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# THE CHANGING DYNAMICS OF GLOBAL AGRICULTURE

A Seminar/Workshop on  
Research Policy Implications for  
National Agricultural Research Systems

DSE/ZEL Feldafing  
Germany  
22-28 September 1988

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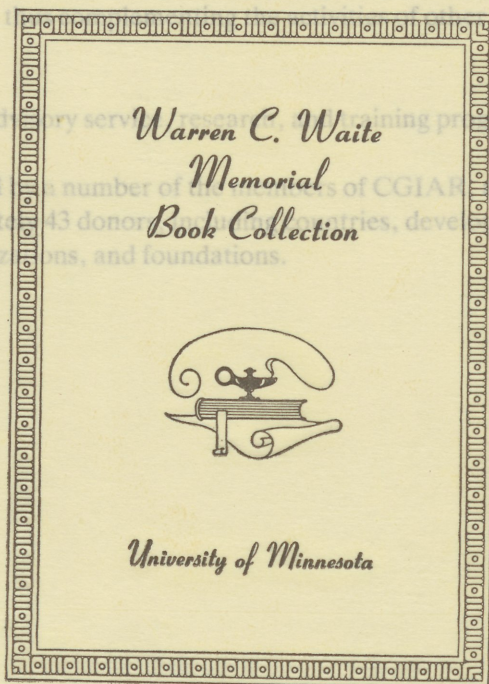


The International Service for National Agricultural Research (ISNAR) began operating at its headquarters in The Hague, Netherlands, on September 1, 1980. It was established by the Consultative Group on International Agricultural Research (CGIAR), on the basis of recommendations from an international task force, for the purpose of assisting governments of developing countries to strengthen their agricultural research. It is a non-profit autonomous agency, international in character, and non-political in management, staffing, and operations.

Of the thirteen centers in the CGIAR network, ISNAR is the only one that focuses primarily on national agricultural research issues. It provides advice to governments, upon request, on research policy, organization, and management issues. ISNAR also provides technical assistance to research agencies.

ISNAR has active advisory services in research, training programs.

ISNAR is supported by a number of the members of CGIAR in informal group of approximately 43 donor countries, development banks, international organizations, and foundations.



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# THE CHANGING DYNAMICS OF GLOBAL AGRICULTURE

**A Seminar/Workshop on Research Policy Implications for  
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# **Information and Cooperation among National Agricultural Research Systems (NARS), and between NARS and International Agricultural Research Centers: Problems and Prospects**

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This paper uses sub-Saharan Africa as an example of the relationships and cooperation between national and international agricultural organizations. After an outline of the main characteristics of national agricultural research systems (NARS) in this geographical area, the paper analyzes the Senegalese Institute for Agricultural Research (ISRA), and describes how it interacts with other NARS and the international agricultural research centers (IARCs). Avenues of cooperation are suggested, using the Senegalese experience as a reference.

African agricultural research has undergone considerable analysis during the last few years, especially under SPAAR (Special Program for African Agricultural Research). Important documents have been published by the World Bank (1987) and by ISNAR (Casas, 1987).

## **National Agricultural Research Systems in Sub-Saharan Africa**

Since 1960 many newly independent countries in sub-Saharan Africa, with support from national research centers, universities, or both, created national agricultural research systems. Most countries have emphasized training for their national research scientists. The number of national and expatriate research scientists is steadily increasing; in 21 of the 24 countries comprising West Africa, the number has risen from 1006 in 1970, to 1458 in 1975, 2687 in 1980, and 3414 in 1985 (including 700 expatriates, about 20%).

But these scientists often lack adequate technical supervision, in some cases are a bit isolated, do not have attractive professional status or an evaluation system, and are not

provided with adequate equipment. As a result, efficiency remains uncertain, and the best scientists are tempted to leave.

The West African countries have accepted enormous financial sacrifices in the name of research, but national resources are still scarce (Table 1). Foreign aid grew considerably, from US\$ 124 million in 1976, to 247 million in 1980, and 307 million in 1983 (in 1988 dollars). In 1983 the main donors were (in US\$):

France	81 million
USA	60 million
CGIAR	45 million
UNDP/FAO	35 million
IBRD	+ 26 million

An overall analysis of weaknesses in national research systems points mainly to:

- a lack of research planning;
- insufficient financing;
- an imbalance between operating, capital, and personnel costs (often more than 80% of the budget is allocated to personnel). Scientific equipment is not replaced, grows obsolete, and is often poorly maintained;
- irregular national funding;
- a lack of flexibility in the administrative management of research services;
- a lack of scientific experience and, in some cases, little training for research staff. Insufficient scientific supervision retards scientific development;
- irregular application of research results.

### **Cooperation among National Research Systems**

Research cooperation is fostered by networks formed by various national research systems for work on crops such as rice, maize, groundnuts, and cassava; on drought resistance as part of CORAF (African-France Research Conference); and on economic cooperation in a region, such as the CEPGL countries (Economic Community of the Great Lakes Countries: Burundi, Rwanda, and Zaire). These networks operate mainly in French.

**Table 1. Expenditure for Research in Twenty-Four Countries of West Africa (1984 or latest data available)**

Country	Total spent on agricultural research ('000 current US\$)	Foreign aid ('000 current US\$)	National and expatriate research scientists	Expatriate scientists (from previous column)
Benin	1,583	332	58	3
Burkina Faso	9,255	8,098	126	60
Cameroon	18,939	9,696	225	65
Cape Verde	120	100 <sup>b</sup>	16	8
Chad	752	496	29	20
Central African Republic	4,200 <sup>a</sup>	3,600 <sup>b</sup>	54	41
Congo	5,500 <sup>a</sup>	3,400 <sup>b</sup>	94	14
Côte d'Ivoire	39,600	24,235	254	180
Equatorial Guinea	NA	NA	NA	NA
Gabon	2,642	1,300 <sup>b</sup>	38	12
Gambia	NA	NA	28	7
Ghana	4,000 <sup>a</sup>	2,800 <sup>b</sup>	263	12
Guinea Bissau	NA	NA	NA	NA
Guinea	NA	NA	35	NA
Liberia	1,650	1,200 <sup>b</sup>	45	7
Mali	7,555	4,911	268	38
Mauritania	NA	NA	11	10
Niger	3,144	1,528	68	35
Nigeria	181,000	1,000 <sup>b</sup>	1,196	24
Sao Tome	NA	NA	NA	NA
Senegal	17,850	12,139	283	119
Sierra Leone	1,393	1,000 <sup>b</sup>	66	8
Togo	2,777	1,075	58	14
Zaire	5,874	3,000 <sup>b</sup>	199	24
Total	305,985	79,910	3,414	701

NOTE: Except for entries marked *a* and *b*, data in the first two columns are from an unpublished IFPRI report by Peter Oram (1986).

Data for the last two columns are from World Bank (1987).

a. IBRD/WAARR mission report: collected in recipient countries in 1985.

b. IBRD/WAARR mission report: estimated on the basis of partial information collected in recipient countries in 1985.

The SAFGRAD network (Semi-Arid Food Grain Research and Development) organizes cooperation between OAU countries (Organization of African Unity) in both French and English. The newest network is RESPAO (a network to study production systems in West Africa). IDRC (International Development Research Centre, Canada) finances many research networks. It is important to realize that the cooperative research networks rely on both bilateral and multilateral foreign funding to survive. Foreign aid is also vital to support information exchange between NARS in sub-Saharan Africa.

### **Cooperation between National Systems and International Centers for Agricultural Research**

Most cooperation involves exchange of plant materials, training for scientific and technical research staff, dissemination of scientific and technical information produced by international research centers, seminars, and conferences. Joint trials are conducted on high-yielding, disease- and insect-resistant cultivars by national systems working with IARCs. Last, international centers are able to better align their research programs with the priorities of national systems by appointing national experts to their boards of trustees.

### **History of the Senegalese Institute for Agricultural Research (ISRA)**

ISRA was created in 1975 to administer all the agricultural research stations in Senegal. Its budget and scientific staff grew steadily until 1985, and then dropped sharply, especially in 1987 (Tables 2 and 3). The personnel budget was substantially reduced, accompanied by important staff cuts, both national (nearly 4% of the scientists, 20% of the research technicians, over 54% of the administrative staff, over 25% of the technical support staff, and over 37% of the agricultural and unskilled laborers), and expatriates (nearly 44%). Such sharp financial and personnel reductions had serious effects on the research program. Insufficient scientific supervision of the ISRA scientists is demonstrated by their few publications in scientific journals, considered as a indication of scientific productivity. Problems of staff management and inadequate career opportunities encourage the more dynamic scientists to abandon Senegalese agricultural research.

### **Cooperation between ISRA and IARCs**

Relations between the Senegalese agricultural research system and the CGIAR (Consultative Group on International Agricultural Research) date back to the early 1960s, when it was established. At that time, and until 1974, contacts were carried out via France, which controlled Senegal's agricultural research.



**Table 2. The ISRA Budget (Millions of French Francs)**

	Operating costs	National staff	Expatriate staff	Investments	Total
1975-76	10.48		15.02	0.36	25.86
1984 <sup>a</sup>	32.30	31.86	32.60	13.58	110.34
1985 <sup>b</sup>	41.11	54.96	33.86	28.37	158.30
1987 <sup>c</sup>	39.37	28.62	26.88 <sup>d</sup>	23.74	118.61
1988	29.31	28.40	28.80 <sup>d</sup>	12.08	98.58

a. Starting in 1984, the ISRA budget followed the calendar year.

b. National staff were reclassified.

c. National staff were reduced.

d. Estimated on the basis of 480,000 FF per expatriate.

**Table 3. ISRA Research Staff**

Scientists	1975	1976	1984	1985	1987	1988
Nationals	25	30	104	131	116	116
Percent nationals	27.8	28.6	53.0	56.7	67.4	65.9
Expatriates	65	75	92	100	56	60
Total	90	105	196	231	172	176

ISRA, from the time of its creation in 1975, actively cooperated with the IARCs. Official relations were established with ICRISAT (millet); IRRI, WARDA, and IITA (rice); and ILCA (livestock). Contacts with WARDA were facilitated by the Senegalese position as a founding member and by its role in the Secretariat.

Two types of relations were established with IRRI:

- personal relationships between scientists which led to exchanges of scientists;
- official relations, with training for Senegalese staff assigned to WARDA.

These types of relationships have expanded. ISRA, in one way or another, now works with all 13 CGIAR centers except ICARDA and CIAT, and with the system as a whole:

- From 1978 to 1984 Senegal participated in the annual CGIAR meetings as regional representative for West Africa.
- The late Louis Sauger was a member of TAC in the early 1970s.
- Djibril Sène was a member of the ICRISAT Board of Trustees from 1974 to 1980.
- Several Senegalese have worked on CGIAR impact and prospect studies.
- Several Senegalese have participated and are still participating in CGIAR ad hoc work groups such as the Task Force on Sub-Saharan Africa of SPAAR.

### ***WARDA – West Africa Rice Development Association***

Initial contacts were made in 1971, when Senegal was a founding member. Formal contacts led to a protocol for a headquarters agreement. The ISRA/St. Louis section accommodated the WARDA irrigated rice research station, including offices, laboratory, and test fields. Between 1980 and 1988, four counterpart scientists in agronomy, genetics, entomology, and weed control were seconded to WARDA.

ISRA has participated in WARDA decision-making bodies. M. Toure is on the newly structured Administrative Council until 1991, and the Scientific and Technical Committee included D. Sne until 1974, and M. Toure from 1981 to 1987.

ISRA participated in varietal and agricultural trial networks with WARDA and other NARS from 1973-1980, and from 1980-1983 with WARDA, IRRI, IITA, and other NARS. Plant material has been exchanged, including Glabberima rice varieties, and rice varieties upgraded by ISRA in the varietal trial cooperation network have been introduced.

Between 1973 and 1988, nearly 100 Senegalese technicians were trained at WARDA; two-thirds attended courses lasting an average of six months. ISRA research scientists often help conduct WARDA training sessions.

In the future it would be advisable to redefine scientific cooperation with a focus on irrigated and lowland rice. A multidisciplinary, multi-institution team should be organized to include IRRI, SAED, ISRA, etc.

### ***ILCA – International Livestock Centre for Africa***

Contacts were established in 1975. ISRA scientists are involved in cooperative research networks on small ruminants, trypanotolerance, agricultural and agroindustrial by-products for animal feed, animal traction, and agroforestry. ISRA scientists help define ILCA programs, and ILCA scientists provide support for ISRA programs with methodology and evaluation work (e.g., the food program evaluation), and under the agroforestry network, plant material is exchanged.

ILCA offers grants for short, high-level training opportunities, such as laboratory training or scientific study tours, which have made it possible for Senegalese scientists to process their animal husbandry data at Nairobi and Addis Ababa. ISRA scientists serve as supervisors for training sessions organized by ILCA. The two institutes together organized training sessions in Dakar.

ILCA does not finance any ISRA program directly, but the trypanotolerant cattle research program in Senegal and Gambia receives an EEC subsidy administered by ILCA. Dr. P.I. Thiongane is a member of ILCA's Board of Trustees and the Program Committee (1985-1991). Dr. A.K. Diallo was a member of the Board of Trustees from 1978 to 1984.

### ***ILRAD – International Laboratory for Research on Animal diseases***

Firm intentions to work together notwithstanding, scientific relations are still limited to training for ISRA scientific and technical staff. ILRAD does not provide any subsidies or material assistance to ISRA. Since Mr. Toure left the Board of Trustees, ISRA is no longer represented at ILRAD. There are several possibilities for cooperation in parasitology, especially relating to trypanosomiasis, heartwater, and training on immunology methods.

### ***CIMMYT – International Maize and Wheat Improvement Center***

ISRA's relationship with CIMMYT began in 1975 when the two organizations began exchanging wheat germplasm, and continues today as part of the OMVS/FAO/ISRA program. They began to exchange maize in 1978, and ISRA has been able to adapt and create several varieties. CIMMYT has cooperated on analytical and methodological work related to genetics and biotechnology, as well as offering other scientific support and information missions. CIMMYT scientists helped implement and evaluate an ISRA rainfed maize program, and ISRA scientists have participated in various regional meetings organized by CIMMYT. A research assistant helped with training on production.

### ***IITA – International Institute of Tropical Agriculture***

This institute is one of the pillars of cooperation with the IARCs. Although not yet formalized, cooperation centers on improving root and tuber plants, especially cassava and sweet potatoes, cowpeas, and to a lesser extent, maize. IITA has offered short training sessions for 28 scientific and technical staff, as well as documentation and information sharing.

Special attention should be given to testing and introduction of Senegalese plant material, especially cowpeas, in the IITA gene pool program. In the future, ISRA and IITA intend to sign an interinstitution agreement, and to carry out a joint program funded by Belgium on mealy bug damage to cassava. An IITA scientist will be seconded to ISRA.

### ***ICRISAT – International Crops Research Institute for the Semi-Arid Tropics***

Cooperation with ICRISAT is relatively old. In the beginning it focused on varietal improvement and the phytopathology of millet, but has expanded to include sorghum, and soon will also cover groundnuts, especially aflatoxin. As part of scientific cooperation on millet, Dr. Gupta was sent to Bamby for five years. His work on varietal improvement should serve as an example. Since 1980, 40 ISRA technicians working in cereal and legume research programs have participated in six-month training courses at the ICRISAT Center near Hyderabad. The establishment of the ICRISAT Sahelian Center in Niamey will provide added thrust to this cooperation.

### ***IRRI – International Rice Research Institute***

Up until 1981, ISRA's relationship with IRRI was strong, especially in work on the chemistry of submerged soils and varietal improvement. These relations were based on personal contacts and have now waned.

ISRA participates in the IRTP network (operated by WARDA, IITA, and IRRI), and in the dissemination of documents. Chances for direct cooperation are good, but may be overshadowed by the reactivation of the WARDA programs. It may be possible for ISRA, WARDA, and IRRI to carry out a joint program on irrigated rice.

### ***CIP – International Potato Center***

Scientific and technical cooperation between CIP and ISRA centers on two activities: varietal improvement to stagger potato production, and organizing training on potato

production and research for technicians from the subregion, an activity started in Senegal nearly three years ago.

CIP and ISRA have prepared a protocol agreement to enhance their future cooperation. Plans are underway for a joint program, funded by Belgium, on the improvement and propagation of potatoes throughout the dry intertropical zone. A CIP scientist will be posted to ISRA.

### ***IBPGR – International Board for Plant Genetic Resources***

Cooperation between ISRA and IBPGR will increase the conservation of plant genetic resources by rehabilitating and equipping the cold storage chamber at Bambey. Ten million CFA francs have been allocated to ISRA for this purpose. Technicians will learn conservation methods, and the organizations will share information and documentation.

There are considerable opportunities to strengthen and expand cooperation. Scientific support would be most useful at ISRA in the collection and evaluation of genetic resources, including fodder and woody species; and conservation and protection using modern methods, especially *in vitro* culture. ISRA, working with ORSTOM and the University of Dakar, is creating a biotechnology center which should emphasize vegetable crops and woody species. As members of the Board of Trustees, D. Sne (1980-1986) and M. Toure (1988-1991) stimulate cooperation.

### ***IFPRI – International Food Policy Research Institute***

ISRA and IFPRI have been in contact since 1983. Both institutions are interested in research on food policy in West Africa. A joint program, financed by USAID (1988-1991) provides for the assignment of an IFPRI scientist to ISRA (already posted), and training for two ISRA scientists.

### ***ISNAR – International Service for National Agricultural Research***

ISRA and ISNAR first interacted in 1983 when ISRA requested ISNAR to carry out a study on the development of human resources in relation to the Research Project. The study began in 1987, when ISNAR resources were made available. Financed by USAID, it will be completed by 1990, and will form part of the ISRA five-year plan, and will cover the development and management of all personnel categories.

During this same period, ISNAR is to research the relationship between ISRA and its environment (one junior scientist is to be based at ISRA for 12 months), and financial structures and mechanisms used by ISRA funding agencies. Prospects for cooperation

between ISRA and ISNAR are very good; ISRA is considered as a model for the development of national research systems in West Africa.

Two avenues of cooperation need to be explored: in training, ISRA could serve as a backup and use its expertise to participate in ISNAR training programs; and in research, cooperative work on the organization of research systems and scientific and financial management procedures, the development of human resources, and planning and budget preparation procedures.

ISRA has been involved in ISNAR meetings and workshops since 1985, and J. Diouf was a member of the first ISNAR Board of Trustees.

### **Conclusions**

Relations between ISRA and the IARCs are varied. The level of the relationship seems to depend on the IARC mandate, the geographical location, and the quality and intensity of personal relations. In general, ISRA has good relations with WARDA and ISNAR; an average relationship with IITA, ICRISAT, CIP, IFPRI, ILCA, and IBPGR; and a fair relationship with IRRI, CIMMYT, and ILRAD. On the whole, ISRA has made good use of opportunities for training and exchanging plant materials with the IARCs.

In the future, more positive relations can be expected with ISNAR, IFPRI, CIP, IBPGR, ICRISAT, and IITA; and relations should be reactivated with WARDA, CIMMYT, ILRAD, and IRRI (Table 4). It would be appropriate for the various centers to increase their scientific and technical support for ISRA programs, and their financial support (also for research equipment) for joint programs executed by ISRA.

Further, ISRA should invite certain IARCs to join its scientific and technical committee and thus participate in defining ISRA programs. Protocol agreements between ISRA and the IARCs should be encouraged. With this in mind, the CNRA at Bambeby should become an international center for groundnuts (including food technology) and agricultural machinery (for the Sahelian zone).

### **Recommendations for Cooperation between NARS and IARCs**

The main purposes of NARS-IARC cooperation should be:

- to improve the quality of personnel assigned to NARS by helping scientists avoid isolated working conditions and providing them with proper scientific and technical

**Table 4. Summary of Current Relations between ISRA and the IARCs**

Description	IARC concerned
Training ISRA staff	CIMMYT, IBPGR, ICRISAT, IFPRI, IITA, ILCA, ILRAD, WARDA
ISRA participation in training organized by, or together with, an IARC	CIP, ILCA, WARDA
Posting IARC scientists at ISRA	ICRISAT, IFPRI, CIP and IITA (both planned)
Posting ISRA scientists at an IARC	WARDA
IARC financing for an ISRA program Joint IARC-ISRA program	IFPRI (USAID funding)
Administering foreign funding for ISRA	ILCA
Scientific or technical equipment for ISRA	IBPGR
Scientific or technical backup at ISRA (analyses, methodology, leadership, evaluations)	CIMMYT, ILCA
ISRA participation in defining IARC programs	ILCA
IARC participation in defining ISRA programs	-
ISRA participation in meetings organized by IARCs	CIMMYT, ISNAR
IARC participation in meetings organized by ISRA	CIP
Studies on ISRA by an IARC	ISNAR
IARC section based at ISRA	WARDA
Joint ISRA-IARC research trials	ICRISAT, IITA, ILCA, WARDA
ISRA-IARC exchange of plant material	CIMMYT, CIP, ICRISAT, IITA, ILCA, WARDA
ISRA participation in IARC executive bodies	IBPGR, ILCA, WARDA; formerly ILRAD and ICRISAT
IARC participation in ISRA executive bodies	-
ISRA-IARC information exchange	CIMMYT, CIP, IBPGR, IITA
ISRA-IARC protocol	WARDA, CIP (under preparation)
ISRA would like more active relations with ...	CIMMYT, ICRISAT, IITA, ILRAD, IRRI, ISNAR, WARDA

supervision, which, together with ongoing training, should enable NARS to be staffed by high-level scientists qualified to meet the agricultural challenges facing their countries;

- to compensate for financial and material shortages by rationalizing and harmonizing research programs, which would require an unequivocal evaluation of the NARS and a national decision to combine forces (unified programs should be supported by centers carefully selected in the various ecological zones and properly equipped through support from international aid);
- to ensure adequate dissemination of scientific and technical information on current research programs and results.

Rather than reviewing all the actions that should be launched, let us stress the main lessons from experience accumulated in the IARCs during the last 25 years. First, the NARS evaluation should be continued, maximizing on ISNAR's experience. This diagnosis is crucial to evaluate the real problems that NARS must face, and to decide on the best remedies.

An effective way to improve the quality and efficiency of NARS personnel would be to organize frequent small meetings for scientists on specific themes.

In an effort to provide better scientific supervision, senior NARS scientists, either nationals or expatriates, should be motivated to stay on the job. When selecting expatriates, more attention should be given to their past research experience, without, however, excluding young scientists. The tendency to hire young expatriates who acquire experience and then immediately leave the NARS should be changed.

Further, scientists could work more efficiently if they were supported by an adequate number of qualified managers and technicians. Priority should be given to training good maintenance technicians for scientific and technical equipment. Resources could be used more expediently if joint programs were designed for NARS and IARCs, with special attention to the development of central bases within NARS. If foreign aid provided adequate material and financial resources, these bases could turn into centers of excellence in their particular fields. These bases, of course, should have access to well-stocked data bases. As part of the Sahelian agricultural development, the Senegalese National Agronomy Research Center (CNRA) in Bambey could be developed into a center of excellence for groundnuts and agricultural machinery. Further, special attention should be given to setting up gene banks and promoting biotechnology laboratories to be shared by several NARS.



Last, the agricultural scientist must change his attitude, and work harder on disseminating scientific and technical information, for example by teaching and using mass media. Modern communications should serve to make producers, planners, and the public at large more aware of the true value of research. It would be well worthwhile conducting bona fide research on the techniques of disseminating scientific and technical information on agriculture.

By further developing cooperation, NARS could perform better. We are convinced that the IARCs can only reach maximum efficiency if they receive support from NARS serving as strong relays that harmoniously combine research, education, and extension work.

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