

The Senegalese Scientific Community: Africanization, Dependence and Crisis

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Although of a relatively small size,¹ Senegal with its population of slightly over 7 million inhabitants displays a number of characteristics common to many developing countries. With more than 65 per cent of its work force in the primary sector, it remains a predominantly agricultural nation, despite agriculture's feeble and constantly declining contribution to GNP (approximately 20 per cent).² Senegal's trade balance is overwhelmingly negative and foreign debt has become a major constraint for the economy. Since 1980, its economic and financial crisis has caused a decrease in real public expenditure, and an associated decrease in the outlays for education and scientific research.

Senegal's privileged status and Dakar's role as capital of French West Africa have been key determinants in the genesis and development of its research and post-secondary institutions. In order to better understand the origins of the Senegalese scientific community, I will, in the first part of this paper, delineate its historical precedents. The task will then be completed by studying the creation and development of the University of Dakar, followed by the institutionalization of Senegalese research activities. The study will limit itself to public institutions—domestic and foreign—that comprise the large majority of active researchers in Senegal.³ Finally, I will seek to define the specificities of this community and analyze the problems of its legitimation and operation, before concluding with a few recommendations for the future.

Historical Precedents

From Colonial Trading Posts to the Creation of the *Afrique Occidentale Française* (AOF)

After the discovery of Cape Verde by the Venetian Ca'da Mosto in the mid-fifteenth century, the colonial powers (Holland, France and England)

established trading posts all along the coast. However, Senegal was not established until the end of the eighteenth century; Sub-Saharan Africa was until then known merely by its contours. The slave trade reached its peak in the seventeenth century, and by the dawn of the eighteenth century, rubber (made from secretions of the *acacia senegalensis*) cultivated along Senegalese river banks became an important export product that revived European rivalries. The first catholic mission in Senegal was established in 1703, but it was not until the mid-nineteenth century that evangelization was intensified with the creation of the 'Pères du Saint Esprit' congregation (Cornevin and Cornevin, 1964). After the abolition of slavery in 1848 and the decline of the rubber trade, the activities of the Senegalese trading posts diminished. It is also during this time that European industrialization increased the demand for raw materials, altering the structure of colonial politics. Under the direction of General Faidherbe, a strategy of land occupation and cultivation based from the old trading posts began.

In 1895, the conquest was completed and the acquired West African lands were united under what became known as the AOF. Dakar was named its capital in 1902. The 'privileged' situation of Dakar during the French colonial experience is the reason for which Sub-Saharan Africa's first secondary school, the Lycee Faidherbe de Saint Louis, was established in Senegal (1919). Dakar also became the site of the first French-speaking university in Sub-Saharan Africa. The birth of the University of Dakar in 1957 was nonetheless preceded by that of Nigeria's University College of Ibadan in 1950. Before independence, however, Senegalese educational institutions were frequented mostly by French students.

The First Half of the Twentieth Century: Creation of the First Scientific Organizations and Institutions of Higher Learning

The problems encountered in land use and cultivation pushed the AOF government to gear technical services towards more immediate uses. Hence, the creation of agricultural research stations (the first was created in Bambey in 1921), a meteorological service (reorganized in 1922), and a geological service (created in 1930). Concerning scientific research at the beginning of the twentieth century, the AOF was favoured by the presence of the Committee of Historical and Scientific Studies of the AOF, created on 10 December 1915 by Governor General Clozel. The goal of the Committee was 'to coordinate the research and publication effort about French West Africa, to insure its continuity and to make the results more readily available' (Clozel, 1916: 7-8). Its publications (beginning in 1918 with the 'Annales et Mémoires' and later the 'Bulletin d'Etudes Historiques et Scientifiques de l'AOF') appeared regularly and enhanced the diffusion of many scientific studies about the Federation. The principal

research and higher education institutes around which the Senegalese research effort revolves today also found their roots in the early twentieth century.

The National Centre for Agricultural Research (CNRA) in Bambey, 120 kilometres east of Dakar, is Senegal's oldest agricultural research centre. Its present location has been the successive site of the Modern Agricultural Farm (from 1913 to 1921), the Groundnut Experimental Station (from 1921 to 1938), the Experimental Station for Soudanese Sector Agricultural Research (from 1938 to 1950) and the Federal Agricultural Research Centre (from 1950 to 1960). Up until the Second World War, research was almost exclusively centred around groundnut farming and, particularly, plant breeding. Research on food crops (millet, sorghum, cowpea, then cassava and soybeans) was only intensified after 1950. The creation of the Soudanese Sector of Agricultural Research and the establishment of the Centre in Bambey as a federal centre for agricultural research mark the regional focus of Bambey that began in 1950. The transformation of the federal centre into a national centre after independence sparked the decline of this regional focus.

The Institut Pasteur of Dakar, successor to the Bacteriological Laboratory of Saint Louis (1896), was created in 1924 by an agreement between the general government of the AOF and the Institut Pasteur in Paris. Twelve years later, in 1936, the French Institute for Sub-Saharan Africa (IFAN) was created. The idea for the creation of an institute of African studies was conceived in 1931, a time of revived interest in the colonies in France and the year of the Vincennes Colonial Exhibit. The conceptions of the colonial era were clearly exemplified in the debate preceding the creation of the IFAN:

It is for us a sort of intellectual duty and a requirement of colonial honour to study the countries that we must administer and the people that we must educate and protect. This is, in part, one of the strongest justifications for colonisation, and it cannot be defined in material and economic terms The establishment of African science is indeed an exigency of our colonial policy (IFAN, 1961: 37).

The arrival of the War retarded IFAN's development projects, as it required the mobilization of almost all of its personnel. The early 1950s were then marked by an increase in personnel at Dakar's IFAN (almost exclusively French at that time) and by the loss of its monopoly with the creation of the Institute of Higher Education. The creation of the Institute on 6 April 1950 laid the foundation for the creation of the University of Dakar.

During the pre-War scientific congresses held in France in 1931 and 1937, expression was given to the need for giving the colonies a research organization whose objective would be to put 'science at the service of the

colonies' (Gleizes, 1985: 7). In response, the Office of Colonial Scientific Research (the ORSC, that would later successively become the ORSOM and the ORSTOM) was created on 11 October 1943. Its mission was first to 'devote the largest part of its resources to research on indigenous agricultural production . . . taking agricultural production in the larger sense of the term, encompassing forests and livestock, and the utilisation of agricultural products' (ibid.: 11). Because of the central role of Senegal in the AOF, it was among the first countries, along with Cote d'Ivoire, to benefit from the first overseas centres. The project for a geophysical observatory in M'Bour was conceived in 1946 and finalised in 1949, which was also the year of the creation of ORSTOM's Soil Research Centre in Dakar-Hann. At the outset, ORSTOM was designed to cover the study of soils in the Sahelian, Soudanian and Soudano-Guinean zones. It would later reduce its focus in 1958 and in 1964 with the creation of centres in Niamey and Ouagadougou. In 1960, it became the ORSTOM Centre of Dakar and increased the number of disciplines it covered.

The Dakar School of Medicine, the first unveiling of university education in West Africa, was created in 1918. In 1949, it began offering instruction in physics, chemistry and biology. The Institute of Higher Education was then inaugurated in 1950. These were the principal steps that led to the official foundation of the University of Dakar on 24 February 1957.

The Rise of the University of Dakar

Located 5 kilometres northwest of the capital, the University of Dakar, which later became the Université Cheikh Anta Diop (UCAD), hosts four major schools (administrative and economic sciences, medicine and pharmacology, science and technology, and arts and human sciences) and a central university library that were founded in 1965. Aside from IFAN, most higher education and/or research institutes were created in the 1960s. These are either institutes with administrative and financial autonomy, like IFAN, or university institutes of departments such as the Centre for Applied Economic Research (CREA) created in 1971 under the auspices of the School of Law and Economics. There is also the Inter-State School of Sciences and Veterinary Medicine (EISMV), a regional school opened in 1968.⁴

In its first few years of existence, instruction at the University of Dakar remained very similar to that of the French universities. In fact, the student population remained mostly French (varying from 61 per cent to 74 per cent) until 1967. But the curriculum was profoundly reformed in 1969, a watershed date in the history of the University.⁵ The reform's main goal was to Africanize programmes in order to better adapt course content to national needs and development. Enrollments skyrocketed from 1,012 for

the academic year 1959–1960 to about 12,000 in the early 1980s. By 1990, the number of matriculated students reached 17,810. The growth of the student population was especially great in the 1970s, when it rose from 2,500 to 10,000 in the space of ten years (Figure 6.1). The number of graduates, however, did not increase at the same pace.⁶ In fact, it remained virtually constant between 1980 and 1990 at around 1,400 per year. The process of Senegalization of students increased in the late 1960s. Indeed, the percentage of French students plummeted from 74 per cent to 27 per cent between 1967 and 1968.

French students today represent less than 1 per cent of the population at the University of Dakar. The percentage of Senegalese students increased from 30 per cent in 1968 to 50 per cent in 1969, to 75 per cent in 1978 and to 87 per cent in the 1990–1991 academic year. The distribution of students along gender lines reveals a disproportionately small female community, particularly within the School of Sciences (12 per cent) and the School of Law and Economics (19 per cent), and to a lesser extent at the School of Liberal Arts (23 per cent). Only the School of Medicine and Pharmacology had achieved parity in 1982–1983 (World Bank, 1991). In the 1990–1991 academic year, females accounted for 23.2 per cent of the student body. Foreign students represent 13 per cent of the total, as the University attracts many students from other French-speaking African countries, particularly Benin, Guinea, Burkina Faso, Mali, Mauritania and Togo.

A quick comparison of student body growth with overall population growth shows that the former has been more rapid than the latter, except during 1980–1985. The percentage of Senegalese students to total population has increased faster than that of the overall number of students to total population, but these figures remain low even in 1990 (approximately ten times less than OECD countries). The number of teachers had also increased markedly during the 1970s, though not as quickly as the student population. The subject of the Africanization of personnel was a recurrent one throughout the 1980s: ‘the Africanization of teaching personnel in the best possible academic conditions will be practically completed . . . in July 1989 with the replacement of faculty within the first two cycles at the different Schools’ (Niang, 1987). This ambitious objective has almost been attained. In fact, while close to a third (31.9 per cent) of teachers were foreigners in 1984, today expatriates account for less than 10 per cent of the total at the University of Dakar. The extent of Africanization varies according to discipline and level of educational achievement. In 1983–1984, the ratio of Africanization at the University of Dakar reached 80 per cent for teaching assistants, but was significantly lower within the higher ranks: 58 per cent for associate professors and 62 per cent for professors. The School of Sciences is the most reliant on the recruitment of foreign personnel (see Figure 6.2), particularly from France. Women only comprise 10 per cent of the teaching personnel. Their greatest representation is within the School

FIGURE 6.1
Enrollment of Students at the University of Dakar, 1960-1990

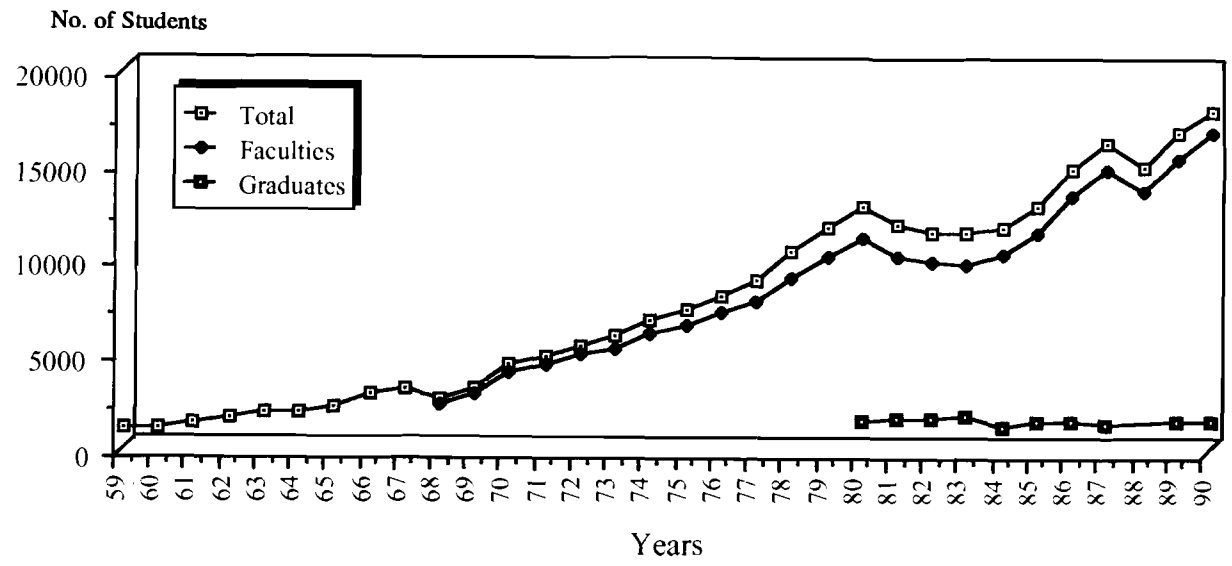
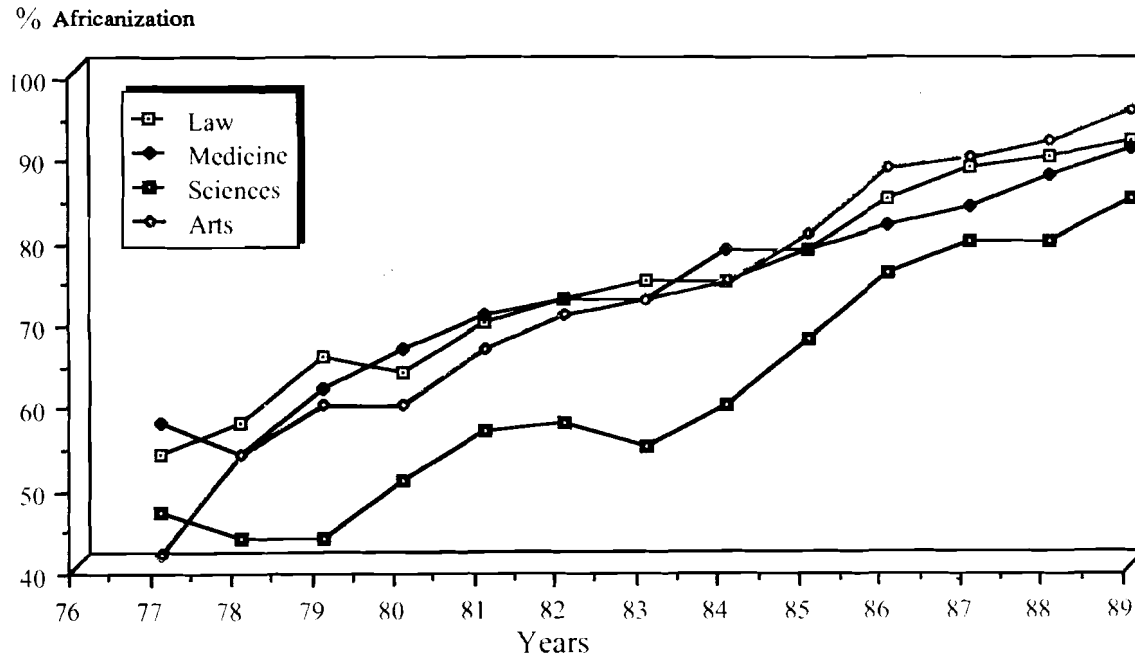


FIGURE 6.2
Africanization of Teaching Staff at the University of Dakar, 1977-1989



of Medicine and Pharmacology (16 per cent), and their smallest representation within the School of Law and Economics (4 per cent).

The creation of the University in 1957 and of the teaching and research institutions affiliated with the University during the 1960s was accompanied by an institutionalization of research activities in the public sector and by the progressive creation of national bodies responsible for science policy.

The Institutionalization of Research Activities

Since independence, Senegal has gradually put in place a system for the elaboration of government S&T research policy. Since 1960, an office for the coordination of S&T research was established at the level of the council presidency. In 1966, an executive level Office of Scientific and Technological Affairs was created. It was then supplanted in 1970 by the Direction of Scientific and Technological Affairs, which was directed by the secretariat of state to the prime minister in charge of the plan. In 1973, the *Délégation Générale à la Recherche Scientifique et Technique* (DGRST) was created and linked to the office of the prime minister. In 1979, the DGRST was transformed into the Secretariat of State for Scientific and Technological Research (SERST), which became the Ministry of Scientific and Technological Research (MRST) in 1983.

After the ministerial reconfiguration in 1986, MRST was dissolved and part of its duties conferred to the new Direction of Scientific and Technological Affairs (DAST) created within the Ministry of the Plan and of Cooperation. DAST was later moved to the Ministry of National Education and then to the Ministry of State Modernization and Technology. With the nomination of a delegate in-charge of S&T research in 1992, the situation was reverted to what it was in 1970. Speaking of the circumstances created in the immediate aftermath of the ministerial reshuffling of 1986, the former minister of research stated:

The changes put in place represent the complete dismantling of the conceptual model of national scientific policy, and its replacement with a new model. This new model detaches the administration of research structures from the directing body of science policy, and relinks them at the level of the departments that depend on them (cited in Ndiaye, 1988: 303).

This is how the Senegalese Institute of Agricultural Research (ISRA) became incorporated into the Ministry of Rural Development. As feared by the former minister of research, the DAST was unable to effectively assume its coordinating duties:⁷

Our experience shows us that effective coordination can be achieved only if DAST were given the sufficient authority and financial control of research activities, regardless of the structure within which those activities take place. The budgetary envelope for research should be globalised, and DAST placed in charge of its evaluation and distribution, and of the technical and financial responsibilities associated with individual research projects (cited in Ndiaye, 1988: 304).⁸

Nonetheless, DAST is in-charge of assembling the sectoral consultative commissions.

Agricultural research activities were directed by French institutes up until 1974, the year of the signing of a new agreement for scientific and technological cooperation with France. From 1975, in accordance with the agreement, all agricultural research (agriculture, livestock, forests, fishing) formerly directed by French institutes was to be transferred to ISRA, except for the autonomous ORSTOM. The creation of ISRA was accompanied by a redeployment of research personnel in regional stations and by the accelerated Senegalization of agricultural research. In the agro-industrial sector, the creation of ISRA was preceded by that of the Institute of Food Technology (ITA), founded in February 1963. ITA, which has benefited from FAO assistance, displays a particularly high level of Africanization of research personnel (93 per cent), although their numbers are small (29 researchers in 1985).

Focusing now on the contents of the VIIth Plan of Economic and Social Development (1985–1989), it is striking that research does not figure in any part of the Plan's twenty-one Priority Action Programmes (PAP). The 'Etudes et Recherches du Plan' claims that the national programme for economic and social development will be supported by R&D, but it is clear that the principal thrust of the Plan remains economic and financial adjustment. Research is only included as a response to the immediate needs of the productive sector. It is significant that the term 'research' is only mentioned three times in the twenty-one PAP documents, in relation to plant breeding and soil conservation, and to lignite and non-conventional construction materials (VIIème Plan, 1985–1989).

The directing body of science policy and Senegalese scientific research in general have been altered by the deep economic crisis and its associated budgetary austerity. The changes have manifested themselves in the form of an erosion of power for the directing body of research, a decrease in the governmental resources devoted to research (and a heightened dependence on the providers of the funds, notably the World Bank) and a re-evaluation of projects destined to improve the national scientific community.

The Scientific Community

Although there is little data available on the Senegalese scientific community at the time of independence, it can be affirmed that there were few people with university training, with the possible exception of the field of medicine. A few Senegalese were fortunate enough to pursue their studies in France before their country's independence. Among these, the two most illustrious are undoubtedly President Leopold Sedar Senghor and Cheikh Anta Diop, the professor whose death in February 1986 profoundly affected the Senegalese scientific community. When Senegal achieved independence, he was one of the few, if not the only, Senegalese researcher at IFAN. Only after 1960 were the first Senegalese grant recipients and fellows sent to study in France.

The first inquiry into Senegal's science and technology potential (STP) elucidating the characteristics of formation and composition of the Senegalese scientific community was conducted in 1972–1973. A second survey was produced by DGRST in 1975. In 1981, UNESCO also made available a study of the STP for the West African Economic Community (CEAO), of which Senegal is a member (UNESCO/PNUD, 1985). Although it is difficult to establish comparisons between surveys because of their different methodologies and definitions,⁹ we will attempt to rely on the aforementioned surveys, complementing them with direct inter-study comparisons to delineate the main characteristics of the Senegalese scientific community.¹⁰

A Community on its Way to Senegalization

The 1975 report and analysis of STP presents in its chapter on human resources a portrait of the typical researcher in Senegal fifteen years after independence: he is 39.1 years old, has a 91 per cent chance of being male, a 50 per cent chance of being French, while only a 30 per cent chance of being Senegalese (Gillet, 1976). What this preliminary data reveals above all else is the heavy dependence of the Senegalese scientific community vis-à-vis French researchers. The proportion of French researchers in the 1973 survey shows an even greater dependence. Senegalese researchers then accounted for only 20 per cent of the 416 per researcher scientific community (CNPRS, 1973). In addition, Senegalese researchers tended to concentrate on the scientific disciplines of medicine (39 per cent versus the average 22 per cent) and social sciences (18 per cent versus 13 per cent), while they were relatively less numerous than expatriates in agronomy and biology. The large majority of expatriates are French. Non-French expatriates generally come from the neighbouring French-speaking African countries and are concentrated within the University. In 1973, there were a few

Belgian and Dutch researchers; today they are joined by several Americans and Asians.

The Senegalization of the scientific community accelerated during the 1970s. The latest survey was carried out in 1981 and looks at 828 researchers. It paints the opposite picture of the 1973 survey: 75 per cent are Senegalese, 20 per cent are French and 5 per cent are non-French expatriates (of which 4 per cent are non-Senegalese Africans). Among the remaining 1 per cent expatriates, there are nine Belgians, three Italians, two Britons, two Americans and one Indian. From the data available in 1990 on teacher/researchers at the University and the main research institutes (ISRA, ITA and ORSTOM), it appears that approximately 75 per cent are Senegalese (see Table 6.1).

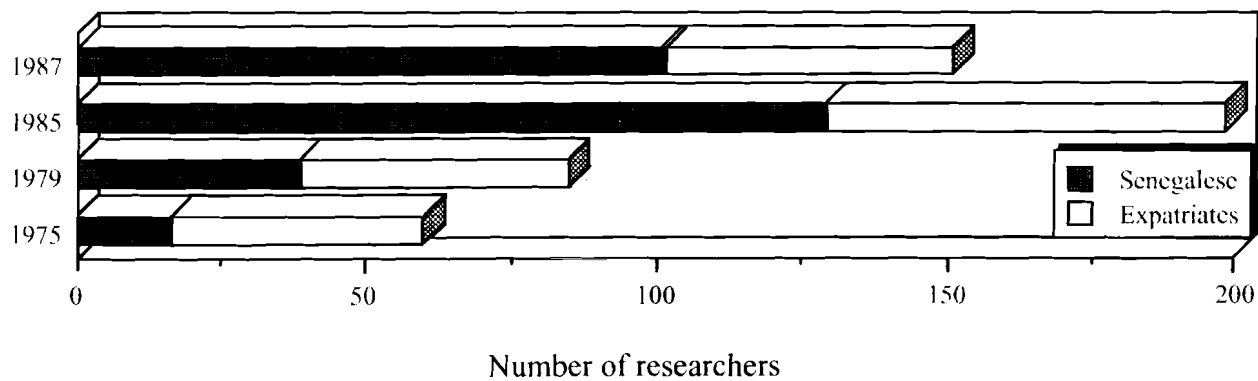
TABLE 6.1
Distribution of Senegalese and Expatriate Scientists in the Main Public Institutions

<i>Institutes</i>	<i>Expatriates</i>		<i>Senegalese</i>		<i>Total</i>
	<i>Number</i>	<i>Per cent</i>	<i>Number</i>	<i>Per cent</i>	<i>Number</i>
<i>Universities*</i>					
UCAD	65	11	536	89	601
Institutes affiliated to UCAD	53	22	192	78	245
ISRA*	60	35	110	65	170
ITA**	2	7	27	93	29
ORSTOM*	108	88	15	12	123
Total	288	25	880	75	1168

* in 1990, ** in 1985

With the exception of ITA, it is within the four UCAD schools that the percentage of Senegalese is highest—nearly 90 per cent. ORSTOM, being the only remaining French public institution with its own research centre in Senegal, is an exception to the dominant trend. This explains the particularly high proportion of French expatriates among its scientific personnel. Nevertheless, efforts have been made since 1983 to integrate young Senegalese researchers into ORSTOM, especially in its microbiology laboratory and in projects defined in conjunction with Senegalese research institutions. A training agreement was also signed by ORSTOM and Senegal in 1990¹¹ and talks are currently under way for the transferring of the Bel Air Centre in Dakar to Senegalese authority. The percentage of Senegalese in the national scientific community has rapidly increased since the early 1970s. Senegalese researchers and technicians now make up the majority of ISRA (see Figure 6.3). In 1974, the year of ISRA's creation, there were only eight nationals among approximately fifty scientists involved in agricultural research.¹²

FIGURE 6.3
Number of Researchers at ISRA, 1975-1987



Estimating that the institutions listed in Table 6.2 represent approximately 80 per cent of the Senegalese scientific community—a realistic hypothesis—the number of teachers, researchers and engineers associated with higher education and R&D can be placed at about 1,500. These scientists devote a varying proportion of their time to research. It ranges from almost 100 per cent for some researchers in research institutes to virtually 0 per cent for a large majority of University professors. The portrait of the average researcher working in Senegal differs greatly in function, depending on whether he works within or outside the University. This difference is described in the following paragraphs.

TABLE 6.2
Number of Scientists in the Main Institutional Sectors in 1990

<i>Institutional Sectors</i>	<i>No. of People</i>	<i>No. of Researchers (Full-time Equivalent)</i>
University	855	128
Public Research Centres	435	313
Total	1290	441

The Under-utilized University Research Potential

Because the precise data for the private sector is unavailable, I will limit my analysis to public sector organizations.¹³ The results of the 1985 survey show that the average age of researchers is 34 (5 years younger than in 1975).¹⁴ The experience of researchers, in number of years, has also declined. It averaged about ten years in 1975, but stood at only about six years at the end of the 1980s. University personnel also tend to be younger than their colleagues in research institutions. The main distinction between the university and non-university researcher was the amount of time he devoted to research. Non-university researchers claimed to spend 72 per cent of their time on research, while university researchers only declared it to occupy 47 per cent of their time, and even that seems to be an excessively high percentage for the university sector. What is more, according to a DAST report, approximately 15 per cent of the teachers are involved in university research activities,¹⁵ Using these percentages, we can estimate the equivalent full-time (EFT) research potential in the two main institutional sectors (see Table 6.2).

While representing almost two-thirds of the Senegalese scientific community, researchers at the University of Dakar represent less than one-third of the EFT researchers. The University potential is, therefore, significant, but largely under-utilized in research activities. In addition,

teacher/researchers at the University of Dakar are well trained; more than half (55 per cent) of them had a tertiary degree in 1981 (AUPELF, 1984). Among these, 16 per cent also had a doctorate degree. The high level of preparation of University teacher/researchers is confirmed by other studies undertaken in the area.¹⁶ Comparatively, ISRA researchers are half as likely to have a tertiary degree or equivalent—a measure of true research specialization.¹⁷

On the other hand, the means devoted to University research are few. According to a 1981 survey, research spending accounted for no more than 3.6 per cent of intramural University spending (UNESCO/PNUD, 1985). Another study for the 1990–1991 academic year estimates (probably excessively) the figure to be 11.6 per cent, of which more than half (56.6 per cent) corresponds to salary expenses (DAST, 1991). The real amount probably lies somewhere in between the two estimates, and it is wholly inadequate. The different analyses of the Senegalese scientific potential highlight the lack of technicians employed in research activities, particularly at the University. A better use of University R&D potential, whose importance has been shown, appears to be necessary.

Training: A Strong Foreign Dependence

In the different schools at the University of Dakar, there is for most disciplines tertiary instruction leading to the obtention of a *Diplôme d'Etudes Approfondies (DEA)*¹⁸ and to the defence of a PhD thesis. Nevertheless, the structures, equipment and the number of supporting staff are insufficient to accommodate the research training of young Senegalese scientists. The training of researchers, therefore, depends largely on the obtention of fellowships for study abroad. In 1981, there were no fewer than 3,380 Senegalese students pursuing tertiary training abroad (UNESCO, 1985), four-fifths of which were in France.¹⁹

The relative dependence on foreign training for tertiary studies that eventually leads to a career in research is a function of the researcher's specialization. Training in medical science is conducted for the most part in Senegal. In other areas, such as in agricultural research, foreign dependence is very high. Of the 131 high level Senegalese researchers and technicians at ISRA in 1985, only twelve (9 per cent) had conducted their higher education in Senegal. The fact that there was no institution for higher education in agriculture before 1979 is largely responsible for this. A priori, it seems paradoxical and absurd that a nation that devotes more than half of its research expenditure to the field of agriculture and which possesses formidable research potential in that sector would not sooner put its human capital and experience to use in the training of its own researchers.

The breakdown of ISRA researchers by country in which they conducted their training shows the multiplicity of sites chosen for training, which include USA (where twenty-eight ISRA researchers have been trained), countries in Western Europe (besides France) and Asia. With 43 per cent of ISRA's researchers trained within its borders, France remains the most frequent choice for training of Senegalese researchers in almost all fields. USA has only participated in this training for a few years, and seems to specialize in a limited number of disciplines—economics and rural sociology in particular. It is expected that USA's involvement in such activities will increase in coming years. USAID has proposed to train forty PhDs and twenty-five MScs for ISRA in the 1989–1996 period.²⁰ But these estimates appear overstated, given the grants offered by other countries and the limited recruiting capacity of ISRA.

In effect Senegal, like the majority of the LDCs, must confront the new phenomenon of intellectual unemployment (Jiminiga, 1986). The figures have attained worrisome levels, and virtually all fields are affected. The main providers of employment, the state and private enterprise, have stopped offering jobs. An association of unemployed scholars, organized by speciality, has been in existence since 1981. It is estimated today that 2,000 to 3,000 of the unemployed hold Master's degrees and that the situation will worsen in the coming years (World Bank, 1991).

A Community in Search of Status

Senegalese researchers working in national research institutes are victims of a lack of social status and career stability that puts into question the future of the research profession. Yero Sylla (1986), former president of the Association of Senegalese Researchers, distinguishes among three categories of researchers: researchers that have become administrators of different bodies (academic, engineering, etc.), contractual researchers like those at the ITA and at the University, and researchers at institutes such as ISRA.

The institutional rules at ISRA do not allow researchers to follow a 'normal' career, for those rules do not acknowledge the specificities of research and seem to privilege function over merit. The decree on which ISRA is founded gives priority to its administrative function rather than its research function. A researcher at ISRA will only advance in his career if he achieves a post of administrative responsibility (that is, director of a centre or department chief).²¹ Until very recently,²² university researchers such as those at IFAN were recruited by special contract and promoted according to a rectorial decree signed in 1975 that does not include advancement by category. Researcher-administrators may be considered at a disadvantage

for such posts since there is no doctorate level salary grade. Holders of a doctorate, of a DEA, of a Master's or of a Bachelor's degree are all in the same category and are promoted according to seniority. These researchers experience the drawbacks of the public sector (low salary) without benefiting from the advantages (job security), because they are employed by the public sector but are not accorded the rank of civil servants.

Because of the heterogeneity of researcher circumstances and careers, there have been several attempts at giving all researchers common status. The SERST and MRST have reformed their classification of researchers and technicians, modelling it after the method used for University teaching personnel, thereby taking researcher status more fully into account. The Association of Senegalese Researchers and the Association of University Technicians worked towards this goal, which was on the verge of coming to fruition when MRST was dismantled. The absence of status marginalizes researchers and devalues the attractiveness of the profession, causing the exodus of the best individuals towards sectors of activity that are more socially and financially attractive such as development, administration or foreign projects.²³

Scientific Output and its Impact on Development

MAINSTREAM SCIENTIFIC PRODUCTION: The measurement and evaluation of African scientific output is problematic.²⁴ A large portion of the work is either published in local journals not indexed in bibliographic databases or in documents that are never published. The most conventional measure of scientific output consists of counting the number of publications indexed in international databases. Among these, the most frequently used is the Science Citation Index (CSI) of the Institute for Scientific Information (ISI).²⁵ The number of yearly Senegalese publications registered by the ISI from 1970 to 1990 has consistently placed Senegal in either the sixth or seventh place in Africa, with slightly over 4 per cent of the African total. This is on par with a country like Cote d'Ivoire, but far behind the African 'giant', Nigeria, that produces close to half the African mainstream publications (Zymelman, 1990; Gaillard and Waast, 1992).²⁶ Researcher productivity is weak, however (approximately one publication for every full-time researcher per year in the early 1970s), and has sagged further during the 1980s.

Drawing from the references indexed in the CSI during the 1970s, Davis (1983) also shows that the largest portion of publications are produced by teacher/researchers at the University of Dakar (40 per cent) and by researchers of French bilateral organizations (35 per cent). Researchers from the national research institutes are only responsible for about a fifth (19 per

cent) of the mainstream scientific production (*ibid.*). Because ISI is an English database, it is interesting to compare the results obtained with PASCAL, a French database.²⁷ What is most evident is that the CSI appears to have a bias against French-speaking countries—the PASCAL database contains twice as many references than does CSI.²⁸ The data available in PASCAL confirms the preponderance of the university sector. Up until 1985, it was responsible for more than half the scientific output indexed by the Francophone database. The university sector, however, has experienced a rapid drop of output in the years following 1985 (see Figure 6.4).

ORSTOM has been the next most prolific entity with, depending on the years, one-fifth to one-fourth of the references.²⁹ The ISRA, despite its high potential, is less visible and its scientific production more irregular. This can be explained in part by its focus on more applied research and its corresponding lack of an international or mainstream publication strategy. It will be seen later that much of ISRA's work is published as 'grey literature'.

The distribution by major research fields shows that the most productive are those of health³⁰ and environment.³¹ Technological research is progressing, but very slowly. Another important characteristic of Senegalese scientific production is its dependence on foreign authors; more than two-thirds of the authors are foreigners, principally French (Figure 6.5).³² The contribution by Senegalese authors has increased in the 1980s, chiefly because of the increase in the number of Senegalese authors per publication.³³

Although the number of EFT researchers has nearly doubled from 1975 to 1985, it should be noted that the productivity per researcher has declined. The number of publications is not the only measure of scientific productivity and many factors can distort the validity of this indicator. The avenues for publication, especially locally, are limited and increases in the number of researchers are not necessarily associated with an increase in the number of national journals. In addition, the regularity of publication of local journals and bulletins is often a function of the means at their disposal, which are becoming increasingly uncertain.³⁴

The few national journals that are diffused regularly are often backlogged and researchers increasingly look towards foreign journals for publication. The proportion of papers published in Senegal has fallen between 1975 and 1990, going from approximately 30 per cent to less than 10 per cent, while the percentage of Senegalese researchers within the national scientific community has increased markedly. More than three-quarters of Senegalese scientific production is published abroad, most often in France.³⁵ However, the attractiveness of French scientific journals has lessened with respect to other foreign journals (principally British, American and Dutch). This evolution has been associated with an increase in the number of publications written in English. More than one-third of Senegalese scientific production

FIGURE 6.4
Number of Documents by Institutional Sector

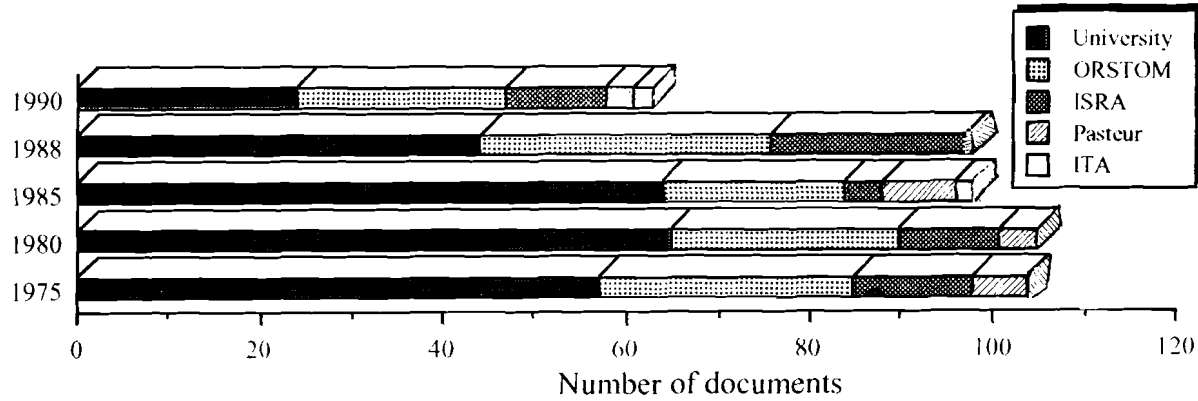
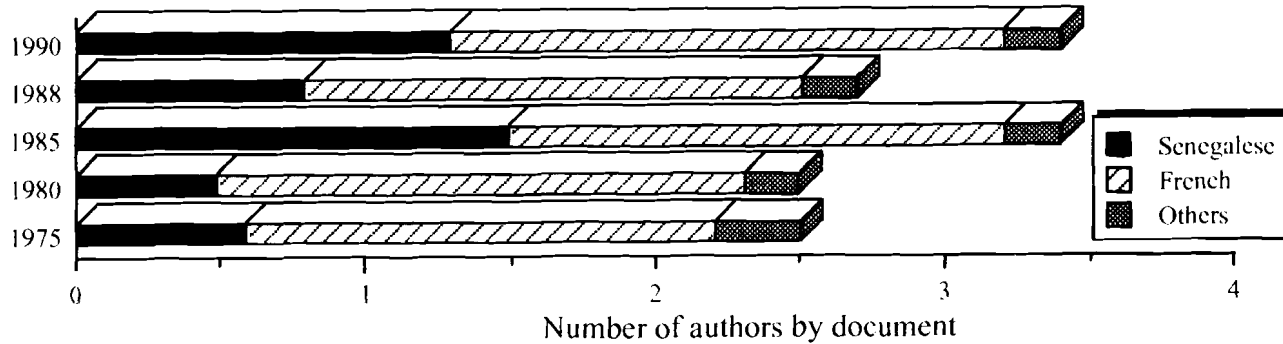


FIGURE 6.5
Number of Authors by Document



is published in English; in 1975 this proportion was only slightly over 10 per cent.

Although the bibliometric indicators found in international databases present certain advantages, they do not paint a complete picture of overall scientific production. This is especially true for scientific work that bears mainly on problems of local interest. For this reason, it is interesting to examine the scientific output of researchers at a single Senegalese institute. I have chosen ISRA (whose output, as has been shown previously, is scarcely visible in the PASCAL database), which has recently published an analytic bulletin of in-house research work in 1986.³⁶

ISRA'S TOTAL SCIENTIFIC OUTPUT: The preface of ISRA's bulletin (ISRA, 1988: 1) begins by posing the question that is the crux of the dilemma: 'How can we know that during ISRA's 13 years of existence more than 2,500 writings, reports, articles, technical fiches, published or "grey literature", were produced by its researchers'. Certainly, this cannot be done by consulting international databases! The establishment of the ISRA database and the publication of its bulletin fill a large void by proposing an indicator based on scientific communication.

The 1986 bulletin shows an output of 207 references distributed among 135 authors. Given that ISRA employed 144 researchers in 1985 (150 in 1986), it can be inferred that, with a few exceptions, almost all researchers recorded their work in one form or another. A large majority of the researchers authored one (57 per cent) or two (18 per cent) papers. The average number of authors per paper (1.5) is lower than that of the overall Senegalese mainstream scientific production (3.7 in 1985). The proportion of Senegalese authors or co-authors represents a majority (52 per cent), although it is slightly lower than that of Senegalese researchers at ISRA in 1985 (62 per cent). The low figure for the average number of authors per paper is explained in part by the nature of the recorded works, which are most frequently internal reports (often individual) and activity reports.

More than two-thirds (69 per cent) of the papers are internal to ISRA, including activity, convention and mission reports. Very few are published in speciality journals: of twenty-one published papers, nineteen were part of two collections prepared for the International Commission for Tuna Conservation. It should also be noted that a large number of works referred to colloquium transcripts (national and international) and internal seminars held at the institution. Contrary to what is found in surveying international databases, most researchers at ISRA do indeed record their work, but the documentation of their research results rarely appears published in speciality journals. Only rarely do these researchers publish in English (just seven out of 207 references).

THE IMPACT ON DEVELOPMENT: Promising results have been achieved in health (leprosy and AIDS). Occasionally, articles in the local (or foreign)

press display results obtained in some laboratory or the other. This was the case for the research (at ORSTOM, ISRA and the University) on the *sesbania rostrata*, a tropical vegetable that displays a remarkable capacity for nitrogen-fixation and that may be used as 'green' fertilizer, especially in rice cultivation. But can the impact of such research on development and its effects on daily life be adequately measured?

Unfortunately, there is an insufficient amount of information available to satisfactorily respond to such a question. The few known pertinent studies in agriculture suggest that there has been a fall in agricultural productivity (Braibant, 1986) and a decrease in rural population's income since the early 1960s (except in eastern Senegal and Cape Verde) (Sene, 1985). But even proven correlations between research and socio-economic progress or regression do not provide information about the process of diffusion or about the role of research. It is therefore necessary to conduct keener sectoral analyses and in-depth case studies within each of the sectors.

Sene (1985) has attempted to do this for agricultural research. Other sectoral studies would be needed to make more general judgements. However, he finds among his primary conclusions that:

- Productivity of Senegalese research has decreased markedly in the last fifteen years, in terms of both the technical themes undertaken and the scientific publication of researchers.
- The area in which the fruits of research have been most widely diffused has been that of the groundnut basin, which comprises the highest concentration of Senegalese researchers.
- For lack of follow-up studies, much of the research becomes quickly outdated. This is the case of rice cultivation in the delta and valley of the Senegal river. Of the 16,000 hectares of soil devoted to the cultivation of rice in 1984, only 64 hectares were planted with varieties resulting from research. Likewise, in Casamance, grain varieties produced by research are no longer in use.
- Research results are often not used in practice because of the lack of credit and the high cost of inputs relative to outputs. The quantities of fertilizer applied are often well below recommended levels and they often hover around the threshold of utility.

Faye and Bingen's analysis of relations between ISRA and the potential users of its research results also shows 'the absence of a clear perception of differences in research clients and their specific needs' (1989: 40-41). It was only in 1987 that the Unit for Valuation of Research Results (UNIVAL) was created at the level of the direction generale, but it has not yet been given the means or personnel that would allow it to be functional.

The usefulness of scientific results is difficult to ascertain. Their effects can be difficult to isolate and can appear with significant time-lags. The effect of Senegalese agricultural science has to this day remained limited. In addition, the end of the agricultural programme³⁷ in 1979 has led to the suppression, or at least the reduction, of subsidies to farmers in accordance with the World Bank-inspired policy of 'getting prices right'. An almost complete stoppage of equipment provision to peasants and a sharp fall in the consumption of fertilizers have followed. This policy has caused 'an end to the diffusion of technologies and a fall in Senegalese agricultural production' (Sene, 1987: 10). In such an environment, the goals set forth by the New Agricultural Policy in 1984 may never be achieved.³⁸

Research Funding: Foreign Dependence and Declining National Research Effort

The funding structure of Senegalese research activities has been relatively stable over time. External resources account for about two-thirds of the amount (see Table 6.3). After a period of relative growth in the national research effort in 1972–1975, where Senegalese contribution to the total resources rose from one-fourth to one-third, the government's portion of funding has remained virtually unchanged. During that same period, there was a diversification of external financial resources and a relative decline in France's contribution from 59 per cent in 1972 to 35.5 per cent in 1986. This diminution can be traced to the recent involvement of the United States (principally USAID) and the World Bank. These two accounted for almost one-quarter of the funding (23.8 per cent) devoted to research in Senegal, after being practically absent in 1975.³⁹

TABLE 6.3
Sources of Research Funding in Senegal

<i>Sources of Funding</i>	<i>1972</i>	<i>1975</i>	<i>1986</i>
Senegal	25	33	32
Foreign Sources	75	67	68
France	59	57	35.5
World Bank*	–	0.5	16
United States*	–	0.5	7.8
United Nations	9.5	3.4	1.1

Source: Analyse du potentiel scientifique et technique for 1973 and 1975; for 1986 cf. Fondeville (1986: Tables 30 and 33 in Annex).

* No data available for 1972.

In 1986, the largest part of external contributions came from foreign nations (particularly France and the United States), then (in decreasing order of importance) the multilateral organizations (especially the World Bank), a group of foreign public organizations (4.3 per cent) and regional organizations, whose contribution has been relatively marginal (0.8 per cent) (Fondeville, 1986). The 1986 study, far from being the most exhaustive, reveals no fewer than thirty-nine different sources of funding (*ibid.*). It should also be noted that most of the foreign aid is spent on the disbursement of salaries for predominantly French expatriate researchers.

The ratio of national to external resources is in danger of falling in the future because of the Senegalese government's persistent economic and budgetary difficulties, and of the conditional aid from the World Bank requiring cuts in public expenditure. The falling government outlays, beginning in 1985, have led to recurrent deficits in public institutions.⁴⁰ Such is the case of ISRA which, despite a large number of layoffs in the past few years (unskilled workers in particular), has been unable to reconcile differences in required salary expenditure and available national resources. The complete dependence on external contributions to finance programmes is unhealthy, as it presents a number of risks and inconveniences. Among the most notable are the multiplicity of foreign aid packages and their often divergent strategies. The large number of donors and their demands also lead to inefficiently large administrative outlays.

In 1986, ISRA managed thirty different grant contracts with foreign partners (ISRA, 1987). These accounted for close to two-thirds of its annual budget, while ISRA's own resources constituted only 6.8 per cent of that amount (Fondeville, 1986). The growing number of special projects giving way to particular grant contracts can also be directly traced to the erosion of the state's participation—which ISRA's directors and many foreign donors would like to see return to 50 per cent of total resources. Some donors are wondering if it would not be best to discuss the removal of aid over five, ten or fifteen years.⁴¹

Research expenditure as a function of GNP is largely insufficient and has been in constant decline since the early 1980s. Given the current conditions in which the state cannot increase its contribution, the Senegalese national research system must inevitably increase its reliance on foreign sources, unless it can diversify and increase the private sector's contribution to funding. Private financing (outside of NGOs) now represents approximately 1 per cent of research credits (Fondeville, 1986). Outside national or foreign private firms and foundations could be called upon to play a larger role in this area in the future. Two national foundations have some potential—the Leopold Sedar Senghor Foundation (devoted to social sciences) and the Foundation for the Impulsion of Scientific and Technological Research (FIRST). The latter is unfortunately far from attaining its assigned objectives,

due in part to its failure to sufficiently distance itself from the public agencies that participated in its creation in 1982.

Conclusion

Although the first outlines of Senegalese research institutions, that are today the heart of the structure, began to appear in the first-half of the twentieth century, the Senegalese scientific community has but a young history. While the structure of the scientific community may be characterized as nascent and formative in its present stage, the process of Senegalization began only towards the late 1970s. The University of Dakar, the first and only Senegalese university until 1990,⁴² was created just a few years before independence. During its first ten years, it was attended mainly by French students. It only began to open its doors to Senegalese students after the reform of 1969, whose objective was to better adapt the content of the University's programmes to the realities of the nation and of its development. In the agricultural research sector, there has been an ongoing Senegalization of research personnel starting in 1975, the year that ISRA was founded. The institutional construction reached its apogee in 1983, with the creation of MRST. The Association of Senegalese Researchers was also created in 1983, and held its first congress in June 1985.

The operation, production and reproduction of the Senegalese scientific community remains nonetheless dependent on foreign expertise, France's in particular. Foreign dependence is especially evident in the financing of research, with external resources representing about two-thirds of the total. Although the majority of researchers are Senegalese, the research structure still hinges heavily upon the participation of numerous expatriates. Aside from a few dozen non-Senegalese Africans, these expatriates are all French. The dependence on foreign researchers, however, varies according to scientific disciplines. Senegalization advanced most rapidly in the field of health, benefiting from the creation of a school of medicine in 1918. The health sector is where Senegalese participation is most advanced. It also contains the greatest number of Senegalese researchers trained in Senegal. On the other hand, agricultural research is still very dependent on foreign sources for the training of its personnel, despite the fact that its researcher potential is high and that it accounts for more than half of the total Senegalese research funds. This situation is due in part to the fact that, until recently, a majority of the researchers in this area were expatriates. The late creation of a school of advanced agricultural learning in 1979 is also both a cause and a consequence of this excessive foreign dependence. From the overall perspective, the growth of higher S&T education structures three decades after the creation of the first full-fledged research institutions in

many ways delayed the institutionalization of scientific fields and, hence, a scientific system which is sustained through a process of reproduction.

The distribution of the R&D effort among the principal sectors reveals a concentration in three main areas: agriculture, natural resources (principally environment) and health. This has not changed significantly in the last fifteen years. Applied research, particularly industrial-technological research, is the most neglected research field and is practically non-existent. The social sciences, although possessing significant research potential, are not very productive nor very visible at either the national or international levels. Productivity per researcher in general is low and the impact of research on development difficult to perceive.

Despite the valiant effort by the Senegalese government at the end of the 1970s, including increases in the research budget, the current trend is a downward one. Senegal is presently traversing an exacting period of economic crisis and budgetary rigor that is stunting the development of the Senegalese scientific community and accentuating its dysfunctions. The economic difficulties have revealed the impossibility of maintaining the growth levels of the 1970s and the need to give priority to qualitative rather than quantitative goals. In the context of austerity, the many problems here discussed will be solved only if the scientific community is able to mobilize new financial resources, notably from the private sector. There is a strong need for a national research policy that transforms Senegal's supply driven R&D system into a demand driven one. Moreover, the goal of attaining a process of complete Senegalization calls for the indigenous generation of R&D, financial and human resources to arrest the foreign dependency, which is staggeringly high at about 70 per cent presently. The modes of scientific cooperation need to be redefined in order to favour the elaboration of durable partnerships. Incentive programmes are needed to more effectively mobilize the existing Senegalese research capacities (especially at the University), to foster inter-institutional collaborations and to implement a reward system adapted to the specificities of research.

Notes

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1. Senegal's area is approximately 200,000 sq.km. In 1985, close to 67 per cent of developing countries had a population of under 10 million and 52 per cent, population under 5 million.
2. GNP per capita in this sector has declined on average by 0.7 per cent a year from 1965 to 1987 (World Bank, 1991).
3. It would be a fruitful subject for future research to study the importance and impact of the non-governmental sector.
4. Two hundred veterinarians from the thirteen French-speaking African member states were trained at EISMV from 1973 to 1984. One-fourth of these were Senegalese, others coming from (in decreasing order of importance) Benin, Togo, Burkina Faso, the Niger

5. The University of Dakar maintained a high level of educational quality in the decade following independence, as evidenced by the equivalence of degrees with those offered by French universities. This quality has progressively deteriorated with the considerable increases in enrollment (World Bank, 1991).
6. The rate of students passing exams has been very variable: the Ecoles de Formation and the centres affiliated with the UCAD have performed better than the UCAD Schools. In the School of Sciences, the rate of success has been the lowest: 37 per cent for the first cycle and 40 per cent for the second cycle (UCAD, 1991).
7. Moving from the auspices of the Ministry of the Plan, the Ministry of National Education, and then to the new Ministry of State Modernization and Technology, DAST has suffered a diminishing of its capacities for intervention.
8. The available information about the power and activities of the new delegation at the RST is insufficient to evaluate its capacity for coordination and promotion of research. A survey was later conducted in 1985, but the data has not been accessible. Another was conducted in 1991, but to the best of my knowledge, it has not yet been compiled.
9. For example, the response rate to the questionnaires used in the 1981 UNESCO study is very low, and the resulting statistics must be viewed and interpreted with caution. According to the survey, agricultural and veterinary sciences comprise 97 per cent of Senegalese research funds. Even if these subjects account for the lion's share of the funds, such a figure is of course excessive and underlies the limitations of the survey.
10. According to officials at ISRA: 'It is unfortunately difficult to precisely estimate the scientific potential of ISRA. The requisite information is not regularly collected nor analysed. The data that we do manage to collect are not very reliable' (Faye and Bingen, 1989: 60). This attests to the difficulty in trying to qualitatively evaluate total national potential.
11. It should be noted that many ORSTOM researchers worked within the Oceanographic Research Centre at Dakar-Thiaroye (CRODT) which depends on ISRA for its funding. Those researchers manage and promote the scientific activities while also providing training for young Senegalese researchers.
12. Many observers contend that the rapid Senegalization of ISRA's personnel could only have been achieved through the promotion of many Senegalese technicians to the rank of researcher. I have not yet been able to study the validity of this hypothesis.
13. The private sector's participation is probably very limited. According to the UNESCO/PNUD survey (1985), it only accounted for 1.1 per cent of scientists involved in R&D programmes in Senegal. Most of the private research is conducted in agriculture. The Senegalese sugar company conducts its own research within the irrigated perimeter of Richard Toll, and chemical firms conduct testing independently or in collaboration with ISRA and with companies involved in product development. But some NGOs are also involved in research for technology transfer, and the research conducted in development projects should not be under-estimated.
14. The average age at ISRA in 1987 was also around 35 years. Most researchers are between the ages of 30 and 40. On average, expatriates are slightly older (Faye and Bingen, 1989).
15. The DAST report accounted for sixty-three researchers (9 per cent), while warning that this involves only national researchers and that the figure is probably under-estimated. The low student enrollments in tertiary education (4.5 per cent) reveals the weak capacity for 'promotion' in university research. In the US and in France, the percentages are 13 per cent and 9 per cent respectively (World Bank, 1991).
16. It may be that this level may have suffered slightly with the rapid Senegalization of the professor/researcher ranks.
17. Of 149 active researchers in 1987, 23 per cent had a tertiary degree or equivalent; 50 per cent had a Master's or equivalent degree and 27 per cent had a Bachelor's degree. Expatriates have a slightly lower level of university training (Faye and Bingen, 1989).
18. The DEA corresponds roughly to the first year of PhD study.

19. Others are in the United States (110), Canada (ninety-seven), Belgium (eighty-three), Morocco (seventy-one), Cote d'Ivoire (sixty-five), and other countries (246).
20. USAID, personal communication.
21. In addition, since 1983 salary expenses have been greater than the state budget earmarked for ISRA. As a result, many bonuses and allowances (annual productivity bonuses, monthly output bonuses, bonuses linked to specific tasks) are no longer offered (Faye and Bingen, 1989).
22. In 1993, the rank of researcher was created at UCAD.
23. Of the twenty-three researchers that left ISRA between 1981 and 1987, three have rejoined ministries (two of them as ministers), two are employed in other Industrial and Commercial Public Institutes (EPIC), six were recruited by private volunteer organizations having NGO status, eight work for regional or international institutions, three have gone abroad (of which two married expatriates) and one was recruited by a multinational corporation in Dakar. The number of Senegalese researchers having left after 1985 is particularly high; the turnover rate reached 18.1 per cent in 1987 (Wessen, 1988).
24. For a discussion of the question of measurement and evaluation of scientific productivity in LDCs, and more particularly of the pertinence of scientific indicators for LDCs, see Arvanitis and Gaillard (1992).
25. The ISI indexes approximately 5 per cent of the 70,000 scientific journals published in the world. These are the most frequently cited journals (or mainstream science) which are found for the most part in journals published in the industrialized world.
26. See also the chapter on Nigeria in this volume.
27. The PASCAL database was consulted for 1975, 1980 and 1985. Although it is more exhaustive than CSI for French-speaking countries, it displays certain inconveniences. It is only possible to extract publications whose first authors have an institutional address in Senegal. In addition, in the late 1980s, with the move of the database from Paris to Nancy, many dysfunctions were found in the indexation of references. Finally, social science references are not included in PASCAL. They are contained in the FRANCIS database, which was not consulted for this study.
28. In the following analysis, only references in which the first author claimed an institutional address in Senegal were included.
29. The decrease between 1975 and 1985 can be attributed to the integration of some of its researchers (mainly oceanographers) into ISRA during that period. Their publications were counted with those of ISRA as of 1980. What is more, many ORSTROM researchers work within the University, the Institut Pasteur, the Organisme de Recherches sur l'Alimentation et la Nutrition Africaines (ORANA) and the Ecole Nationale Supérieure et Universitaire de Technologie (ENSUT).
30. Research in this area is often the product of doctors at the Hospital of Dakar and that of the UCAD School of Medicine. It often takes the form of brief notes by multiple authors.
31. This is the field of predilection for ORSTOM researchers.
32. This dependence would be even greater if the references concerning Senegal indexed in the PASCAL database were included. During 1988, there were ninety-seven references about Senegal, of which the first author did not reside in Senegal. Aside from the authors of a few Senegalese theses, most of the other authors were French or (to a lesser degree) American.
33. The average number of authors per paper was particularly high in 1985 (3.45). In certain fields such as health, and especially clinical research, some publications list up to ten authors, sometimes even more than ten.
34. In the School of Arts and Human Sciences, only the Department of Geography publishes bulletins regularly (TECASEN and LABOGENU). The latest issue of the Senegalese Journal of History was published in 1981 (Richard, 1988).
35. Expatriate French researchers generally publish in the journals of their home institution (ORSTOM, CIRAD, IPOM, etc.).

36. See ISRA (1988). This bulletin is the first product of the operation begun in 1988 to evaluate the global production of ISRA.
37. The 1958–1979 Agricultural Plan consisted essentially of appropriating credits and subsidies to farmers for the acquisition of agricultural equipment, inputs (fertilizers and fungicides) and high yielding varieties of seeds (principally groundnuts).
38. The main goal of the New Agricultural Policy is to achieve 80 per cent self-sufficiency in grain by the year 2000. It also seeks to promote the diversification of agricultural export products to improve the balance of payments.
39. The analysis of agricultural research funding by the World Bank (1982–1988) reveals a similar distribution. Senegal's estimated portion of 33 per cent at the beginning of the projects has only fallen to approximately 30 per cent in 1987. France's share is 33.5 per cent, of which half is devoted to remunerating expatriate French researchers.
40. Paradoxically, the World Bank, which had required the state to reduce its spending, has laid out among its conditions for the renewal of the Agricultural Research Programme in 1989 that the Senegalese government re-establish its budgetary contribution to ISRA to its 1983 level, or 1.45 billion CFA (World Bank, personal communication).
41. USAID, personal communication.
42. A second university was created in Saint Louis in 1990. Six hundred students enrolled for the first year.

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