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STRENGTHENING NATIONAL AGRICULTURAL RESEARCH SYSTEMS IN AFRICA THROUGH COLLABORATIVE RESEARCH NETWORKS.

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Africa Rice Network Project

Final Report

(September 1993 - September 1994)

1 Introduction

1.1 WARDA's Rice Task Forces

To have significant impact, WARDA requires the collaboration of strong national programs both in technology generation and to adapt results to particular rice growing environments. It is also clear that the long-term needs for rice research in the region can ultimately only be met by a greatly strengthened capacity of and cooperation among national programs. For this reason, WARDA's strategy posits partnership with member states as one of its basic institutional values, and the strengthening of their research capabilities as one of its principal objectives.

To ensure that WARDA's plans for collaboration meet the needs of national programs, WARDA has institutionalized a series of consultative mechanisms to fully involve national scientists in the planning, execution, and review of its collaborative research activities. Task Forces are the central component of the consultative process with national programs, and the basic unit for planning and conducting collaborative work within the regional rice research system. Task Forces are composed of all NARS rice scientists in the region who are working on closely related thematic problems in similar agroecologies. To date, the following eight Task Forces have been established: (1) Mangrove Swamp Rice, (2) Upland Rice Breeding, (3) Lowland Rice Breeding, (4) Integrated Pest Management, (5) Sahel Irrigated Rice, (6) Cropping Systems, (7) Problem Soils, and (8) Rice Economics.

Task Forces are self-managing, with Steering Committees composed of and chaired by national scientists. WARDA has played a catalytic role by providing the initiative and logistical support for Task Force members to hold planning and review meetings.

Task Forces carry out four general functions: (1) research planning, (2) technology development and transfer, (3) dissemination of information, and (4) allocation of assistance for regional research activities. Each Task Force has developed a regional master plan to serve as a basis for task sharing. To develop this plan, members began by identifying the priority constraints to rice production within their respective thematic areas. After reviewing past research, regional research priorities were established, and the relative strengths and weaknesses of each national program in the priority research areas were critically examined.

On the basis of these analyses, specific tasks have been allocated to various national programs, with responsibilities corresponding to national comparative advantages. Programs

with strengths in particular research disciplines were identified to play a lead role working with WARDA in advanced research and to generate new technologies for the benefit of the entire region. All national programs participate in the testing of new technologies and in the exchange and dissemination of research results.

1.2 The Africa Rice Network Project

WARDA had received donor support to develop and initiate the Task Force mechanism. However, by 1993 as the number of Task Forces expanded and new collaborative opportunities were identified, severe resource constraints emerged. The Africa Rice Network Project was developed and submitted to USAID for funding. The purpose of the Project was to supplement existing donor commitments to allow WARDA to expand and deepen its collaboration with national programs.

The goal of the Africa Rice Network Project is to strengthen the rice science capacity in West Africa on a sustainable basis by enabling national research programs to jointly plan and execute coordinated and complementary research activities for the generation and testing of improved rice production technologies in the sub-region.

The project has seven essential components: (1) annual Task force planning and review meetings, (2) regional monitoring tours, (3) in-trust funds to provide small grants to NARS in the conduct of Task Force activities, (4) an administrative assistant to help manage Task Force projects and reports, (5) visiting scientist fellowships for short-term training of national researchers, (6) bi-annual rice research symposia to strengthen the scientific level of communication in rice research, and (7) institutional support to the Rice Research Station in Sierra Leone to enable it to take over major regional responsibilities in technology generation research for the mangrove swamp environment.

2 Project Accomplishments

USAID grant funds received by WARDA for rice network activities during the period of September 1993 to September 1994 were used to support: (1) direct costs of annual plenary meetings and Steering Committee workshops for all eight WARDA Task Forces, (2) direct costs for participation of African scientists in three regional workshops, (3) in-trust funds through which small grants were provided to national programs to conduct regional research projects approved by Task Forces, (4) travel and subsistence costs for participation of the rice scientists in regional monitoring tours, (5) travel and subsistence costs for national researchers under visiting scientist status at WARDA, (6) institutional support to the Rice Research Station in Sierra Leone, and (7) project management and logistical support costs.

2.1 Annual Planning and Review Meetings

Project funds were used to organize plenary and Steering Committee meetings for all eight WARDA Task Forces from February to May. These meetings permitted rice researchers

from national programs to examine results of Task Force activities executed in 1993, reassess regional rice research priorities, and develop coordinated plans of action for 1994. Details on these meetings are presented in Table 1.

Table 1: **Task Force Meetings Supported by USAID Under Africa Rice Network Grant, September 1993 - September 1994.**

Task Force	Meeting	Venue	Dates	Participating Countries
Economics	Annual workshop	Bouake	18-21 February	15
	Steering Committee	Bouake	6-8 April	4
Problem Soils	Annual workshop	Bouake	28 Feb - 1 Mar	12
	Steering Committee	Bouake	6-8 April	5
Cropping Systems	Annual workshop	Bouake	2-4 March	12
	Steering Committee	Bouake	6-8 March	5
Upland Rice Breeding	Annual workshop	Bouake	5-7 March	15
	Steering Committee	Bouake	11-13 March	3
Lowland Rice Breeding	Annual workshop	Bouake	8-10 March	15
	Steering Committee	Bouake	11-13 March	4
Mangrove Swamp Rice	Annual workshop	Bouake	11-12 March	6
	Steering Committee	Bouake	11-13 March	4
Integrated Pest Management	Annual workshop	Bouake	13-15 March	14
	Steering Committee	Bouake	11-13 April	5
Sahel	Annual workshop	Segou	21-24 March	5
	Steering Committee	St. Louis	24-26 May	3

The objectives of the Steering Committee meetings were to: (1) review progress reports of Task Force projects undertaken in 1993, (2) review and endorse NARS research proposals for work in 1994, (3) allocate research support funds to these activities, and (4) discuss and take decisions on any other Task Force related issues (training, project monitoring plans, equipment, etc.). One hundred forty seven projects for a total fund request

of $493,405 were submitted to the Steering Committees of WARDA's Task Forces; 110 projects were approved for Task Force supplementary funding of $269,758.

Fifty one Task Force projects amounting to $120,000 were supported by USAID funds. The breakdown by Task Force of research proposals reviewed for funding and the number and grant level of projects supported by the USAID Rice Network Project are shown in Table 2. Details on the projects approved for USAID support are provided as an appendix.

Table 2: Results of Research Proposal Reviews by Task Force Steering Committees

Task Force	Total Projects		USAID Support	
	Submitted	Approved	Projects	Funds ($)
Mangrove Swamp Rice	14	8	8	24,750
Upland Rice Breeding	18	15	-	-
Lowland Rice breeding	18	16	11	24,200
Integrated Pest Management	46	28	12	24,460
Cropping Systems	19	16	15	28,990
Sahel Irrigated Rice	12	10	5	13,155
Problem Soils	10	9	-	-
Rice Economics	10	8	SHAZAM[1]	4,445
Total	147	110	51	120,000

2.2 Regional Workshops

Project funds also financed the participation of 14 West African scientists in three regional workshops (Workshop on Regionalization of Research in West and Central Africa, Banjul, Gambia: 14-18 March; Sahel Irrigated Rice Breeding Methodology Workshop, Saint-Louis, Senegal: 24-26 May; and The Impact of Structural Adjustment Programs on the West African Rice Economy, Bamako, Mali: 6-10 June). These workshops focused on the coordination of regional agricultural research and the measurement of research impact.

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[1] a computer software recommended for economic studies

2.3 Collaborative Research Projects

With USAID support, 51 collaborative research projects were developed and are being conducted by African scientists in 13 countries (Benin: 4; Burkina Faso: 5; Cameroon: 3; Chad: 1; Gambia: 2; Ghana: 2; Guinea Bissau: 4; Mali: 2; Niger: 1; Nigeria: 14; Senegal: 4; Sierra Leone: 8; Togo: 1). Project funds were also used to equip national programs with "SHAZAM", a computer software recommended for economic studies. Those projects are additional to the routine research undertaken within national programs and are characterized by their significant regional spillover benefits. Projects include breeding improved rice plants for resistance/tolerance to drought, iron toxicity, blast and other major fungal diseases, African rice gall midge, rice yellow mottle virus, control of weeds and major insect pests (*Chilo zacconius, Orseolia oryzivora*) and nematodes (*Hirschmanniella spinicaudata, H. oryzae*), and research on sustainable rice based cropping systems. Details of projects supported by USAID funds are presented as an appendix.

The following are highlights results obtained and/or disseminated through the regional collaborative research program.

2.3.1 Achievements in Varietal Improvement

- **Mangrove Swamp Rice**: varieties were screened for high grain yield and tolerance to salinity and acidity; six promising entries were identified by national programs.

- **Upland Rice**: forty-five promising entries were identified as best at more than two locations for grain yield (11), drought resistance (10), blast resistance (10), acidity tolerance (14).

- **Sahel Irrigated Rice**: twelve promising entries were identified for grain yield (8) and salinity tolerance (4).

- **Lowland Rice**: forty-six promising entries were identified for grain yield (16), drought resistance (8), deep water ecology (7), disease resistance (6) and iron toxicity tolerance (6).

2.3.2 Achievements in Pest Management

Entomology

Inventory of insect pests:

- **Mali**: Task force survey found that 90% of rice insect pests are stem borers; two dominant species were identified: *Maliarpha separatella* and *Chilo zaconnius*.

- **Niger**: Task Force survey confirmed that major insects pests are: *Orseolia oryzivora, Diopsis spp., Aleurocybotus indicus* (causing 80% of yield loss), and *Trychispa sericea.*

- **Ghana**: *Maliarpha separatella* was identified as the major insect pest.

Biology studies:

- **Burkina Faso**: rearing procedures for ARGM and the parasitoïd (*Tetrastichus pachydiplosisae*) were tested.

Pest control:

- **Nigeria**: cultural control methods of ARGM incidence were tested.

- **Mali**: a new predator (*Paederus fuscipes*) against stem borers was identified.

- **Guinea**: chemical control methods (use of Diazinon 60 EC and Homei 500 G) of six insect pests (*Diopsis longicornis, Orseolia sp., Nymphula sp., Sesamia calamistis, Diacrisia scortilla, Chilo zaconius*) were tested.

Nematology

- **Burkina Faso**: *Hirschmaniella spinicaudata* was identified as the predominant species in irrigated rice.

Pathology

Blast:

- **Varietal resistance**: WAB 56-125, WAB 56-39, WAB 56-30, WAB 56-104, FARO 37 were identified as highly resistant varieties.

- **Biological control**: various *Trichoderma spp.* that are potential antagonist against P. Oryzae were identified.

- **Chemical control**: Kitazin and Topsin M70 WP were tested in Guinea.

Rice Yellow Mottle Virus:

- **Varietal resistance**: Moroberekan, Seberang Mer77, and MR77 were the highest resistant varieties identified in Mali.

Leaf Scald:

- **Sierra Leone**: a Task Force survey estimated yield losses due to leaf scald at 24 - 38%.

Weeds:

- **Senegal**: Plot submersion resulted in significant control of *Paspalum scrobiculatum, Ischaenum rufosium, Oryza barthi*; low humidity resulted in 0% germination for *Ammania auricula*.

- **Guinea**: good control of Rottboelia escalata was obtained with the use of SATURNIL.

2.4 Regional Monitoring Tours

Multi-disciplinary Task Force Monitoring tours were organized in September in Cameroon (3 - 10 September), Guinea and Sierra Leone (3 - 10 September), Mauritania and Senegal (17 - 23 September). Twenty three scientists from national programs, 12 WARDA scientists and the Coordinator of INGER Africa participated in the tours. The tours gave participating scientists the opportunity to observe farmers' constraints over a range of conditions, to evaluate the performance of improved technologies in Task Force trials, and to better assess the research capacities of other national programs. Details on these monitoring tours are presented in Table 3. The following are the major conclusions and recommendations of the tours.

2.4.1 Multi-disciplinary Task Force Monitoring Tour to Guinea and Sierra Leone

After a lengthy visit to rice research and extension organizations and farmers' fields, and a thorough discussion with national scientists, farmers, and extension personnel in Guinea and Sierra Leone, the following major conclusions and recommendations were formulated by the team.

2.4.1.1 Guinea

2.4.1.1.1 Conclusions

1. Guinea seems to have a tremendous potential for increased rice production. However, in upland soils, continued rice-groundnut-cassava rotations under shortened fallow period would result in a permanent degradation of the resource base; also soils in Lowland ecosystems, were poor. The unavailability of mineral fertilizer was another soil fertility issue noticed by the team. Iron toxicity seemed to be a major production constraint in lowland fields.

2. Major insect pests observed in the lowland ecosystem were *Locris, Diopsis, Chnootriba,* and *Nymphula depunctalis*; whereas, in the upland, *Chnootriba similis, Nymphula depunctalis,* and *Aspavia* were considered the major insect pests.

3. The pressure on lands was increasing due to population growth and settlement of Liberian refugees.

2.4.1.1.2 Recommendations

1. Soil conservation measures (improved fallow, legume use etc.) and nutrient replenishment of the amounts removed (mostly P and K) were highly recommended. A stronger link with the Cropping Systems Task Force and training of national scientists in insect and weed identification, as well as laboratory and field experimentation methods were also suggested.

2. It was suggested that promising varieties for iron toxicity tolerance be screened in Kamalo, Yattia, Kilissi and De Bamba. Suakoko 8, an iron toxicity tolerant variety with taller plant type that responds well under low inputs conditions was recommended for distribution to the farmers.

2.4.1.2 Sierra Leone

2.4.1.2.1 Conclusions

1. Soils in Sierra Leone appeared to be less degraded. Less intensive cropping systems and the abundance of wild-growing legumes (mostly Calopogonium) in the weedy fallow might account for the apparently better soils.

2. Sierra Leone has a relatively strong national research program. Soil fertility conservation (valley cropping, legume rotations, and fallow management), lowland production intensification and inland valley swamp characterization were research priorities for both national and Task Force research programs.

3. A species of *locris*, not currently in the WARDA collection, and a beetle, *Chnootriba similis,* were fairly abundant in Sierra Leone. Severe outbreak of African rice gall midge (ARGM) was observed in the lowland ecosystem at Mawirr, near Rokupr.

2.4.1.2.2 Recommendations

1. Soil improvement studies involving recycling of crop residues, green manuring, appropriate crop rotation systems and the planting fast of growing nitrogen fixing leguminous shrubs in fallow plots should be emphasized.

2. IPM scientists in Sierra Leone should make pest observations on the experimental plots of other scientists to increase research efficiency. The current gall midge

infestation at Rokupr was a case in point where an evaluation of the breeder's trials might help identify sources of gall midge resistance.

2.4.2 Multi-disciplinary Task Force Monitoring tours to Cameroon

This tour was initially planned for Cameroon and Nigeria. However, due to the political situation in Nigeria at the time of the visit, and the logistical problems consequently anticipated, the visit to Nigeria was canceled. The team visited various rice research and extension activities in Cameroon; the major conclusions and recommendations formulated by the team are summarized below:

2.4.2.1 Conclusions

1. Weed infestation was a major production constraint; the principal species were *Rottboellia cachinchinensis, Ageratum canyzoïdes, Imperata cylindrica, Pennisetum sp and Chromolaena odorata* in upland ecosystems. In lowland ecosystems, *Leersia hexandra, Cyperus difformis, Spheneclea zeylanica, Echinochloa sp and Scipus sp* were the major species found.

2. Numerous insect species that caused plant damage were observed; the dominant species was *Diopsis spp*. Rice blast and leaf scald were the major diseases identified by the team.

3. The major production constraints identified during the tour were the lack of appropriate post harvest technologies and high yielding varieties tolerant to diseases, cold and drought.

2.4.2.2 Recommendations

1. The team suggested the introduction of rotary weeders, and portable rice threshers and mills; the conduct of on-farm studies of rice blast, herbicides application, and studies of adoption of modern varieties were also suggested.

2. The team also recommended a stronger link between the Cameroon program and the Sahel Irrigated Rice Task Force, particularly in the area of genetic materials exchange.

3. Pathology training at WARDA for a national technician working in the breeding program, as requested by Cameroon, was endorsed by the team; the team felt that such training would better prepare the Cameroon program to properly address the major disease problems, particularly in the northern part of Cameroon.

2.4.3 Multi-disciplinary Task Force Monitoring Tour to Senegal and Mauritania

This tour was particularly focused on irrigated rice varietal improvement. The following are major findings and recommendations of the scientists who participated in the tour.

2.4.3.1 Mauritania

2.4.3.1.1 Conclusions

1. Large private farms, producers' organizations, high costs of production and liberalized markets were the principal characteristics of rice farming in Mauritania; the most popular varieties used by farmers were JAYA, IR 28, TN1, IR 1561-228, BG 90-2, and IKP.

2. The lack of adapted varieties for the second season rice crop, and excessive soil salinity and alkalinity were the major production constraints identified by the team.

2.4.3.1.2 Recommendations

1. The team recommended more emphasis on on-farm varietal trials using the best varieties identified through the multi-locational testing program.

2. The team also suggested that more research work be conducted on the recuperation of soils degraded by salinity and alkalinity.

2.4.3.2 Senegal

2.4.3.2.1 Conclusions

1. The most popular rice varieties were JAYA for the wet season and IKP for the second season; other characteristics of rice production in Senegal were the high level of mechanization of production activities, and the high number of producer organizations.

2. Poor water control systems, insecure land tenure, the use of poor quality seed, soil salinity, and the lack of a credit system were the major production constraints identified by the team.

2.4.3.2.1 Recommendations

1. The team was pleased to notice that major production constraints in Senegal were research priorities at both WARDA and ISRA; however, they felt that closer

collaboration between these two institutions would produce better results.

2. In the allocation of collaborative research activities, ISRA should assume a greater share of responsibility for on-farm research.

Table 3 **Monitoring Tours Supported by USAID Under Africa Rice Network Grant, September 1993 - September 1994: Number of participants by country/institution.**

Participating Countries or Institutions	Monitoring Tours			
	Cameroon 3 to 11 September	Guinea-Sierra Leone 3 to 11 September	Mauritania - Senegal 17 to 23 September	TOTAL
Benin	1		1	2
Burkina Faso	1			1
Cameroon	4			4
Ghana		1		1
Guinea		1		1
Mali	1	1	1	3
Mauritania			1	1
Niger			1	1
Nigeria	2	1		3
Senegal	1		1	2
Sierra Leone	1	2		3
Togo	1			1
WARDA	4	5	4	13
INGER/IITA		1		1
Total	16	12	9	37

2.5 Visiting Scientist Program

With financial support from the USAID Africa Rice Network Project, three fellowships were awarded to african scientists to support short-term training in special research areas and/or to work with special equipment not available within their own national program.

- The first fellowship was awarded to a young researcher from Togo; he traveled to WARDA for the period 16 February to 16 March, 1994, where he conducted a literature review and worked with WARDA scientists to develop a methodology and project proposal to determine the genetic traits of upland rice varieties that enhance competitiveness with and tolerance to weed growth.

  The three major conclusion of the literature review were that: (1) limited weed control technologies were available to african farmers, (2) excessive weed infestation contribute an average of 40 % of yield loss on small rice fields, and (3) modern high yielding varieties require cleaner fields.

  Two field trials and one pot experiment were planned in the three year research project (May 1994 to April 1997) developed during the visit. The experiments will compare genetic traits of upland rice varieties that enhance competitiveness with and tolerance to weed growth. The proposal was funded by the African Development Bank and is actually being implemented at WARDA in collaboration with Justus-Liebig University, Giessen, Germany.

- The second visiting scientist was from Ghana. This scientist took up the position of rice breeder at the Savanna Agricultural Research Institute (formerly the Nyankpala Agricultural Experiment Station of the Crop Research Institute) without previous rice breeding experience and had not had the opportunity to interact with his predecessor prior to assuming duties. The Director of the Crop Research Institute therefore considered it essential that individual training focussed on rice breeding methodologies be arranged for him before he took a leadership role in Ghana's rice breeding program. That need was met through the Africa Rice Network Visiting Scientist program.

  He traveled to Mbe, and to Ibadan, Nigeria during 6 to 22 June, and 28 August to 13 September respectively, to work with WARDA scientists to improve his breeding skills.

  He was also nominated to participate in the Genetic Evaluation and Utilization training course organized by WARDA and IRRI at M'bé, Cote d'Ivoire in October 1994.

- The third visiting scientist was from Togo. He worked at WARDA headquarters in

Mbe for the period 9 - 20 September 1994, to identify and select the best genetic materials developed through the WARDA upland rice breeding program for the composition of Task Force trials. M'bé, Man and Khorogo sites were visited.

Segregating populations were the focus of the visit at M'bé; F_3-F_5 populations were evaluated; 104 F_3, 56 F_4, and 2 F_5 (WAB 450-29-2 and WAB 450-14-6-2) populations were selected. In Man he observed and made selection from the following trials:screening F_4 population for tolerance to acid soils; screening varieties/lines with or without P2o5 for tolerance to acidity; the observational yield trial; and screening for resistance to blast were the trials evaluated during the visit to Man. Twenty-five, 24, 7 and 7 varieties/lines were respectively selected during that visit.

Three trials were evaluated at Khorogo: one of F_5 populations, and two observational yield trials (early maturity and tolerance to drought). Three F_5 populations, 23 early maturity, and 10 drought tolerant entries were selected.

The list of materials identified during the visit was published and circulated with the intention that it would be useful to other Task Force members in better planning their research programs.

The visitor formulated two suggestions: (1) considering the volume of segregating materials available at WARDA, national program should save on their breeding program and take greater advantage of results obtained at WARDA; (2) three to four member monitoring tour teams (breeders and pathologists) should be formed to select materials to compose future Task Force trials.

2.6 Institutional Support to the Rokupr Rice Research Station in Sierra Leone

At the fourth meeting of the Mangrove Swamp Rice Task Force held at M'Be, Bouake in March 1994, it was decided that USAID funds should be used to strengthen the capacity of the Rice Research Station (RRS) in Rokupr, Sierra Leone, in order for that institution to play the lead role for mangrove swamp rice technology generation research and to ensure spillover of such technologies to other mangrove areas of the region. Support of $30,000 was given to RRS to conduct research. An additional $10,000 was given for administrative costs of a regional Liaison Scientist based at the RRS, Rokupr. The Liaison Scientist ensures effective regionalization of mangrove swamp rice technology generation work. The RRS operated out-station programs at Walleni, Kabala, Bo, Blama, and Rotifunk to verify on-station research results, demonstrate rice production technologies and produce seed.

The following were the major activities conducted by the Station:

2.6.1 Varietal Development

Two types of varietal development work were carried out at the Rice Research

Station: hybridization and conventional varietal trials.

2.6.1.1 Hybridization

The objectives of the hybridization work at the RRS were to breed improved rice plants with good grain quality for resistance/tolerance to heavy metals (Fe, Mn, Al), toxicity, salinity, acidity, diseases and pests. A total of 40 successful crosses generated 5795 F_1 seeds.

Fifteen F_2 populations were also sown with the objective of selecting plants for appropriate type and duration, with good grain quality (long, slender, etc.), disease and pest resistance/tolerance under natural in[illegible]n at Rokupr. These selected F_2 populations will be advanced to F_3 in the forthcoming se[illegible]. for further selection.

Several selection were made in the F_3 populations for advancement. In addition, 18 fixed line populations (F_6) were distributed to various stress screening nurseries.

2.6.1.2 Conventional Variety Trials

The conventional trials conducted were: (1) three sets of observational trials, (2) the African Mangrove Swamp Rice Observational Nurseries (AMSRON), (3) an advanced yield trial, (4) three sets of multilocational variety trials, (5) two sets of on-farm trials, and (6) direct seeding trial.

2.6.1.2.1 Observational Trial

In the short duration category, two sets of observational trials were screened for adaptation and phenotypic acceptability. The first set comprising 43 entries was put together by RRS with Pa Lahai and ROK 5 as local and improved checks. These were established at Balancera on the Great Scarcies and Moyeamoh on the Bumpeh river in the north and south-west mangrove regions of Sierra Leone. At Balancera, the trial was sown on 04-07-1994 and transplanted on 21-08-1994 in standard replicated plots of four single rows 5m long at a spacing of 20cm x 20cm. Check varieties were replicated after every 20 entries. The second set comprising 26 entries was received from WARDA, Bouake, Ivory Coast and was sown on 15-07-1994, and transplanted on 20-08-1994. The same checks as in the first set were used.

For the medium duration trial, 71 accessions were tested using farmer's cultivars. The trial was sown on 30-06-1994 and transplanted 28-08-1994. Another trial in this category, received from Bouake and comprising 33 entries, was sown on 15-07-1994 and transplanted 28-08-1994. Several selection in situ are in progress for advancement to yield trials.

In the long duration screening set, 51 entries composed by RRS were tested with ROK 10 as the improved check. The trial was sown on 23-06-94 and transplanted on 03-08-1994. In the second long duration trial composed at Bouake, Ivory Coast, 45 entries including ROK

10 were tested for adaptation to the mangrove swamp salinity/acidity conditions. The trial was sown on 13-07-1994 and transplanted on 15-08-1994.

2.6.1.2.2 AMSRON 1994

Two sets of the African Mangrove Swamp Rice Observational Nursery (AMSRON) 1994 of INGER-Africa program were tested for adaptation and phenotypic acceptability at Rokupr and Rotifunk, in the north and south-west mangrove regions of Sierra leone. A total of 100 entries including two checks, WAR 77-3-2-2 (early duration) and ROK 10 (long duration) were sown on 25-07-1994 and transplanted on 19-08-1994. The entries in AMSRON 1994 originated mostly from the earlier WARDA Mangrove Program at Rokupr RRS, Sierra Leone.

2.6.1.2.3 Advanced Yield Trial

An advanced yield trial of five varieties, viz RD 15, Kaolak Gbailie, IR 2856-44-1-1, RP 1064-14-2-3, CR 149-3244-198 and Kuatik Kundur as the improved check, was conducted at Rokupr in randomized complete blocks with four replications. The trial was sown on 13-07-1994 and transplanted 15-08-1994.

2.6.1.2.4 Multilocational Variety Trials

Multilocational variety trials of short, medium and long duration were conducted in both the northern and southern mangrove regions of Sierra Leone. The trials were laid out in randomized complete blocks with three replications. A total of 15 entries including two checks were used in each trial; in each duration category, a farmer's local check and an improved variety were used.

2.6.1.2.5 On-Farm Trials

Two sets of on-farm trials, one from WARDA and one from the Sierra Leonian national program, were conducted during the season. The method used for the national set was a strip plot design with three replications; one strip was fertilized with 60:40:0 kg NPK ha^{-1} and the other strip was not fertilized. The WARDA set was laid out in simple unreplicated plots and fertilized with 20 kg N ha^{-1}.

2.6.1.2.6 Direct Seeding

Farmers are practicing direct seeding in tidal mangrove swamps with use of toxic pesticides to control crabs and birds. These chemicals, however, are also hazardous to humans. The national program is developing safe techniques to use pesticides to promote labour saving direct seeding practices for crop establishment in tidal mangrove swamps. An experiment comparing eight varieties was conducted at three sites: Balancera in the short season zone, Kassirie in the medium season zone, and at the station in Rokupr. Data

collection is in progress.

2.6.1.2.6 Maintenance Stock

A total of 176 rice varieties were maintained in the Mawirr associated mangrove swamp of Rokupr. The objective was to purify varieties to ensure pure stock.

2.6.1.3 Soil Stress Screening

2.6.1.3.1 Screening for Tolerance to Acidity

Two nurseries, one from WARDA composed of 40 entries and one composed at the RRS with 195 entries, were tested for tolerance to acidity, at Rokupr and Romankneh on the Great Scarcies river respectively. The WARDA nursery was sown on 13-07-1994 and transplanted 28-08-1994. Several selections for adaptation and phenotypic acceptability were made, but acidity per se was not a problem at Rokupr this season as a result of excessive rainfall.

The RRS composed nursery, located at Romankneh four kilometers from Rokupr, was sown on 07-08-1994 and transplanted 15-09-1994. At this site, acidity damage was observed; strong response to N and P, general plant discoloration, stunting, reduced tillering and low yields were indications of acidity damage at the Romankneh site.

2.6.1.3.2 Screening for Tolerance to Salinity/Acidity

A trial for tolerance to salinity/acidity comprised of 30 entries including six tolerant checks was sown on 13-07-1994 and transplanted 20-08-1994 at two sites, Rokupr and Balancera. Selection based on phenotypic acceptability was conducted as salinity and acidity stress was negligible at both sites. A more appropriate site will be selected for future work.

2.6.1.3.3 Screening for Tolerance to Salinity

A salinity tolerance trial of 26 entries including six tolerant checks was sown on 15-07-1994 and transplanted 29-08-1994 at Kychom. Salinity stress was also negligible at this site, however, several accessions are being selected for adaptation and phenotypic acceptability.

2.6.1.4 Disease Resistance Screening

2.6.1.4.1 Seedling Blast Resistance Screening

A total of 195 Mangrove accessions were screened in the Uniform Blast Nurseries (UNB) at Rokupr and Rotifunk. The nurseries were established in June/July. The same accessions were screened under the Horizontal Resistance Blast Nursery (HRBN) for

identification of partial resistance at both sites. The presence of other diseases were also noted.

2.6.1.4.2 Screening for Resistance to RYMV

Although Rice Yellow Mottle Virus occurs only sporadically in mangrove swamps, efforts are being made to develop varieties with adequate resistance to the disease. This is especially necessary as improved mangrove varieties are also cultivated in other rainfed lowland ecologies such as the inland valley swamps where the problem is usually severe.

All the 195 mangrove rice varieties tested in the soil stress nurseries and in the blast screening trial were tested for resistance to RYMV in a screenhouse at Rokupr. The susceptible checks CP4 and ROK 5 and the resistant check, Moreberekan were included at regular intervals. The plants were inoculated using expressed virus sap in phosphate buffer (pH 7.0, 0.1N) by the finger rub method. Disease rating is in progress.

2.6.1.5 Screening for Tolerance to Crabs

The same set of mangrove rice accessions used in the RYMV trial was also screened for tolerance to crab damage at Rokupr Experimental Farm (tidal swamp) and Kassirie (in farmers' fields). ROK 10 was included as tolerant check and the advanced breeding line, WAR 73-1-m1-4, as susceptible check after every 20 accessions. The trial plot was fertilized using a 15:15:15 formula at the rate of 25g m^{-2} at seeding, and two weeks thereafter. Data collection on crab damage and other pests/diseases is in progress.

2.6.2 Characterization of Production Environment

2.6.2.1 Physico-chemical Characterization

Site characterization to determine physico-chemical soil properties is in progress. The rationale is to define the test sites and selection domains of germplasm being developed at Rokupr for extrapolation to other NARS region.

In the northern mangrove region of Sierra Leone, composite soil samples were collected from all WARDA/RRS project trial sites and prepared for physico-chemical analysis. Soil solution is also being monitored for electrical conductivity (EC) and acidity (pH) in the acidity/salinity screening trials at Rokupr and Romankneh. Analysis of the samples is in progress. In the southern mangrove region, physico-chemical characterization through soil and water analyses was undertaken. Eight soil cores were collected at a 0-20 cm depth from each of seven sites. Water sampling which started in September 1994 is also being carried out monthly in these sites.

Preliminary trends indicate that there is little change in water pH over sites and time so far. However, EC has been observed to increase over time and site progressively from

inland sites to those closer to the sea. Sample collection and analyses continues.

2.6.2.2 Other Mangrove Swamp Rice Task Force Activities

2.6.2.2.1 Socio-economic studies

A region-wide study to assess adoption of modern rice varieties and return to research investment in mangrove swamps of the Gambia, Guinea, Guinea-Bissau, Senegal and Sierra Leone is in progress.

2.6.2.2.2 Integrated Control of Seedling Blast, Brown Spot and Crab Pests in Mangrove Rice in Sierra Leone

The aim of the trial was to reduce seedling blast damage, and field infection by brown spot and crab damage by the use of partially decomposed rice husk in upland nurseries. The trial was conducted at Rokupr and Balancera. It was laid out in factorial design in randomized complete blocks to incorporate nursery practices (rice husk and 15:15:15 application), rice cultivars and plant spacing. Field data collection is in progress, however, preliminary trends indicated that rice husk was very effective in controlling seedling blast.

2.6.2.2.3 Seed Multiplication

Three short duration (WAR 77, ROK 5, and ROK 22), two medium duration (ROK 21 and Kuatic Kundur), and three long duration varieties (ROK 10, ROK 23 and CP 4) are being multiplied by the RRS. The purpose of this seed multiplication is for demonstration and seed exchange with farmers.

The Liaison Scientist based at the Rokupr Rice Research Station in Sierra Leone continued the coordination of mangrove swamp rice research and outreach activities. In particular, he assisted seed multiplication for Task Force Trials and the regional transfer of results from the RRS to other national programs.

2.7 Project Administration

Interviews of candidates for the Task Force Research Assistant position were conducted in May 1995. Mr. Dougou Keïta from Mali was selected and appointed to the office of WARDA's Director of Research. He arrived at post on August 1, 1994. The following were his major activities and accomplishments during the reporting period:

- Documentation and initial analysis of the Task Force activities.

- Development of a two year plan of work to serve as a systematic guide for administrative support to ensure that Task Force operations remain efficient and

accountable, and that the results of Task Force research are broadly distributed.

- Preparation of three reports (one annual, one quarterly, and one progress report) to donors.

- Editing of four 1994 Task Force meetings proceedings.

3 Conclusion

The Africa Rice Network Project provided opportunities for rice scientists to exchange information and experiences throughout the region. Project resources were also used to cover in-trust funds through which small grants were provided to national programs to conduct regional research projects approved by Task Forces. This mechanism has enabled WARDA to successfully mobilize the expertise available within African institutions of the region in the joint planning and conduct of rice research and related activities.

All research activities funded by the Africa Rice Network Project were conducted in compliance with Federal guidelines and regulatory procedures. This assistance has been critically important for WARDA and the region's NARS. Extension of the grant would permit further continuation of funded on-going projects, research data collection and analyses, and the publication of results that will benefit African rice farming communities.

Appendix : *Collaborative Research Projects Funded by USAID West Africa Rice Network Grant, October 1993 - September 1994*

TASK FORCE	COUNTRY	PROJECT	GRANT US $
Mangrove Swamp Rice	Gambia	Advanced and Observational Yield Trials of Short and Medium Duration	3,000.00
			3,000.00
	Guinea Bissau	Mangrove OFAR – Farmer Managed	3,500.00
		On – Station and On – Farm Seed Multiplication	2,500.00
			6,000.00
	Nigeria	Yield Trial	3,250.00
		Optimum Planting Date of Rice in the Mangrove	2,500.00
		Soil and Plant Analysis	3,000.00
			8,750.00
	Senegal	Evaluation Multilocale de Variétés Tolérantes en Rapport Avec Différentes Techniques Culturales en Riziculture de Mangrove	3,500.00
			3,500.00
	Sierra Leone	Seed Multiplication of Standard Mangrove Swamp Rice Varieties	3,500.00
			3,500.00
			24,750.00
Lowland Rice Breeing	Benin	Selection de Variétés Adaptées à la Production de Repousse	1,500.00
			1,500.00
	Cameroon	Leaf and Panicle Blast Screening Nursery	2,000.00
			2,000.00
	Chad	Essais Riz de Bas-fonds en irrigué	1,900.00
			1,900.00
	Gambia	Multilocational Yield Trial for Medium-deep Waterlogged Ecology	2,500.00
			2,500.00
	Ghana	Breeding for Drought Tolerant Rice varieties for Rainfed Lowlands	2,000.00
			2,000.00
	Guinea Bissau	Screening for Low-input Lowland Rice	1,300.00
		Screening for Medium Deep Water Varieties	2,500.00
			3,800.00
	Nigeria	Breeding of Rice for Iron Toxicity Resistance	3,000.00
			3,000.00
	Sierra Leone	Developing Varieties Tolerant to Iron Toxicity for Inland Valley Swamps	3,000.00
		Developing Lowland Rice Varieties with Resistance to Rice Yellow Mottle Virus	2,500.00
			5,500.00
	Senegal	Etude d'Evaluation Variétale à la Toxicité Ferreuse	2,000.00
			2,000.00
			24,200.00

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Cropping Systems	Benin	Association de culture du Riz et Maïs	1,830.00
		Gestion Integrée de l'Azote dans un Système de Culture	2,040.00
			3,870.00
	Bu kina Faso	Gestion de l'Azote et des adventices dans un Système à Base de Riz Pluvial à Travers l'Utilisation de Légumineuses	1,530.00
			1,530.00
	Cameroon	Gestion Integrée de l'Azote, de l'Eau et des Adventices dans les Rotations Suivantes: Sorgho / Riz, Riz / Riz, Légumineuse / Riz, Maïs / Riz et Riz / Muskwari	1,320.00
		Determination de la Meilleure Légumineuse en Culture de Riz au Nord Cameroun	1,960.00
			3,280.00
	Ghana	Improved Fallow System and Its Effects on Weed and Nitrogen Use Efficiency of Rainfed Lowland Rice	1,900.00
			1,900.00
	Mali	Gestion de la Fertilité des Sols de Riz en Culture Continue	1,860.00
			1,860.00
	Nigeria	Effect of Cropping Sequence on Weeds and Soil Fertility on Inland Valley Swamps	1,900.00
		Effect of Cropping Sequence and Nitrogen Fertilizer on the Production of Upland Rice	2,700.00
		Effect of Vegetative Propagation of Sesbania rostrata at Varying Phosphorus Rates on Productivity of a Rice – based Cropping System	2,450.00
		Effect of Green Manuring on Lowland Rice / Vegetable Cropping Systems	2,220.00
		Effect of Cropping System and Nitrogen Fertilizer on the Production of Upland Rice	2,400.00
			11,670.00
	Sierra Leone	Cropping Intensification in the Lowand	2,450.00
		Improved Fallow Management Systems for Uplands	1,030.00
			3,480.00
	Togo	Mise au Point d'un Système de Culture pour une Exploitation Durable des Bas Fonds en Riziculture	1,400.00
			1,400.00
			28,990.00
Sahel Irrigated Rice	Burkina Faso	Etude de la Gestion de l'Eau sur Sols Filtrants	4,379.00
		Etude de l'Effet du Compost sur l'Amélioration de la Fertilité des Sols sous Riziculture irriguée	1,565.00
			5,944.00
	Mali	Tests Multilocaux Hivernage / Contre Saison	1,003.00
			1,003.00
	Niger	Effets des Nématodes sur la baisse de Rendement du Riz	2,653.00
			2,653.00
	Senegal	Tests Multilocaux de Variétés de Riz Irrigué à Cycle Court	3,555.00
			3,555.00
			13,155.00

Integrated Pest Management	Benin	Contôle des Adventices du Riz dans les Bas-fonds	1,350.00
			1,350.00
	Burkina Faso	Etude de la Pathogéicité des Espèces Hirschmanniella spinicaudata et H. oryzae et Comportement de Quatre (4) Variétés de Riz Vulgarisées au Burjkina Faso	2,250.00
		Résistance Variétale à la Cécidomye Riz Orseolia oryzivora	1,223.00
			3,473.00
	Nigeria	Effect of Seedling Age and Weeding Regimes on Performance of Irrigated Rice	1,700.00
		Studies on the Rice Blast, Yield loss and Selection of Moderately Resistant Rice Varieties and Micro-organisms for Integrated Pest Management	1,620.00
		Effect of Varietal Type and Spacing on Weed Control in Upland Rice	3,250.00
		Effect of Crop Phenology and Planting Date on African Rice Gall Midge (ARGM) Infestation and Natural Enemy Composition	2,210.00
		Screening of Rice for African Rice Gall Midge (ARGM) Resistance	857.00
			9,637.00
	Senegal	Importance de l'Attaque des Foreurs de Tiges du Riz en Phase Végétative et Phenomène de Tallage Compensateur	800.00
			800.00
	Sierra Leone	Pest Control in Boliland Rice Agroecology	3,600.00
		Screening Rices for Stable Resistance to Blast and Other Major Fungal Diseases	4,100.00
		Integrated Control of Seedling Blast, Brown Spot and Crab Pests in Mangrove Rice	1,500.00
			9,200.00
			24,460.00
Rice Economics	14 member States	SHAZAM * Software Purchase	4,445.00
			4,445.00
			120,000.00

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ANNEX - 1

USAID PROJECT: Collaborative Research Networks in Africa

CENTER: WARDA

PROGRAM: Rice (West Africa)

REPORTING PERIOD: For the Year Ending September 30, 1994

		US$
1.	Cash on Hand at the beginning of the Year	- ° -
2.	Cash Remittance Received during the year	400,000
3.	Actual Disbursements during the Year (Annex 2)	(304,396)
4.	Cash on hand at September 30, 1994	95,604

Certified by:

Signature:

Name: Kwame AKOTO

Position: Head of Finance and Support

Date Prepared: February 13, 1995

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USAID PROJECT: Collaborative Research Networks in Africa

CENTER: WARDA

PROGRAM: Rice (West Africa)

REPORTING PERIOD: From October 1, 1993 to September 30, 1994

Functional Acitivity	Program Budget US$	Total Disburse-ment	Funds Carried Forward
Coordination	40,000	8,259	31,741
Planning / Evaluation	107,000	103,633	3,367
Research Collaboration	120,000	120,000	-
Training/Institution Strengthening	75,000	19,833	55,167
Administrative Support	58,000	52,617	5,329
Network Integration	0		
TOTAL US$	400,000	304,396	95,604