

AGRICULTURAL RESEARCH AND EXTENSION IN FRANCOPHONE
WEST AFRICA: THE SENEGAL EXPERIENCE

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I. INTRODUCTION - STATEMENT OF THE PROBLEM

The need for a close relationship between agricultural research programs and extension programs has been debated in Senegal for over 25 years. At independence, the "promotion of Research-Development" was a pillar of the government's rural development policy for the 1960s. Thirteen years later in 1973, on the eve of the creation of ISRA (The Senegal Institute for Agricultural Research), the Minister of Rural Development renewed the government's concern with Research-Extension (R-E) by convening a national conference on the most effective use of research results in agricultural production programs.¹ More recently, several international assistance agencies, including the World Bank, USAID, and the French Caisse Centrale, have made research and extension agreements a cornerstone of their support for agricultural projects.² CIRAD, the newly created umbrella organization for French international agricultural research, too, plans to redefine its Senegal³ program in order to concentrate on joint research and extension programs.

Despite the continued concern among Senegalese policymakers with improving the R-E alliance, many of the government's agricultural policy statements do not clearly articulate the contribution and importance of agricultural research to agricultural development. Agricultural research occupies a secondary place in Senegal's four-year development plan and is scarcely noted, either in the government's 20-year review⁴ of agricultural development or the more recent New Agricultural Policy.⁴ Furthermore, charges and countercharges continually fly between researchers who are criticized for non-adaptive, ivory tower research and "developers" (extension personnel) who are charged with a narrow minded productionist orientation at the expense of addressing problems identified by farmers.⁵

Most recommendations for closing the R-E gap concern improved communications and contacts between research and extension personnel. While clearer lines of communication could improve the quality of the Senegalese R-E, we suggest that the R-E structure must be transformed to promote an interactive exchange among researchers, extension personnel, and peasant farmers which assures the continued development of new technology and access to this technology by peasant farmers.

Our discussion of the R-E issue in Senegal is presented in this paper as follows: Part II suggests that the Senegal R-E experience can be most fruitfully understood as a case of institutional change. Part III provides a historical overview of R-E in Senegal, followed in Part IV by two case studies. The conclusion offers policymakers some lessons for closing the R-E gap; we also identify aspects of production systems research (FSR) in Senegal that might contribute to the sustained development of Senegal's agricultural research capability.

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II. INSTITUTIONAL CHANGE - SOME GENERAL CONSIDERATIONS

Ruttan and Hayami (1985) argue that adaptation in state agencies such as ISRA occurs as a result of changes in an institution's economic, political, and technical environments. In most industrialized countries, for example, agricultural research agencies have responded to change in a straightforward manner: farmers with constraints on their land or labor demand the development of improved technology and more modern inputs in order to overcome these constraints; agricultural scientists and administrators, in turn, seek to satisfy these demands and thereby continue an ongoing process of change and adaptation.

Several conditions influence this process. Demand is usually expressed through active farmer or commercial organizations. Moreover, the research system is often decentralized and includes the appropriate incentives so that scientists and research administrators can respond to client demands and are rewarded for so doing. In many cases, if these conditions exist it is because governments and policymakers have deliberately and carefully nurtured support for agricultural research. As Ruttan and Hayami (1985) note, "the power structure among vested interest groups" usually determines the nature of the response which researchers make to client demands.

Agricultural research is commonly a publicly financed activity, since its results are publicly available. But client-oriented agricultural research does not necessarily require financing through tax revenues. Specific groups, especially plantation owners or large cash crop producers, often finance their own commodity research programs. Where agricultural research is a state activity, it can offset, as Ruttan and Hayami (1985) suggest, "serious distortions in the allocation of research resources" unless "vested interest groups" feel that the costs of change outweigh the benefits of maintaining the status quo. If this latter condition exists, "socially undesirable institutional innovations" can occur.

While Ruttan and Hayami's model deals in detail with the relationship among economic factors, technical factors, and institutional change, the role that political factors play needs to be better defined and incorporated into the analysis. To achieve this, we begin by expanding our view of the arena in which an agency such as ISRA operates, to include the international community and more specifically the assistance agencies and international agricultural institutes that help to finance and support agricultural research. These institutions form part of the structure of power of agricultural research in West Africa. They influence institutional change through their ability to withhold financial resources and goods. They also help define the demands and rewards facing research scientists and administrators. In short, they play a major role in defining the rewards and incentives for agricultural researchers.

In addition, we can achieve a better understanding of the relationship between political factors and institutional change by specifying and characterizing the "vested interest groups" that seek to influence the nature and direction of agricultural research programs. To do so requires the ability to identify and relate different actors in an overall R-E

system. For example, we suggest that in order to analyze and evaluate innovation in agricultural research throughout most of West Africa, it is necessary to identify the specific interest groups within the research community, the relationship between research and developers in the development agencies, and between these actors and the international research and assistance agencies.

Before turning to these case studies, we briefly review part of the history of agricultural research in Senegal and outline the organization and activities of ISRA's recently created Production Systems Department.

III. AGRICULTURAL RESEARCH AND EXTENSION IN SENEGAL - AN HISTORICAL OVERVIEW

In order to understand the R-E relationship in Senegal, it is useful to note three distinguishing features of Senegalese agricultural research: researcher autonomy, an extensive research infrastructure, and a tradition of research under farmers' condition.

For over 50 years, from the early 1920s through 1974, agricultural research in Senegal was in the hands of specialized institutes, most notably IRHO, IFAC, IRTC, and IRAT.⁶ This permitted considerable research autonomy for their research scientists and administrators, and it has left a tradition of researcher accountability primarily to a disciplinary scientific group within a bureaucratically organized research institute or government agency.

Second, since Senegal served as the headquarters for agricultural research in French West Africa for almost 50 years, the country today has one of the most extensive research infrastructures of any Francophone Sahelian country. The Groundnut Experiment Station, established at Bambey, Senegal in 1921, became the Federal French West Africa Agronomic Research Center in 1950. Researchers operated a network of 10 substations throughout West Africa, of which three were in Senegal. By 1960, when Senegal designated IRAT to manage most Senegalese agricultural research, additional substations were already operational at Sefa, Richard-Toll, Guede, and Djibelor (Map 1). In addition, IRHO had separate facilities at Bambey and three of its own substations; other French research institutes, especially IEMVT, CTF and ORSTOM, also managed their own substations.

By the early to mid-1960s, considerable basic agronomic work on Sudano-Sahelian agriculture had been completed. Researchers were confident that if improved groundnut varieties, better soil fertility practices, animal traction, and better cultivation practices were available to farmers, their use would lead to increased agricultural production. Many of these changes and improvements are still part of the technical packages in Senegal's rainfed agricultural production programs.

Third, the expansion of Senegal's research infrastructure noted above was due partially to researchers' demands that trials and experiments be undertaken on substations and *Point d'Appui, de Pre vulgarisation et d'Experimentation Multilocale* (PAPEMS) throughout the country. Because the PAPEMS were located near village fields, they provided opportunities for farmer visits, field demonstrations, and short-term training. The development of two of Senegal's popular hybrid maize varieties, for example, started from the contacts between PAPEM researchers and peasant farmers.

Researchers' concern with doing research in the "real rural setting" was also one of the key elements in the proposal in the early 1960s to establish a series of *Actions Regionales Pilotes de Developpement Integral* (ARDIs), or action research programs within uniform agroecological zones. Although never established, the ARDI was a key idea behind Senegal's well-known *Unites Experimentales*. The *Unites* program made a significant contribution to agricultural development in Senegal during its 12-year existence from 1968 to 1980. Many technical recommendations were either developed or made more appropriate to the conditions of the southern Sine-Saloum; researchers and extension personnel alike gained a much better appreciation of the structure and organization of the peasant farmer family, and suggestions were made to improve the nature and management of the village level extension agents (*encadrement*). Moreover, the *Unites* program marked an important phase in the evolution of agricultural research in Senegal and is widely regarded as one of the first types of "farming systems research" in West Africa.

The IRAT-ISRA *Unites* program, however, has never been without its critics: from the beginning, many researchers felt that *Unites* off-station research was not truly scientific research; extension personnel, in turn, charged that the program should have been the responsibility of agricultural extension since the program was principally action research. Among the other criticisms, including the program's cost and directive (top-down) approach to research, was the complaint that extension agencies were not formally involved in the *Unites* and thus a R-E alliance was not forged. Only informal personal contacts existed between researchers and extension personnel at the local level. By the time the *Unites* program ended in 1980, no progress had been made toward the promotion of an ongoing research and extension relationship.

During the *Unites* period, nevertheless, ISRA had joint research contracts with several agricultural extension agencies. As one condition of its *Caisse Centrale* (C.C.C.E.) financing, *Societe Nationale d'Aménagement et d'Exploitation des Terres du Delta* (SAED), was obligated to negotiate research contracts with ISRA for both on-station and off-station programs to study smallholder production problems on irrigated perimeters. Cotton research was undertaken under contract with *Societe pour le Developpement des Fibres Textiles* (SODEFITEX), and the USAID-financed Cereals Production Project in the Groundnut Basin included provision for research contracts between ISRA and *Societe de Developpement et de Vulgarisation Agricole* (SODEVA).

To summarize, off-station, farm level research related to agricultural

production programs is not new in Senegal. For over 20 years, on-station researchers have regularly pushed their programs outwards in order to run their trials and experiments under different agroecological conditions. ISRA, too, has responded to demands from extension agencies for farm level research. Assistance agencies have also played an important role by defining research programs and methodology in their project documents and by very closely supervising the execution of these programs. In addition, researchers have followed relatively independent programs and have rarely been concerned with a need to respond to farmers' constraints and problems.

The Production Systems Research Department

As part of a much larger program for reorganizing ISRA, the Agricultural Research Project financed principally by the World Bank created the Production Systems Department in 1982. The department was given the responsibility to organize production systems or FSR teams in ISRA's regional research centers, as well as manage several thematic or support research programs including bioclimatology, weed control, post-harvest technology, and soil fertility.

Since 1982, the PSR Department has launched three production systems teams in three research centers at Djibelor, Kaolack, and St-Louis, plus a multidisciplinary research program at the Dahra Center in Senegal's sylvo-pastoral zone. Each team is composed of at least an agronomist, animal scientist, economist, and a sociologist. Scientific support and management for these teams is provided by a multidisciplinary Central Systems Analysis Group composed of senior researchers based in Dakar.

Under the Agricultural Research Project, each Production Systems Team was to include a researcher/agricultural extension specialist who would fill a joint ISRA-Extension Agency position within the Extension Agency. The objective of this specialist would be to institutionalize the R-E relationship between each PSR Team and the appropriate Regional Development Agency. The specific responsibilities were to include: (1) the management of all farm level tests and trials prepared by production systems and commodity researchers in collaboration with the extension agency; (2) the training of extension personnel in the use of new technology; (3) the identification of any farmer reactions to or constraints on the use of new technology, and (4) monitoring to assure that researchers were aware of these reactions and constraints.

Both ISRA and the Regional Development Agencies found it difficult to accept the specialist position. The extension agencies were not convinced that a researcher should be assigned a full-time position within their agencies. ISRA did not have personnel qualified to fill the position and, faced with restrictive personnel ceilings, preferred to guard researchers exclusively for its research programs.

In place of a research/extension specialist, ISRA proposed ISRA-Extension protocol agreements as a means to build and institutionalize the R-E relationship in the major agricultural zones throughout Senegal. ISRA and SOMIVAC signed a protocol agreement in 1983 and similar agreements

are under discussion with both SAED and SODEVA. Before looking specifically at the ISRA-SOMIVAC relationship, the following case study illustrates the advantages and disadvantages of an R-E relationship which is essentially "driven" by an extension agency and a donor.

IV. TWO CASE STUDIES IN RESEARCH-EXTENSION

1. Matam: ISRA-SAED Contract Research

Dreams and plans to harness the Senegal River and gain control of its water flow for inland transport and agricultural production date from the turn of the century. Following the recommendations of a study mission in 1935, France created the *Mission d'Aménagement* in 1938 to try to offset Senegal's dependence on Indochinese rice imports. By 1945, the *Mission* had plans to develop approximately 50,000 ha for irrigated rice production. Today, SAED is responsible for irrigated crop production along approximately 600 km of the left bank of the Senegal River.

The valley, SAED's area of intervention, is commonly divided into three zones: the Delta, Middle, and Upper Valleys. Over one-half the irrigable land is located in the Delta and is composed of large perimeters (i.e., up to approx. 2,000 ha perimeter⁻¹) in which the average holding is between 1 and 1.5 ha. The Middle Valley includes both large and small (village) perimeters, while only small perimeters (approximately 20 ha perimeter⁻¹ in which the average holding is .25 ha) are found in the Upper Valley.

The development of approximately 240,000 ha in this valley is one of Senegal's principal economic priorities. This land can potentially be brought into production upon completion of the Diama and Manantali dams in 1986 and 1989 respectively. SAED's ability to bring only an additional 3,000 ha per year into production, however, makes the timely achievement of this objective somewhat questionable.

The research base for a major economic development program has not been laid. There has been little or no consideration of the role of agricultural research in the development of the valley, nor does ISRA have a long-term research policy for the region despite its importance for Senegal's economic future. Since WW II, agricultural research has been undertaken by several national and international organizations, with little or no attempt to coordinate their often diverse programs. Neither IRAT (until 1974) nor ISRA has ever had the core scientific research personnel to carry out more than limited research activities. Until 1981, for example, the only ISRA irrigation engineer was stationed at Bambey. WARDA has been responsible for rice research; ORSTOM has done most of the basic soils work in the region; FAO, OMVS, CILSS and CIMMYT have been variously responsible for most of the basic research on sorghum, maize, and wheat. There has been no socioeconomic research linked with the agronomic research, nor has there been any systematic evaluation of the technical package used by SAED. In sum, agricultural research in the valley has been designed and carried out primarily in terms of the interests of different research institutes and agencies. These programs may have been compatible, but they were neither

conceived nor designed to address the significant problem of long-term agricultural development planning for the region.

ISRA has undertaken several contract research programs for SAED. Varietal testing was done and cultivation techniques were studied as part of the Dagana Perimeter development program. Power hand tillers were tested in the Ndombo-Thiago (Richard-Toll) perimeters. ISRA also managed an experimental cattle production unit and a model sprinkler irrigation system at Ndiol under contract with SAED. In May 1983, a joint donors meeting (France, USAID, The World Bank), convened to review future financing for SAED, recommended that ISRA and SAED move beyond contract research and toward a closer, more reciprocal R-E relationship.

In response, ISRA and SAED held discussions on this question in October 1983, and an ISRA-SAED committee was commissioned to define the priority ISRA-SAED research questions and programs and to prepare an ISRA-SAED protocol agreement.

An ISRA-SAED research protocol has not yet been prepared, but the St-Louis Production Systems Team consults regularly with SAED in the design and implementation of its research program. Pressured by its donor agencies to show progress toward decentralization and smallholder responsibility as a condition for continued financing, SAED seeks to dominate these consultations and to stipulate the conditions of the R-E relationship with ISRA. SAED, donor agencies, and the Government of Senegal are convinced that the development of a new technical package is the key to improving smallholders' productivity. As one part of its support to SAED, the French *Caisse Centrale* earmarked funds in 1980 for an ISRA research program to help solve specific production and management problems in the Middle Valley Matam perimeters. A joint SAED/ISRA meeting in September 1980 identified three priority research themes:

- Increasing the area under cultivation without reducing agricultural productivity;
- Developing and maintaining a cost effective irrigation system;
- Testing a diverse number of crops, especially vegetables.

During a subsequent technical meeting in early 1981, ISRA resisted pressure from SAED to move quickly from on-station trials to farm level recommendations. Attention focused on several financial and administrative issues, including management of the contract. ISRA was concerned principally with resolving outstanding issues from a previous contract, receiving an advance payment, and posting a SAED technician/agronomist full-time at Matam to supervise and coordinate the research. SAED, on the other hand, felt that ISRA should provide enough researchers to carry out the contractual research.

Two years later and only under considerable pressure from the *Caisse Centrale*, the Special Agreement for Matam (*Convention Particuliere*) was signed in March 1983. The delay from the start of discussions in late 1980 to early 1983 was not due to serious misunderstandings or difficult

negotiations between ISRA and SAED, even though the relationship between the two organizations was strained. The ISRA Center at Richard-Toll was administratively unable to respond to many of the problems raised by the contract, and at the time responsibility for the negotiations was transferred to the Production Systems Department, the Department faced other priorities.

As finally negotiated, the Matam Agreement consisted of the following research activities:

- Forage crop trials (even though the 1981 meeting had suggested the use of agricultural by-products);
- Rice and maize varietal trials;
- Fertilizer response trials on rice and maize;
- Fruit tree nursery;
- Vegetable crop demonstration trials and marketing studies, and
- Water management studies.

This list reflects the compromise of donor and researcher proposals based on suggestions concerning methodology, results of ongoing research, and availability of researchers to carry out desired activities. Rice producers were not consulted and the available research results used to prepare the off-station program came principally from on-station programs.

ISRA did receive an advance payment, but the vehicles and motorbikes were not delivered until midway through the growing season, and SAED agents responsible to supervise the trials were posted even later in the year.

During the first year, all the programs were started except for the water management study, which was delayed pending the acquisition of required equipment. Six farmers participated in the rice variety trials, four in the maize trials, six in the fertilizer response trials, and three groups of five farmers each were selected for the vegetable crop demonstration trials. All the trials were designed and managed by researchers; at SAED's request, the trials were run in only one zone even though 1983 was the first year of operation for the perimeter and most farmers had little previous experience with irrigated agriculture.

By the end of 1983, only the rice varietal trials provided significant results. For logistic and organizational reasons, the other varietal trials were inconclusive; the maize trials, for example, were started 46 days late. A dispute between SAED and the perimeter farmers, which prevented the delivery of diesel fuel for the irrigation pumps, jeopardized other trials when the perimeter could not be irrigated on time. ISRA and SAED recognized that the 1983 trials had been identified and defined without any discussion with farmers and, consequently, were unresponsive to their interests. As a

result, farmers refused categorically to consider the forage crop trials because of the competition with food crops, especially since the area had been quite hard hit by drought. Farmers also were uninterested in "concentrated" stands of fruit trees, which they saw as a haven for birds.

The forage crop trials and the fruit tree program were dropped from the 1984/1985 program of work. Three rice varieties were selected for demonstration trials with a limited number of farmers, while the maize varietal trials were designed to identify the place of maize in a crop diversification scheme. Fertilizer response trials on rice and maize were continued on farmers' fields but were run directly by SAED agents or research assistants. Several vegetable variety trials were also continued in order to assess the viability of different types of vegetable production during the cool dry season. At SAED's request, the hydrological research component was designed to evaluate the technical aspects of water supply in the zones rather than to examine the problems of water management and control at the farm level.

By 1985, considerable progress had been made toward adapting the research program to the problems and constraints identified at the local level. At separate times, SAED, ISRA, and CCCE visited Matam in March 1985 to review "the real need of farmers with respect to a research program." Discussions during both visits emphasized the need to simplify trials in order to facilitate management by the SAED field agents and to improve their ability to turn the results into farm level recommendations.

Currently, during the 1985/1986 season, rice demonstration trials that combine different fertilizer response trials are underway in all five zones of the Project. In response to specific problems raised by the SAED agents during their discussions with ISRA, two tests were also designed in one zone to evaluate insecticide use and different weeding techniques. In contrast to previous years, 1985/1986 trials have been adapted and oriented to respond to specific problems raised by the SAED agents in each zone. In addition, a one time socioeconomic/opinion survey is planned for the end of the trials in order to obtain a more systematic view of the farmers' impressions of the research program.

Consistent pressure from SAED and CCCE has obliged ISRA to design more demonstration trials and to expand these trials as quickly as possible to all five zones of the Project. Farmer disinterest and opposition in some trials has led to modifications in the research program. The Matam research program has made only a tentative effort to include the farmers' point of view in the research program design. The identification of local problems by the SAED agent in each zone should not be confused with the direct identification and management of research by farmers. The effort to listen to technical agents provides at best a channel of communication, albeit imperfect, that has previously been unavailable to farmers.

2. ISRA-SOMIVAC Research-Extension Liaison Unit

The second case study, drawn from the Lower Casamance Region,¹³ begins with the brief history of the ISRA-SOMIVAC (*Societe pour la Mise en Valeur de la*

Casamance) Research-Extension Unit since 1983 and illustrates a possible strategy for improving the R-E relationship.

When the Djibelor Production Systems Team was organized in March 1982, ISRA proposed a protocol agreement with SOMIVAC that would commit both parties to joint efforts to adapt agricultural research and extension programs to the problems and needs of peasant farmers. After approximately six months of periodic discussions between ISRA, SOMIVAC, and USAID, a Research-Extension Protocol Agreement¹⁴ was signed by ISRA and SOMIVAC in 1983.

During its first year of activities under the Agreement, the Liaison Unit served principally as a forum for researchers and management level SOMIVAC personnel to discuss their respective programs. As a result of these discussions, SOMIVAC agreed to assist the PSR Team, both in defining recommendation domains for the Lower Casamance and in preparing a joint plan of work for watershed management in the mangrove swamp inlets (*bolongs*). The Liaison Unit's performance at the end of 1983, however, was judged by both ISRA and SOMIVAC to be far short of expectations. Managers and planners from SOMIVAC, rather than field and technical extension personnel, attended the few meetings that were held; and the unit's meetings rarely arrived at concrete conclusions or led to specific, coordinated activities.

In order to improve the effectiveness of the Liaison Unit, ISRA and SOMIVAC created seven small subject matter technical working groups in June 1984 to design specific and joint R-E activities focusing on priority topics and problems in rice breeding, animal traction and equipment, land use, animal production, seed multiplication, socioeconomic (production systems) studies and surveys, and agricultural inputs and agricultural policy. Currently, special Lower Casamance Project funds finance some of these programs. One principal program is the rice variety trials, which are managed by farmers and visited during the cropping season by joint ISRA-SOMIVAC teams who obtain farmers' reactions to the trials. Other major activities include testing sweet potatoes as a sequential crop to irrigated rice in selected areas and monitoring the desalinization process in two zones that have been recently protected by small saltwater intrusion dams. Here researchers will test simple cultivation techniques and rice varieties that are moderately salt tolerant; they will also undertake a short socioeconomic farm and village survey in one valley. Other joint activities for 1985/1986 include a follow up study of the use of groundnut seeders for rice, joint R-E visits to rice seed multiplication farms, and an analysis of PIDAC's special credit program among selected producers' groups (*Groupement de Producteurs*).

Training has been an important component of the ISRA-SOMIVAC relationship since 1984. SOMIVAC/PIDAC personnel participated in three ISRA PSR Department Workshops: a Farming Systems Research Methodology Workshop (October 1984); another entitled Microcomputers in Agricultural Research (MSTAT-January 1985), and a third concerning the Design and Analysis of Agronomic Trials and Tests for Peasant Farmers (May 1985).

Responding to USAID's interest in reorienting the Lower Casamance

project toward a program for saltwater intrusion control and mangrove swamp watershed management, the Liaison Unit organized a June 1985 workshop-conference to discuss saltwater intrusion dams in the Casamance. The workshop brought together researchers, extension personnel, government representatives, and delegates from farmers' organizations. The result was a direct and frank discussion of the government's preference for large dams vs. the ISRA-SOMIVAC preference for a small dams policy; the conclusions should provide a sound basis upon which to evaluate the advantages and disadvantages of the large and small dams policies.

In addition to the ISRA-SOMIVAC research activities, SOMIVAC's acceptance of the agricultural zones delimited by the Djibelor PSR Team represents an important step toward closing the R-E gap in the Casamance. Until this year, SOMIVAC defined its zones of intervention with maps and descriptions prepared by outside consulting firms. These maps and descriptions were extremely useful in regional development planning and especially in defining water management programs, but were of limited use in defining an appropriate extension program adapted to different production systems. The PSR Team's "zonification" of the Lower Casamance has been refined each year and the fact that SOMIVAC has accepted these zones for its extension program reflects the importance that SOMIVAC now gives to incorporating socioeconomic criteria in its planning. Furthermore, the PIDAC extension program now includes themes or recommendations for intensifying cropping that were proposed by the PSR Team: associated cropping with maize and cowpeas, and the sequential cropping of rice and sweet potatoes.

Under the protocol agreement, the ISRA-SOMIVAC relationship in the Lower Casamance has progressed along three fronts: joint or coordinated research activities and studies; training, and discussions and review of regional rural development policy. In addition, more technical personnel from the field participate in the Liaison Unit's meetings and activities.

The success of the ISRA-SOMIVAC relationship, however, is not due solely to the joint activities of PSR researchers and field level extension personnel. ISRA on-station researchers play a critical role through their ongoing research programs and by committing some of their research time to problems raised by the PSR Team. In other words, the ISRA-SOMIVAC experiment is significant because the on-station programs provide critical support to the PSR program and to the Liaison Unit's activities. For example, the on-station weed control program has moved from a singular concern with the chemical control of weeds to an examination of how different land preparation techniques practiced by the farmers can more effectively and less expensively control weed growth. Farmer-managed trials have been added to the varietal breeding programs, and the rice plant pathologist and entomologist have added cassava and other vegetable crops to research programs that centered predominantly on rice. The soil fertility program is testing lower fertilizer doses and the agricultural engineer has moved beyond the standard census of agricultural equipment to a review of the farmer's use of equipment.¹⁵

Major challenges have yet to be overcome in this R-E experiment.

Extension agents and those working directly with peasant farmers are still only marginally involved in the Liaison Unit and an effective means to include farmers' representatives (from producers' groups, cooperatives, or village organizations) in the Liaison Unit has not been found. Even though more researchers, especially those with on-station programs, and extension personnel are now ready to account for the peasant's point of view in preparing their programs, the peasant farmer is still not a full partner in the R-E relationship.

Furthermore, the interactive process of the Liaison Unit must spread from the local level to both regional and national policymakers. Both ISRA and SOMIVAC need to reach out with the news and results of their joint programs. The ultimate test of the successful R-E relationship is, of course, increased agricultural production and improved rural welfare. Meanwhile, the Liaison Unit can make a significant contribution to agricultural development by calling the attention of policymakers to the important accomplishments and effectiveness of programs designed on the basis of farmer defined problems.

Despite the Liaison Unit's progress to listen to and respond to farmers' problems, its operations and programs still depend heavily upon outside encouragement; donor agencies have provided a critical measure of support for the Liaison Unit. Such support has a limited time frame and is oriented toward specific objectives. USAID/Senegal, for example, is increasingly interested in watershed management, thereby leaving the future of the R-E unit open with respect to support for continued work on rainfed agricultural problems.

CONCLUSIONS AND POLICY IMPLICATIONS

ISRA represents a classic case of an open institution that must constantly respond to demands from its environment. Foreign aid currently pays the operational costs of ISRA's research programs, and researchers spend a significant amount of time dealing with aid agency advisors, consultants, and evaluators who solve ongoing problems, define new activities, or review the results of past programs. Foreign financing of Senegal's agricultural research will be required for many years, and aid agencies will continue to be among those with important vested interests in ISRA's programs.

Confronted with this situation, we have suggested that a central and dominant concern for ISRA researchers and administrators should be how to include the Senegalese peasant farmer as well in agricultural research. Our case studies represent two ongoing experiences, and while the balance sheets for the account of the peasant farmer cannot yet be drawn, these case studies suggest some lessons to be applied when creating a more farmer oriented R-E framework to develop and transfer technology. They also underscore the contribution that PSR can make to improving the long-term performance of agricultural research in Senegal.

Lessons for ISRA

Contractual research like that under the Matam Agreement is very attractive to ISRA. It offers ready research funding at a time when research costs are rising and financial support is uncertain. Contractual research with an extension agency can also keep research programs relevant by forcing researchers to address real world problems in collaboration with extension personnel. Consequently, it is easily understood why contractual research continues to be an important part of ISRA's research portfolio; it offers concrete research opportunities for researchers and a relatively secure source of financial support for research programs.

The Matam case also poses several problems. Research questions raised by extension agencies arise from immediate problems and constraints and as a result are often very specific and localized. Consequently, they may not represent high priority questions for researchers. Moreover, by responding to contractual research opportunities, researchers face considerable pressure to draw fast, and perhaps premature conclusions and policy recommendations. Finally, contractual research by its nature cannot offer the long-term funding required to build a system that provides continued access to researchers by farmers or that encourages researchers to respond to farmer defined problems.

Consequently, we suggest that agencies such as ISRA should not engage in contractual research as currently defined. The extension agencies should have the technical capability to undertake pre-extension work directly with farmers and to evaluate research results that are directly relevant to the objectives of the agency's production program.

The ISRA-SOMIVAC Liaison Unit does offer one means to build a long-term relationship that serves both researchers and extension personnel and through which farmers can influence research and extension programs. Its activities can be defined to resolve specific problems and to seek the longer-term development of improved technology.

A Liaison Unit does not, however, substitute for direct collaboration between researchers and farmers or for measures to increase farmer influence in agricultural research and policy. At best, a Liaison Unit can encourage such collaboration by providing a framework supportive of on-farm research and by reducing the incentives to pursue bureaucratically driven or more academic research interests and concerns. The ISRA-SOMIVAC Liaison unit has not yet institutionalized a farmer driven incentive system for research and extension programming. This will require a long-term and deliberate effort. Unless this effort is made, the researchers, state agencies, and donors--not farmers--will continue to be the most important vested interest groups in Senegal's agricultural research and development.

The Contribution of PSR to R-E in Senegal

The ISRA Production Systems Research Department is only three years old, but with significant financial and technical assistance it has been able to launch three PSR Teams in three regions of Senegal since 1982. The

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Department's research staff is composed principally of young, recently trained Senegalese researchers; as a result, experienced expatriate scientists will be needed to advise these young researchers and to continue programs while awaiting those currently in overseas training. While the PSR Department is relatively young, we can suggest some areas where PSR contributes to research programming, and especially to improving the R-E relationship.

The PSR Department's mandate stipulates that farm level problems and constraints as defined by farmers are the PSR Teams' point of departure for research programming. In other words, farmers are more than PSR clients, they are full partners in problem identification and technology testing. The mandate also includes the reorientation of on-station programs to make them more responsive to farmer problems.

Several on-station programs at Djibelor are being strengthened because of researchers' efforts to respond to questions and problems posed by the PSR Team. Furthermore, researcher meetings and discussions at the Center suggest that the PSR Team has renewed a spirit of research relevance and an openness to new ideas and approaches among Center researchers. On-station researchers respect the importance of PSR testing of their results while the PSR Team, in turn, understands the significance of maintaining solid on-station programs to assure the provision of testable technology.

The response of extension agencies and government officials to the consequences of the PSR mandate is unclear. Given the profound and continuing nature of Africa's agrarian crisis, many governments are beginning to revise their agricultural development policies.¹⁶ In Senegal, the recently announced New Agricultural Policy calls for a dramatic reorganization of agricultural extension and proposes several measures to encourage more private initiative in Senegal's agricultural sector. Some parastatal extension agencies are being disbanded or drastically reduced in favor of giving cooperatives¹⁷ and producers' groups more responsibility for input supply and marketing.

The sense of urgency among policymakers to resolve the agrarian crisis creates demands on researchers for quick-fix solutions. At the same time, given their appreciation of the complex nature of the agrarian crisis, government policymakers are receptive to the innovative programs of ISRA's PSR Teams. Ultimately, the preeminent challenge to the PSR Department is to capture this opportunity and create a research structure with its cornerstone the assurance of farmer access to new technology and an influential voice in agricultural research and development programs.

Footnotes

¹ See Senegal, Ministere du Developpement Rural, Direction des Services Agricoles, Actes des Journees d'Etudes sur la Recherche et la Vulgarisation, Rufisque, Senegal, Secretariat d'Etat a la Recherche Scientifique et Technique, Les Liaisons Recherche-Developpement, Propositions Pour Une Organisation. P. Viguiet et R. Tourte, Ministere de la Cooperation de la Republique Francaise, Octobre 1979.

² See SAED - Bilan et Perspectives, May 1983; Study paper prepared by the World Bank Group, the French Ministry of Foreign Affairs, Cooperation and Development, the Central Fund for Economic Cooperation (CCCE) and the U.S. Agency for International Development/Senegal. This document calls for the "better use of research results and a reorientation of the research-development relationship." Also see the Agricultural Research and Planning Project Paper (USAID/Senegal, April 1981) in which the disbursement of second year funding is conditional upon the approval of a protocol agreement between ISRA and SOMIVAC (the regional extension and development agency for the Casamance) "concerning research/extension linkages in conducting production systems research."

³ These two programs are still in the planning stages.

⁴ Agricultural research is not included in planning for primary sector development in Senegal's four-year Economic Development Plans. It is treated instead as part of a fourth sector which regroups several activities, including "Studies and Research." See Senegal, Ministere du Developpement Rural, Bilan Global des Realisations du Gouvernement en Faveur du Monde Rural Depuis l'Independance, Dakar, Fevrier 1982; Senegal, Ministere du Developpement Rural, La Nouvelle Politique Agricole, Dakar, Avril 1984.

⁵ At a recent (October 1984) workshop entitled "An Orientation to Farming Systems Research," held under the auspices of the ISRA Production Systems Research Department, these charges and countercharges dominated the working group sessions which were devoted to a discussion of R-E linkages. (The workshop proceedings are in preparation).

⁶ The history of agricultural research and research policy in Senegal needs to be written. The most complete summary can be found in Michel Benoit-Cattin (Editor) Recherche et Developpement au Senegal. (In preparation.)

⁷ See Bilan Global des Realisations . . . , Annexe 12. Also see, Senegal, Ministere de l'Enseignement Superieur et de la Recherche Scientifique, Secretariat d'Etat a la Recherche Scientifique et Technique, Evolution des Surfaces Cultivees et des Productions dans l'Unite Experimentale de Thyse-Kaymor, de 1970 a 1980, par G. Pochtier, Premier Seminaire sur le Mais, 21-23 Janvier 1981, ISRA, CNRA de Bambey (Janvier 1981).

8 The research-development aspect of an ARDI was basically similar to what is now called a "recommendation domain." See R. Billaz and M. Dufumier, "Les Unites Experimentales du Senegal" in Recherche et Developpement en Agriculture (Paris: PUF, 1981).

9 See discussion in E.H. Gilbert, D.W. Norman, F.E. Winch, Farming Systems Research: A Critical Appraisal. MSU Rural Development Paper No. 6 (East Lansing: MSU, Department of Agricultural Economics, 1980).

10 In Senegal, Regional Development Agencies (SRDR-Societe Regionale de Developpement Rural) are responsible for rural development within a fixed regional/agro-ecological zone. In addition to broad rural development objectives, the Government of Senegal assigns specific crop production objectives to these agencies. Those agencies with which the PSR Department have the most contact include: SAED, The Senegal River Development Agency; SODEVA, The Agricultural Development and Extension Agency (primary for the Groundnut Basin); SOMIVAC, the Casamance Development Agency and its affiliated agency, PIDAC, The Integrated Project for Agricultural Development in the Casamance.

11 The Jardin de Richard (Richard-Toll) was established in 1824 to experiment with the irrigated production of cereals, fruits and vegetables. Unrealized plans for the first water control project along the Senegal River date from 1904.

From 1939 through 1953 most irrigated agricultural production activities in the valley centered around Richard-Toll and were managed by the Agriculture Service and the Mission de'Amenagement du Senegal. Following a series of financial management problems MAS activities were transferred to a public works company, ORTAL, which was replaced at independence by the Societe de Developpement Rizicole du Senegal (SDRS). In 1971, the Compagnie Sucriere Senegalaise (CSS) took over 7,000 ha for sugar cane production, leaving only the "Colonat du Richard-Toll" to continue to be managed as a state company (en regie).

SAED was created in 1965 in the wake of the failure of another regional agency, Organisation Autonome du Delta (OAD); in 1974 SAED also took over from the Organisation Autonome de la Vallee (OAV) and extended its zone of activities to Podor, Matam and Bakel.

12 The Diama is a major anti-salt dam under construction near St-Louis. It will raise the water level upstream and assure fresh water for between season crops. The Manantali, which is located much further upstream, will create an 11 billion m³ reservoir and in addition to its hydroelectric and navigation potential will facilitate the irrigation of 240,000 ha in Senegal.

The Sahelian climate throughout the valley is characterized by one rainy season from the end of June until October. Before the recent series of drought years, the average rainfall varied from 400 mm/year in the Delta to 700 mm/year in the Upper Valley.

Complete water control is provided by SAED or by village pumps, and three agricultural seasons can be distinguished: a rainy season (June-October) during which rice cultivation dominates; a cold, dry season from November to February which is ideal for many vegetables, and a hot, dry season from March to June.

In November 1984, Senegal hosted a major international conference under the auspices of the Senegal Valley Development Authority (OMVS) to elaborate an "apres-barrage" strategy.

13 The Lower Casamance in southern Senegal covers an area of approximately 7,300 km², which corresponds to the estuary of the Casamance River. The area is quite flat and includes an extensive network of mangrove swamps; saltwater commonly intrudes 200 km upstream. Rice production is traditional throughout the low-lying inundated areas, but with the declining rainfall in recent years, rainfed upland cereals and groundnuts have become more important crops. The population of the area is estimated at 260,000, of which the Diola is the largest ethnic group. Senegal's development plans commonly refer to the Casamance as Senegal's future bread basket, yet since 1968 the area has experienced cereal deficits. See Jolly, et al. (1985) and Posner, et al. (1985). Since 1978, USAID has financed the Lower Casamance Integrated Rural Development Project (PIDAC) under the auspices of the Agency for the Development of the Casamance (SOMIVAC). The Djibelor Agricultural Research Center is one of ISRA's oldest centers and it is currently staffed by approximately 20 researchers, of which almost one-half are affiliated with the PSR Department.

14 The first ISRA-SOMIVAC R-E Unit was established in 1977 to foster greater research-extension collaboration. It had essentially a life on paper until March 1980 when it convened to review SOMIVAC's activities and concerns, and ISRA's research programs. This meeting did not lead to any joint activities or programs.

As noted above, the signing of the protocol agreement was a condition imposed by USAID/Senegal to the second disbursement of funds under the Senegal Agricultural Research and Planning Project.

15 Following the PSR Team's "discovery" of the importance of rainfed, upland crops in the Lower Casamance, the Team was instrumental in opening up a 40 ha area near the Djibelor Center, primarily to provide on-station researchers with the means to run trials on rainfed crops.

16 See Carl K. Eicher (1982) "Facing Up to Africa's Food Crisis." Foreign Affairs 61:151-174; Carl K. Eicher (1983) "West Africa's Agrarian Crisis." A paper presented for the Fifth Bi-Annual Conference of the West African Association of Agricultural Economics, Abidjan, Ivory Coast, December 7-11, 1983. Also see Michael F. Lofchie (1975). "Political and Economic Origins of African Hunger." Journal of Modern African Studies 13:551-567.

17 In keeping with government policy, SODEVA recently released 708 of its 1,258 employees, of which 160 were government civil servants who are now awaiting assignment by the government civil service commission; 37 were hired by a major oilseeds and processing firm, SONACOS; 511 have no guaranteed employment.

Commonly Used Abbreviations

French Research Institutes (Selected)

CIRAD	(Formerly GERDAT): Centre de Cooperation Internationale en Recherche Agronomique pour le Developpement
CTFT	Centre Technique Forestier Tropical
IEMVT	Institut d'Elevage et de Medecine Veterinaire des Pays Tropicaux
IRAT	Institut de Recherches Agronomiques Tropicales et des Cultures Vivrieres
IRTC	Institut de Recherchers du Coton et des Textiles Exotiques
IRFA	Institut de Recherches sur les Fruits et Agrumes
IRHO	Institut de Recherches pour les Huiles et Oleagineux
ORSTOM	Office de la Recherche Scientifique et Technique d'Outre Mer

Senegal Regional Development Agencies (Selected)

SAED	Societe Nationale d'Amenagement et d'Exploitation des Terres du Delta du Fleuve Senegal et des Vallees du Fleuve Senegal et de la Faleme
SODEFITEX	Societe pour le Developpement des Fibres Textiles
SODEVA	Societe de Developpement et de Vulgarisation Agricole
SOMIVAC	Societe pour la Mise en Valeur de la Casamance
PIDAC	Project Integre pour le Developpement Agricole de la Casamance

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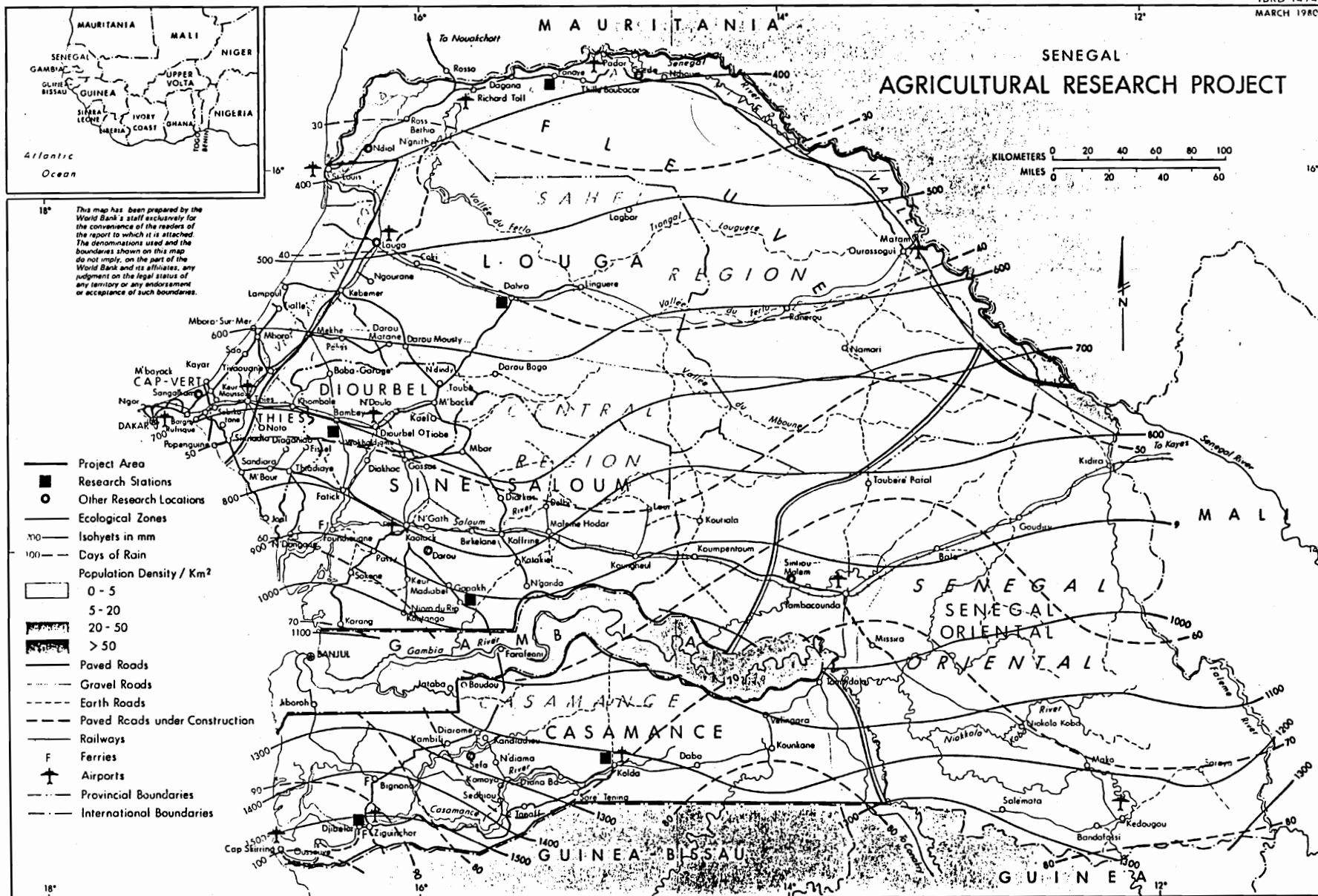
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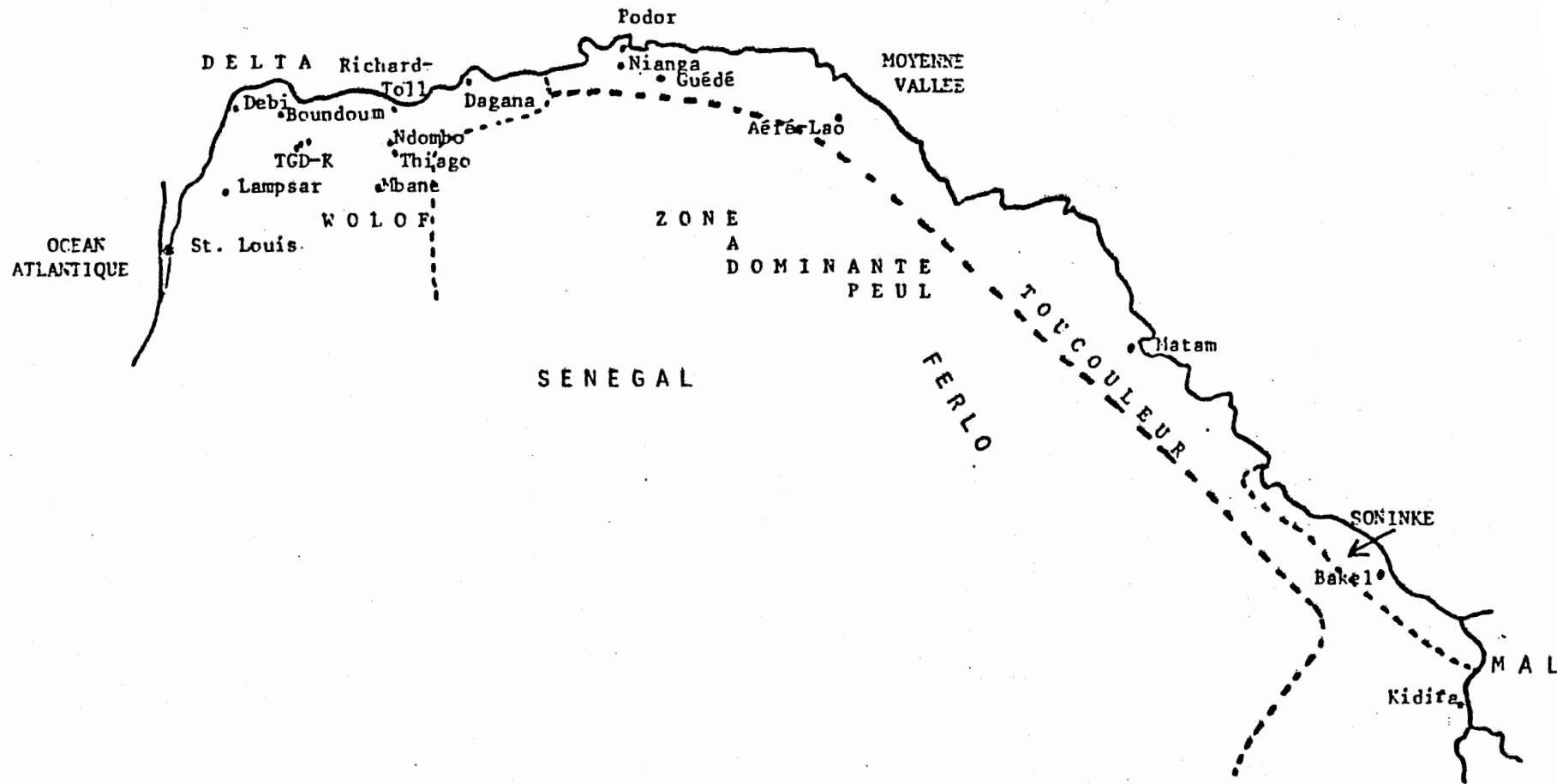
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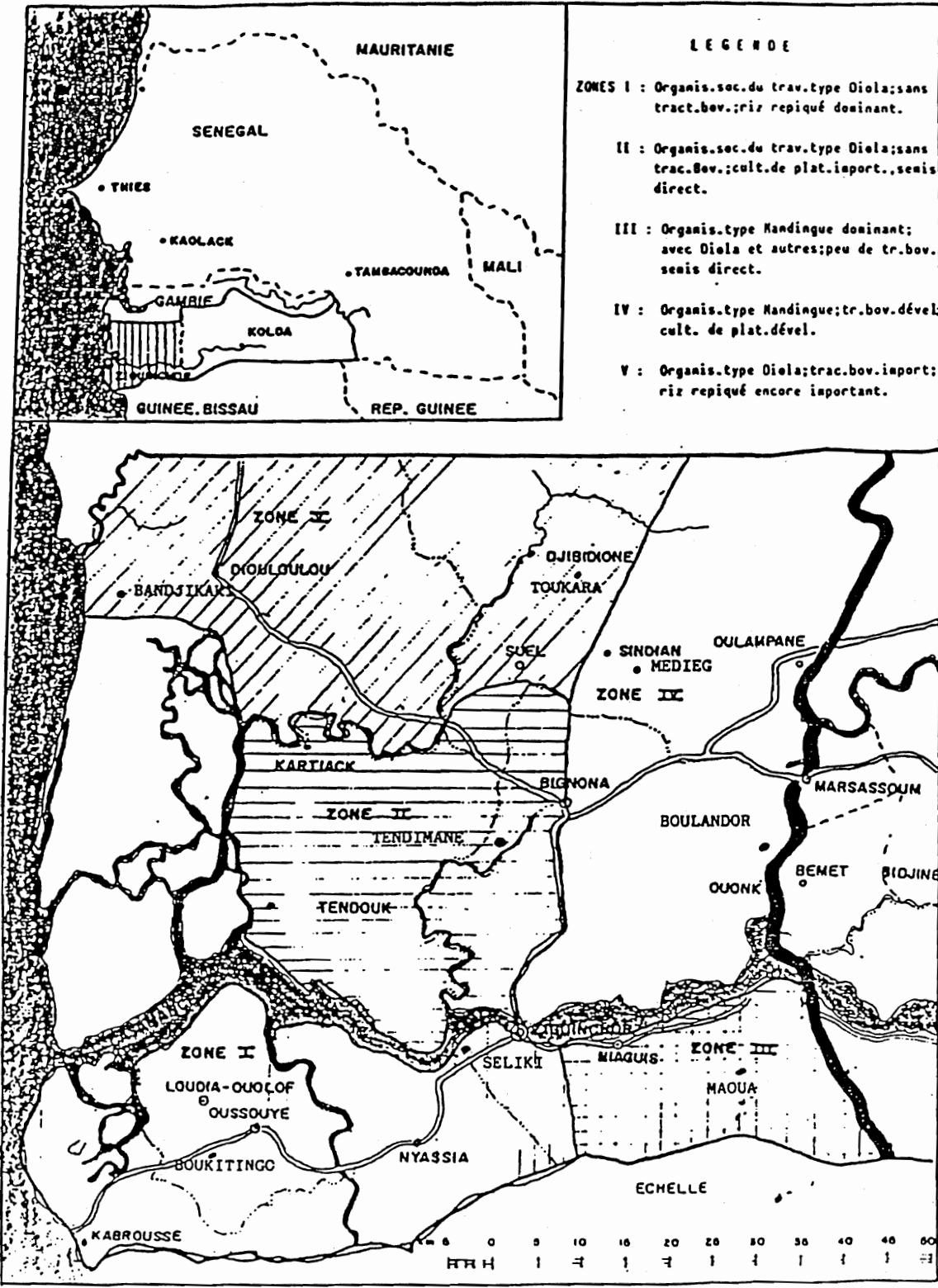
Map 1. Location of Agricultural Research Facilities in Senegal.

MAURITANIE



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Map 2. The SAED Zone of Intervention



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Map 3. The Agricultural Zones of the Lower Casamance
 (Source: CRA-Djibélor, Equipe Systèmes)

**SENEGAL
AGRICULTURAL RESEARCH PROJECT
ISRA ORGANIZATION CHART**

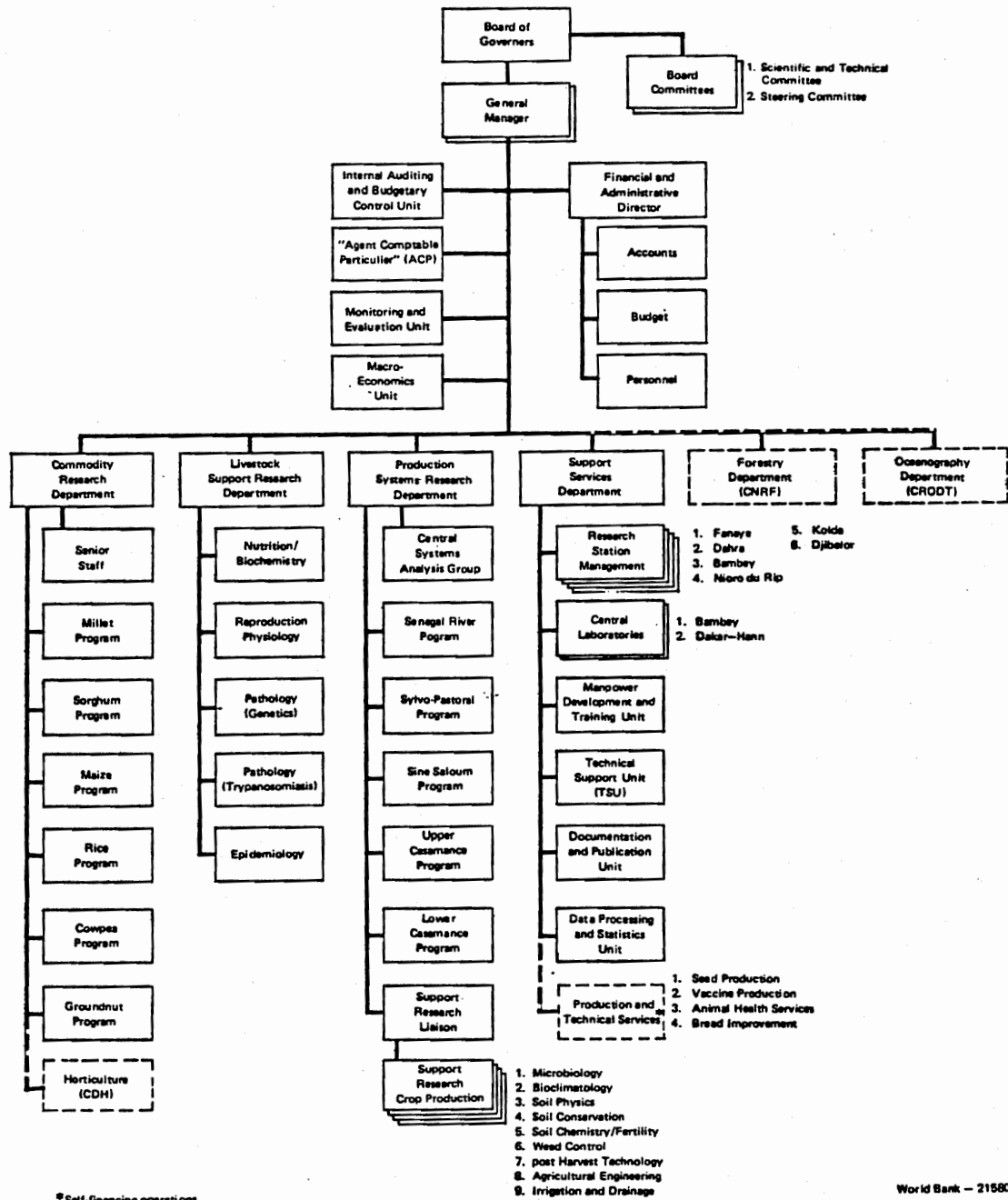


Figure 1. Senegal Agricultural Research Institute Organization Chart.