only speculate how eliminating social research will impact INTSORMIL's program in Sudan and elsewhere. The program will probably be severely handicapped in evaluating its activities and in guiding the development and acceptance of new technology. Although economic analyses of the new sorghum varieties promise to fill part of the gap (Habash 1985), the broader assessments that an FSR-type of analysis would provide will not be forthcoming. INTSORMIL will need this input to avoid the kinds of adverse impacts that new agricultural technology has had in the past. In the absence of relevant "social intelligence," INTSORMIL is likely to have difficulty fulfilling its main mission: "fighting hunger with research."

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