Donor Country Profile: France

Perhaps among all the former pre-independence authorities, France has maintained the strongest links with its former colonies. With 11 of its 17 member states being former French colonies, it is not therefore surprising that WARDA has had cause to work closely with various French institutions. In this year's *Donor Country Profile*, we give a flavor of our collaborative work with France.

France has a long history of agricultural research in West Africa, and long-standing relationships with WARDA. The level of French funding to WARDA since 1990 is shown in Figure 12. "France's contribution to WARDA has been across the spectrum," explains Director General Kanayo F. Nwanze, "from unrestricted core funding, through special projects and seconded specialists to capital investment in the major building works of the early 1990s."

France has high expectations from its own research and development activities, including its collaboration with organizations like WARDA. The French research organizations have established a platform to review on-going collaborative activities and coordinate new

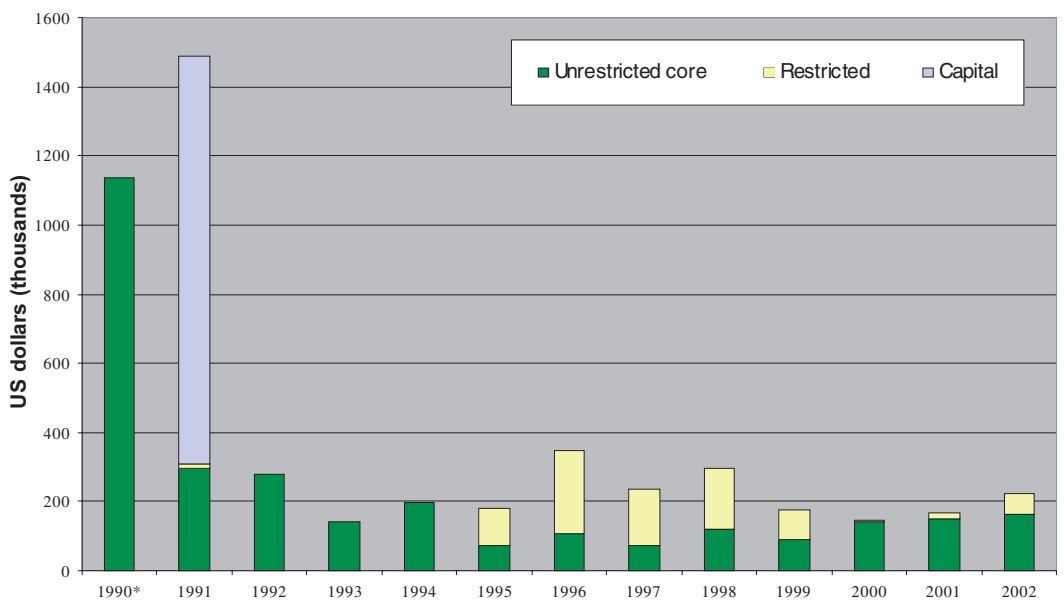

Figure 12. French contributions to WARDA's budget, 1990–2002

*Data for 1990 combines unrestricted core and restricted funds.

directions—the *Commission Inter-Organismes* (CIO) involving *Centre de coopération internationale en recherche agronomique pour le développement* (CIRAD), *Institut national de recherches agronomiques* (INRA) and *Institut de recherche pour le développement* (IRD, formerly ORSTOM). As a rule, CIO and WARDA meet every two years. "These meetings serve a primary purpose for reviewing collaboration between WARDA and French research institutions," explains Nwanze, "developing programs of work, and establishing modalities for the secondment of French scientists to WARDA and short-term exchange of staff."

The last WARDA–CIO meeting was held in Montpellier, France, in June 1998. In 2000, WARDA and its French partners initiated discussions toward the next WARDA–CIO consultation in 2002. WARDA's Director General and then Director of Research visited *Pôle international de recherche et d'enseignement supérieur agronomiques* (AGROPOLIS) in Montpellier in early July 2002 in preparation for the meeting. Extensive discussions were held at that time with a large number of research scientists and technicians. Major areas of research, programs and activities were identified, and it was agreed that an umbrella 'Memorandum of Understanding' (MOU) should be developed as a framework for future collaboration. A final discussion with senior administration of *Commission pour la recherche agronomique internationale* (CRAI) called for stronger international linkages and encouraged scientists to add value to their results through joint publications. The meeting scheduled for November 2002 had to be postponed as a result of the Ivorian crisis, and is expected to be rescheduled for the first quarter of 2004.

Plant physiology

Alain Audebert was seconded from CIRAD to WARDA in 1994, where he served as Plant Physiologist until 2002. In addition to his coming from a French institution, much of Audebert's work at WARDA was also funded by France. In eight years, the physiology team at WARDA, headed by Audebert, addressed three principal issues: iron toxicity in the lowlands, drought in rainfed systems, and physiological characteristics of NERICAs.

Audebert's work on iron toxicity was reported in detail in last year's report (*see* 'Painting the Rice Red: Iron Toxicity in the Lowlands,' *WARDA Annual Report 2001–2002*, pages 29–37). In March 2003, the iron-toxicity work was the subject of a regional workshop, held in Cotonou, Benin. The findings of the WARDA–CIRAD project were the main emphasis. Iron toxicity is present throughout the West Africa region, and the national agricultural research systems (NARS) are generally focusing on two approaches, namely breeding and fertilizer management. Meanwhile, the WARDA–CIRAD iron-toxicity project researched the iron-toxicity mechanism in rice.

The general discussion at the workshop raised the needs for: an integrated iron-toxicity research program covering all the NARS; management of multilocational trials; increased iron-toxicity surveys in the sub-region; harmonization of iron-toxicity evaluation criteria for rice; harmonization of screening methodology; and, continued basic research at WARDA.

When asked about drought, Audebert says: "Water stress is one of the most important production constraints to rainfed rice—lowland, hydromorphic and upland. Drought period is characterized by timing (during cropping season), duration and intensity. Depending on these parameters, drought resistance in rice is a complex of interacting physiological, phenological and morphological mechanisms for escape, avoidance, resistance and recovery, with different cultivars exhibiting different combinations of mechanisms." However complex, drought resistance is exactly what one has to study if one wants to help in the efforts to breed varieties that will survive under drought conditions.

Typical effects of drought on a rice plant are: reduced height, reduced leaf area, reduced biomass (that is, total plant weight), changed rooting pattern, and delayed development. In addition, rice has the ability to abort some of its tillers in order to maintain minimum physiological activity in the remaining tillers. Drought stress during tillering stage prevents the appearance of new tillers, but at recovery a large number may appear at the same time; these, however, do not grow and develop. The extent of these reactions is dependant on the severity of the stress, so if the plants are subjected to a long period of drought they will be shorter, smaller and develop slower than plants subjected to a short period of drought.

In uplands, the team noted that plants under vegetative-stage drought stress had deeper roots than normal. This led to a careful study on the effects of drought on the distribution of growth patterns between droughted and non-droughted plants. The results showed that drought had no effect on the percentage growth of roots and above-ground parts. "We therefore deduced that the deeper roots were the result of growth following the moisture gradient in the soil, with the aim of tapping more water resources at lower depths," explains Audebert.

One of the traits of African cultivated rice that breeders want to transfer into NERICA varieties is the species' good adaptation to drought. In particular, *Oryza glaberrima* has 'interesting' leaf morphology: its leaves are thinner and have a low density of stomata—these are like pores or depressions in the leaf surface that enable the exchange of oxygen and carbon dioxide. A plant controls stomata apertures according to its water status (stomatal conductance). The stomata are also a route for plant evapo-transpiration—a process that needs to be minimized in drought conditions. In addition, the thin leaves of *O. glaberrima* roll faster than those of *O. sativa*—thereby reducing the exposed water-losing surface area. Finally, the species maintains good plant-water status through evapo-transpiration by stomata. "From our studies," says Audebert, "it seems that the physiological mechanisms for drought avoidance are different in *O. sativa* and *O. glaberrima*. It is, thus, important to determine the mechanisms in *glaberrima* for the NERICA work."

Detailed studies on stomatal conductance and leaf-rolling concluded that stomatal conductance is controlled by a soil-moisture-dependent root signal, while leaf-rolling is controlled directly by the water status of the leaf.

Locating genes that contribute in a quantitative way to drought resistance should enable these genes to be used in breeding through marker-assisted selection. To this end, a 'mapping population' for drought avoidance was developed at WARDA, in collaboration with Aberdeen University, and is undergoing extensive testing at WARDA and IRRI to identify quantitative trait loci, or QTLs. Several QTLs have already been identified for leaf-drying, leaf-rolling, relative water content, and root growth (particularly root penetration ability). Results indicate that rooting behavior can influence drought avoidance, and so there is potential value in screening for root traits under controlled conditions.

For part of the second-half of the 1990s, WARDA also had a nematologist—Daniel Coyne, seconded from the UK Natural Resources Institute (NRI). "We did a short study in 1997 on the cross-effects between drought and infestation by cyst nematodes," says Coyne. "What we found was that nematode infestation on rice induced similar symptoms on plant water status as does drought. Consequently, the presence of a large population of nematodes presented symptoms of water stress equivalent to those observed under drought conditions, but also exacerbated the effects of drought."

For each of the drought-related traits discussed above, the NERICAs have an intermediate value between that of *O. glaberrima* and that of *O. sativa*. Hence, the on-going need to characterize the influence of the various traits on the drought-coping mechanisms

of rice, so as to be able to characterize NERICA lines for drought tolerance.

Economics of water use options in the Middle Valley of the Senegal River

Pierrick Fraval was the second (successive) senior staff to be posted at WARDA from fellow CG Center the International Water Management Institute (IWMI). In addition, Fraval was a staff member of *Cemagref* under the French Ministry of Agriculture (*see* Box 'Cemagref'). This three-way collaborative arrangement may sound like a recipe for administrative confusion, but it afforded the opportunity to look at the 'big picture' of potentially conflicting water-use options in the Senegal River valley.

"For some time, donors have expressed concern about investments, water management and incentives for productive and sustainable agricultural development, along with the roles of the various stakeholders in the valley," explains Fraval. "They—and we—were also interested in possible future scenarios for the upstream Manantali reservoir, in the light of past performance and events." Fraval reviewed and analyzed 20 years of hydraulic, agronomic, financial and organizational data on river-water-dependent crop-production systems to derive an *ex-post* (after-the-event) economic analysis. He also conducted modeling of dam management, and used remote-sensing and GIS technologies (both based on satellite imagery) to explore linkages between hydraulic and socio-economic determinants of performance. The work was done in collaboration with IRD, *Société d'aménagement et d'exploitation des terres du Delta du Fleuve Sénégal et des vallées du Fleuve Sénégal et de la Falémé* (SAED), CIRAD and *Institut sénégalais de recherches agricoles* (ISRA).

Of particular concern to Fraval was the 'most satisfactory' way to release water from the Manantali dam to accommodate conflicting water uses (primarily agriculture and planned hydro-electric power generation); the relative economic importance of modern irrigated and traditional flood-recession agriculture; and, the capacity of irrigated agriculture to generate enough income to sustain itself.

The Manantali dam in the upper valley (in Mali) was completed in 1987 and controls 40–60% of the water flow of the Senegal River, the rest coming from

Cemagref

Cemagref is a French public research institute, whose work focuses on sustainable development in non-urban areas. It contributes to the conservation and acceptable management of land and water systems, the prevention of associated risks and the development of sustainable economic activity.

Cemagref has four areas of research:

- Hydrosystem functioning
- Water use and waste
- Rural land use and landscapes
- Agricultural and food technology.

The institute has about 1000 employees, of whom almost half are professional engineers and scientists. *Cemagref*'s training role is evident in the presence of PhD students (about 150 at any one time) and long-term trainees (500).

Around 40 scientists belonging to three research units deal with irrigation and drainage issues in France and overseas. A collaborative program called PCSI (*Programme Commun de recherches sur les Sytèmes Irrigués*) has been put in place with CIRAD and IRD to reinforce their scientific production.

Cemagref has been collaborating with the International Water Management Institute (IWMI) for more than 15 years in different locations around the world. This scientific collaboration is supported by the French departments of Agriculture and Foreign Affairs. At present, this collaboration is focusing in West and Southern Africa and involves three scientists posted at IWMI and WARDA.

uncontrolled tributaries. The dam can hold up to 11 billion cubic-meters of water, so its management has direct consequences on downstream users, especially farmers in Senegal and Mauritania. Management of the dammed water is in the hands of a joint venture of the three countries, known as the *Organisation pour la Mise en Valeur du Fleuve Sénégal* (OMVS). From 2002, management was supposed to be carried out with a view to generating 800 Gigawatts of electrical power per year for the urban centers of the countries involved.

Over 125,000 ha of land on the banks of the river in Mauritania and Senegal have been developed for pump-based irrigated agriculture over the past 30 years. Most are small, village-based schemes of less than 50 ha. Much has been done by WARDA in relation to irrigated rice production in the Senegal River valley, and much of it is reported in the pages of these Reports. In summary, rice is the main crop and is grown primarily in the rainy season, although dry-season vegetable (onion and tomato) production is increasing. Average rice yields are 4–5 tonnes/ha, but highly variable among farmers and schemes. Especially in Senegal, the State has withdrawn from subsidizing irrigation schemes, which are now managed by farmers' organizations. Many schemes are now run at an economic loss, because of high management costs, but they are also plagued by unsustainable practices and generally poor management. Domestic rice is also beset by marketing problems in the liberal world trade market. Cropping intensity (land cropped per year) is consequently low, at about 60% compared to a potential of 200%. "However, irrigated agriculture is by far the major agricultural activity in terms of production value and global revenues," says Fraval.

Meanwhile, flood-recession agriculture (i.e. growing crops after the river floods and recedes) in the depressions of the floodplain is practised by 70% of rural households, who have been growing sorghum and other crops for centuries (rice is a relatively recent crop in the Sahel). "This production system is highly irregular," explains Fraval, "as the flood has covered anywhere between 20,000 and 300,000 ha of the floodplain annually between 1950 and 2000." However, this type of agriculture is profitable for the farmers, since they apply no external inputs and use seeds from the past season.

So, what—in Fraval's opinion—is the best management option for the Manantali dam? "As can be seen," he says, "it is a highly complex issue, with the three main options being hydro-electric power, irrigated and flood-recession agriculture." The first question is perhaps to look at the irrigated versus recession agriculture. With best cropping practices, farmers can produce 7.5 t/ha in one season with irrigation, giving a net income of US$ 470 per hectare—clearly, on paper, this is by far the most profitable use of the river valley. "However," says Fraval, "the residents of the floodplain are extremely averse to risk. They will invest time in something that will not cost them anything other than time but guarantees food for the family, rather than invest in potentially profitable farming." An analysis of 25 years of flood and recession-farming data showed the area of the latter directly related to the area of the former. "It is apparent," Fraval continues, "that when there is enough water, the first choice of very many farmers is to grow sorghum after the flood."

In addition, the team showed that it would be very difficult to successfully promote irrigated rice production in the current set-up of schemes managed by farmers' cooperatives. "Sustainability is crucial to the long-term viability of irrigation schemes," says Fraval. "With present non-sustainable practices, 99% of schemes make a profit on average; however, when we modeled using sustainable practices, we came up with a figure 31% of schemes making a loss!"

So, the team considers that, given the risk of lack of sustainability of irrigated agriculture, it is a wise option to release water from the Manantali dam with a view of enabling floods and the associated flood-recession

agriculture. The next question is: how does hydropower come into the picture? It seems that the main question comes down to whether OMVS will insist on maximizing hyro-electric power. The team's report says, "maximizing hydro-power (or hydro-electric power) would require keeping a relatively high water-table in the reservoir, which is not compatible with releasing a lot of water in the middle of the rainy season, when the reservoir is filling." Reservoir management simulation has been difficult in the past, but IRD developed a computer model in 2001. On the historical data of 1970 to 2000, the model predicted that water for recession agriculture on 45,000 ha could be guaranteed every year, while generating 96% of the desired hydro-electric power. So, it seems that flood-recession agriculture and hydro-electric power generation are not incompatible, so long as one does not try to maximize the hydro-electric output.

OMVS only makes money from hydro-electric power and irrigated agriculture. Without state intervention or a complete reversal of attitude from the farmers, irrigated agriculture is not going to expand. Thus, it will be tempting for OMVS to maximize its revenues from hydro-electricity. "Without a flood, recession agriculture cannot occur," explains Fraval. "If the flood is prevented, it is likely that many farmers will move away from the area. Conversely, if farmers could be encouraged to invest in some inputs in the recession crop, then their profit margins could be significantly improved! In conclusion, with a balanced approach based primarily on actual and not just potential (on paper) performance, it is possible to achieve real integrated water management in the Senegal River valley."

Informal collaboration in the Senegal River valley

Marco Wopereis took up the position of Agronomist in WARDA's Sahel Irrigated Rice Program in October 1994. As part of his opening gambit, he visited the offices of the then *Institut français de recherche scientifique pour le développement en coopération* (ORSTOM, now IRD) in Dakar, where he met Pascal Boivin. Discussions quickly turned to soil degradation in the Senegal River delta, and possible collaboration.

"Even though no common project was ever defined, the collaboration with ORSTOM/IRD was highly productive, especially in terms of journal articles," says Wopereis, now Program Leader with the International Fertilizer Development Center (IFDC-Lomé).

"We went on a tour of the Senegal River valley," continues Wopereis, "including a memorable trip to Foum Gleita—this place is really in the middle of nowhere, a moon landscape, then about 4 hours rocky drive from Kaedi, and Kaedi at least 11 hours from St-Louis!" Despite the distance, the two decided that the site would make a good field laboratory for soil-degradation work, mainly because of signs of alkalinity in the field—described by Wopereis as "soapy-tasting white salts on the soil surface." Wopereis then wrote a project proposal that was funded by the UK Department for International Development (DFID), and Piet van Asten was sent as Associate Expert by the Netherlands Directorate General for International Cooperation (DGIS).

"The collaboration itself took the form of joint field and laboratory trials on both sides of the Senegal River—that is, Senegal and Mauritania," continues Wopereis. The teams also collaborated on simulation modeling of soil-degradation processes under irrigation. "We particularly investigated the types and rate of the processes involved, and the buffering capacity of the soils," Wopereis concludes.

After the departure of both Boivin and Wopereis from Senegal, van Asten and Claude Hamecker continued the informal WARDA–IRD collaboration at Foum Gleita, with some extra input from IRD's Laurent Barbiero. The rest, as they say, is history—*see* 'A Holistic Approach to Irrigated Rice Farming Problems

Uncovers More Than Just Soil Degradation,' *WARDA Annual Report 1999*, pages 30–37, and 'Donor Country Profile: The Netherlands — Soil degradation in irrigated rice fields in the Sahel,' *WARDA Annual Report 2001–2002*, pages 57–60.

Interspecific hybridization research

At the turn of the Millennium, WARDA's biggest project—both in terms of funding and media attention—was the Interspecific Hybridization Project (IHP) that boosted the development and dissemination of the 'New Rice for Africa,' or NERICA, varieties. This project involved a broad range of partners, among which may be numbered IRD. The team leader at IRD was (and is) Alain Ghesquière.

One major achievement of the WARDA–IRD collaboration was the establishment of a molecular biology laboratory at WARDA's headquarters at M'Bé (*see* 'Molecular Biology Facilities at WARDA,' *WARDA Annual Report 1999*, pages 16–21).

IRD has been developing a population of NERICA lines based on a single cross between an *Oryza glaberrima* and released *O. sativa* variety IR64. "The idea," explains Ghesquière, "is to provide a permanent resource for the evaluation of variation provided by *glaberrima*." One extremely useful outcome was the discovery that among 52 lines tested, fragments of almost the entire *glaberrima* genome were conserved in NERICA lines (one extremity of chromosome 10 was *not* represented)—this shows the value of the exercise in providing full *glaberrima* representation in the NERICA material. In 2001, initial field evaluations were conducted at WARDA's Sahel Station for plant architecture, plant type, panicle structure and precocity. Recently, IRD–IHP project staff M. Lorieux was outposted to *Centro Internacional de Agricultura Tropical* (CIAT) in Colombia, where he will evaluate the material under Latin American conditions.

A major problem for lowland-rice farmers in the sub-region is rice yellow mottle virus (RYMV). Achieving good resistance to this disease is a high priority for both the NERICA work and the biotechnology work in general. Back in 1999, Marie-Noëlle Ndjiondjop finished her PhD at IRD having identified a genetic marker associated with high resistance to RYMV in *sativa* variety Gigante. Since then, Ndjiondjop has become WARDA's Molecular Biologist and the work has continued at both IRD and WARDA to pave the way for efficient marker-assisted selection of RYMV-resistant material. The subsequent identification of additional markers even closer to the target resistance gene helped confirm that the resistance in Gigante and that in several *glaberrima* lines are the result of different alleles (genes at the same site in different individuals). Other sources of RYMV resistance and associated markers have been identified on other chromosomes.

The next stage is for markers to be used to speed the breeding process. In fact, the work began at IRD almost as soon as the Gigante resistance was characterized and had an available marker. "There are some obviously favorite varieties among lowland-rice farmers in the various countries of the region," explains WARDA Lowland Rice Breeder Howard Gridley. "For example, Bouaké 189 in Côte d'Ivoire, and Jaya in Senegal." For this reason, WARDA and IRD are targeting three of the most popular lowland varieties with the aim of incorporating RYMV resistance into plants that are otherwise identical to the current released versions. As time goes on, the new markers are introduced into the system to improve the efficiency of selection. In 2002, lines carrying various combinations of resistance genes were available for testing. The proposal is to release such material to the national programs for in-country evaluation, with the prospect of increased diversity being introduced into the varietal portfolio.

Nematodes

Several *glaberrimas* are highly resistant to nematodes, while all tested *sativas* have proven susceptible. Preliminary studies of first-backcross NERICA lines have shown that nematode resistance is conferred by a single gene. Mapping of the gene and an associated marker are opening up opportunities for marker-assisted selection for nematode resistance. The International Rice Research Institute (IRRI) is working with the same material to test for resistance to another species of nematode under Asian conditions.

IVC in the *WARDA Annual Report*

'Tooling Up for Inland Valley Development,' *WARDA Annual Report 1996*, pages 39–43.

'Technology Generation and Dissemination: The Role of Agro-ecological Characterization,' *WARDA Annual Report 1998*, pages 23–31.

'Donor Country Profile: The Netherlands — Inland Valley Consortium—A long-standing partnership,' *WARDA Annual Report 2001–2002*, pages 54–57.

Inland Valley Consortium

"France is a very faithful donor to IVC [the Inland Valley Consortium]," says former IVC Scientific Coordinator Marco Wopereis, who left WARDA in 2002, "they form part of the core group with The Netherlands that has supported IVC since the start."

The IVC has featured regularly in the pages of WARDA's annual reports, including a section in last year's *Donor Country Profile* on The Netherlands (*see* Box 'IVC in the *WARDA Annual Report*').

Like The Netherlands, French funding to IVC used to be through a special project, but has recently become an 'attributed' allocation from France's core contribution to WARDA. Also like The Netherlands, French money has been used rather as 'core' funds for the IVC itself. Former IVC Regional Coordinator Marie-Jo Dugué (2000–2002) explains: "French funding has been mainly used to support facilitation, communication, exchanges between members … particularly for RCU [Regional Coordination Unit, hosted at WARDA] operating costs, annual workshops, publication and translation expenses, and training for IVC members." Dugué's position as Regional Coordinator is funded directly by France; it is a seconded position from *Coopération française*, as it was in the time of Dugué's predecessor, Jean-Yves Jamin (1995–1999).

Both Dugué and Wopereis are firm believers that the Dutch–French combination in the Regional Coordination Unit works well. Wopereis says: "In the two years we worked together in the IVC, we were able to move the Consortium to a second phase." Meanwhile, Dugué propounds the partnership

Members of the IVC National Coordination Units of Benin and Togo discuss the diversity of inland-valley characteristics in Togo, July 2001

Scene from an IVC monitoring tour, Gagnoa, Côte d'Ivoire, November 2001

Members of the IVC National Coordination Unit of Burkina Faso at the inland valley of Bletou, November 2001

Former IVC Regional Coordinator visiting a local radio station in Benin: local radio is a good means of communicating development messages to rural communities. This radio station is close to IVC key sites Gankpetin and Gomè, July 2001

facilitation brought by an Anglophone Dutch Scientific Coordinator (!) and a French Regional Coordinator: "IVC is an efficient Anglophone–Francophone network, covering both south–south and north–south exchanges."

Major developments within the Consortium in 2002 comprise the first annual Consortium meeting to be held outside of Côte d'Ivoire (at Abomey, Benin, in March) and the adoption of Participatory Learning and Action Research (PLAR) as the farmer-learning and extension methodology of choice for the whole of IVC (*see* 'Participatory Learning and Action Research for Integrated Crop Management in Inland Valleys,' pages 23–32 for further details).

"Dugué left WARDA in December 2002," says Director General Kanayo F. Nwanze, "leaving a hole in IVC and WARDA. However, we have assurances from the French Government that they wish to continue funding—and filling—this post. So, we are looking forward to our third IVC Regional Coordinator with anticipation!"

Geographical Information Systems and other Information Technology: Training Program at CIRAD

Geographical Information Systems (GIS) Research Assistant Mahaman Moussa visited France as part of CIRAD's training program in 1998–99 and again in May–June 2001. The training came at an ideal time for the IVC, as it moved towards standardizing and disseminating results from agro-ecological characterization work conducted during its first phase. "The training covered two main topics," explains Mahaman, "first, remote-sensing and, second, development of an information system for inland valleys in the sub-region." (Additional details of the work were presented as part of the 'Donor Country Profile' on The Netherlands in the 2001–2002 Annual Report.)

"The training activities gave me the opportunity to learn more about a rapidly advancing science," explains Mahaman, "and additional skills with which to assist WARDA and its partners." Direct beneficiaries of Mahaman's training to date have been the IVC National Coordination Units of Benin, Mali and Togo; Guinea will also benefit later in 2003. The opportunity thus provided by Mahaman's training has resulted in continued GIS collaboration between WARDA, IVC and CIRAD. Writing in a 1999 issue of CIRAD's newsletter, supervisor Michel Passouant said, "For CIRAD, this type of project is very interesting. It is a framework for mutual exchange of expertise. Our experiences and competencies in the fields of GIS, database management and multimedia have contributed [to the project's] success. In addition, this sets up a new collaboration with IVC and the subject could be of interest to other countries."

Training

WARDA has a long history of training collaboration with France, no doubt fuelled in part by the fact that so many people in the region are Francophones. In the early 1990s, at least six students pursued postgraduate training at the then *Institut supérieur technique d'outre-mer* (now *Ecole supérieure de Cergy-Pontoise*,

ISTOM) in subjects as diverse as agronomy, pathology, physiology and varietal improvement. WARDA also has a track record for training long-term collaborators and staff through French institutions.

In 1993, WARDA Pedologist (soil scientist) Sitapha Diatta began his PhD research with the University Henri Poincaré Nancy I on 'soil and hydrology in two topographical sequences in Côte d'Ivoire.' The research was sponsored by the African Development Bank. In 1995, Diatta took a year's sabbatical to complete studies and write-up in France, and then submitted and defended his thesis in 1996. The value to WARDA was clear and Diatta was duly promoted to associate principal staff Soil Physicist in 1997.

Yacouba Séré joined WARDA as Plant Pathologist in September 1997. By then, he already had quite a history of French-based training. After his *Maîtrise en Biologie Végétale* at Dijon University in France in 1973, he received a two-year fellowship from his country (Burkina Faso) for a post-graduate diploma in plant pathology. He then received a special extension for him to complete his *Doctorat 3e cycle* (PhD equivalent) in '*Amélioration des Plantes – Option Phytopathologie*' in 1977. While he was still with his national program in Burkina Faso in 1994, WARDA assisted in obtaining funding from the African Development Bank to allow him to conduct a bio-ecological study of rice blast fungus in Burkina Faso as the last part of his *Doctorat d'Etat es Sciences*, which he successfully defended at Abidjan University in 1999.

National partners have also benefited from WARDA collaboration with France. In particular, Souleymane Nacro studied African rice gall midge at the University of Rennes I, N'Guessan Placide studied rice yellow mottle virus (RYMV) at the University of Montpellier (with African Development Bank funding), and Sié Moussa studied the effects of thermal constants on irrigated-rice varieties also at the University of Montpellier (again with African Development Bank funding). Sié's work was mentioned in last year's Report (*see* 'Breeding Rice for the High-Potential Irrigated Areas — Working together: WARDA and Burkina Faso,' *WARDA Annual Report 2001–2002*, page 23).

More recently, CIRAD sent Violaine Bousquet from the *Institut national polytechnique de Nancy* to work with Alain Audebert on root penetration in rainfed-rice cultivars. WARDA and IWMI supported Frédéric Larbaigt's study of sustainability and maintenance of irrigated rice schemes in the Senegal River floodplain at the *Ecole nationale Génie de l'eau et de l'environnement de Strasbourg*. Meanwhile, Séré is supervising student Sorho Fatogoma, who is conducting RYMV research at IRD, Montpellier.

Core staff and people in high places

Thierry Cadalan served WARDA as Molecular Biologist from 1997 to 1999 (*see* 'Molecular Biology Facilities at WARDA,' *WARDA Annual Report 1999*, pages 16–21). Frédéric Lançon was WARDA's Policy Economist from 1999 to 2003 (*see* 'Policy Dialog in Rice Food-Security in West and Central Africa,' *WARDA Annual Report 2001–2002*, pages 38–45). In 2002, WARDA recruited French-national Aline Lisette-Vidal as Head of Training, Information and Library Services. Lisette-Vidal has had a couple of busy years [doesn't everyone in WARDA?—Ed.] bringing training activities into a coherent system after several years of staff and other resource shortages. "It was only in 2001 that the decision was made to combine the three disparate support units under a single head," explains Director General Nwanze. Previously, the units had reported through the Program Division, but their mandates clearly extended beyond research alone. Lisette-Vidal has brought much-needed order, particularly to the training side, and WARDA can look

forward to renewed energy as it seeks to upgrade the capacities of its various partners.

Henri Carsalade, Assistant Director General, Food and Agriculture Organization of the United Nations (FAO), was Chairman of the Board of Trustees from 1992 to 1993, then Remi Pochat, *Directeur Scientifique*, *Laboratoire Central des Ponts et Chaussées* (LCPC), joined the Board in 2001.

Future

The relationship between WARDA and France is perhaps one of the longest between the Association and a donor institution. With a membership of 17 West and Central African countries, 11 of which are Francophone, it is not surprising that WARDA capitalizes on the rich human resources within French institutions with wide-ranging experience in agricultural research and development in the sub-region.

Apart from secondment of scientists to call on, special project activities, collaboration between 'north' and 'south,' and joint supervision of research scholars, WARDA has also tapped the French pool of experience as evident in the number of core staff that have been with the Center since the early 1990s. The continued support by the French Government for the position of the IVC Regional Coordinator testifies to this long relationship and the assurances that in spite of the temporary dislocation due to the Ivorian crisis, the new coordinator has been identified and should be on board later in 2003. Thus, the hole in the IVC created by the departure of Marie-Jo Dugué in December 2002, is about to be filled and, in the words of Director General Nwanze, "nature allows no vacuum."