

DDDR: IAR/73/22 RESTRICTED

June 1973

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

TECHNICAL ADVISORY COMMITTEE

Sixth Meeting, Washington, D.C., 25 July-3 August 1973

RESEARCH PROPOSALS OF THE WEST AFRICA RICE DEVELOPMENT ASSOCIATION

(Revised version)

(Agenda Item 2)

TAC SECRETARIAT

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

ROME 1973

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EST AFRICA RICE DEVELOPMENT ASSOCIATION

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# WARDA Research Proposals

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Monrovia, June 1973

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## INTRODUCTION

The 14 nations of West Africa, Dahomey, Gambia, Ghana, Guinea, Ivory Coast, Liberia, Mauritania, Mali, Niger, Nigeria, Senegal, Sierra Leone, Togo, Upper Volta and the countries and organizations cooperating in the development of the region felt that the expansion of rice production constituted a priority goal both in terms of the extent of rice requirements to be met and the economic and social impact implicit in the modernization of rice cultivation. It was therefore decided at an international conference held at Monrovia in September 1969 to set up the West Africa Rice Development Association (WARDA). A year later, the Constitution of the Association was adopted at the Conference of Plenipotentiaries held in Dakar. Twelve of the West African countries are now active members of WARDA, while only Guinea and Upper Volta have not yet accepted the agreement creating WARDA.

It was also recognized at that time that whilst expanding rice production was basically dependent on generally upgrading the rural sector, there were problems to be solved at the national level, and the trend of the inter-regional cooperation efforts of the new Association ought to be towards closing the existing gaps in rice agronomic research and ensuring coordination of research at the regional and international level.

At the Rice Research and Development Meeting held in Rome in March 1971, the complex nature of the problems to be solved before high-yielding rice varieties could be developed was

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brought out. The Mid-Term Work Programme approved at the meeting was adopted at the First Session of the Governing Council of WARDA, held in September 1971 in Monrovia; the Executive Secretary elected at the same session, took up office on 1 December, 1971. With the assistance of experts from Member Countries, Cooperating States and Organizations, an endeavour was made to shorten the programme to 14 research projects, two development projects and a project to coordinate research and development. These projects were presented at the First Extraordinary Session of the Governing Council of WARDA held from 9-10 May, 1972 at Bamako. Following the recommendations of both the Scientific and Technical Committee and the Advisory Committee, the Governing Council decided to combine a certain number of research projects while at the same time reducing their cost.

Necessary latitude was left to the Executive Secretary to negotiate the funding of these projects. In accordance with these decisions, and at the instance of the TAC, the Directors (represented in some cases by their appointees) of IRRI, IRAT and IITA met with the Executive Secretary of WARDA to revise the WARDA projects with a view to better formulate them with clearly indicated linkages on international level with the on-going work in the other research institutions such as IITA, IRAT and IRRI. This approach will therefore avoid duplication of effort and hopes to maximise output from the investments to be made. WARDA considers this type of consultative meeting at international level of prime importance and hopes that it will

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become a permanent feature as it could prove important for world rice research. It is also felt that the rapidly expanding WARDA research network in West Africa would contribute substantially to rice research achievements on the international scene.

WARDA's overall research programme was divided into two parts, viz:

1. Coordinated trials at a network of locations in the region with the aim of establishing a direct impact on rice development in the region. This programme is further referred to as Project W1.
2. Special Research Projects for reinforcing existing research work and for filling existing gaps in rice research in the region, backstopped by available knowledge and experience at the international level (Projects W2 to W4).

Average rice yields over the entire region are about 1 ton per hectare. It is of paramount importance that through a joint and concerted effort, good varieties and good cultural practices are developed for the various conditions under which rice is grown in the region. Applied research is only one aspect. Of equal importance for achieving our goal are an effective extension service and a government policy to make the various ~~inputs~~ available to the farmers and to make the application of new technology an attractive proposition.

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WARDA's Research Projects in 1972 and 1973 are being financed largely by funds provided from bilateral sources such as USAID and The Netherlands, while the United Kingdom has made a promise of \$100,000 per year for two years. The member countries of WARDA provide houses for field personnel, office and laboratory space and land for the experiments. Member countries, in addition, make direct financial contributions towards the provision of supporting services such as secretarial help to the research personnel based at Monrovia, support in administration and documentation to the out-reach programmes in the region, handling of seeds for redistribution, etc. Details of the breakdown of monetary contributions for the WARDA Research Projects are shown below:

CONTRIBUTIONS FROM BILATERAL AID AND MEMBER STATES FOR THE  
INITIAL FINANCING OF THE WARDA RESEARCH PROGRAMMES

Project	W1	W2	W3	W4	Total
USAID <sup>1</sup>	315,000	185,930	-	155,570	656,500
United Kingdom <sup>2</sup>	13,000	68,000	-	19,000	100,000
The Netherlands <sup>3</sup>	100,000	-	-	-	100,000
Member States <sup>4</sup>	113,500	40,000	20,500	40,500	214,500
TOTAL	541,500	293,930	20,500	215,070	1,071,000

<sup>1</sup>USAID commitment up to 30 June 1973.

<sup>2</sup>United Kingdom has committed the same amount for 1974.

<sup>3</sup>Contribution for two years. The Netherlands indicates a contribution of \$75,000 for 1974.

<sup>4</sup>See appendix 5 for the agreement signed between WARDA and the Member Countries for their contributions in kind.

The total contribution to the administrative budget of WARDA by the member states in cash for 1972 and 1973 are \$395,211 and \$426,184 respectively. The expected contributions in kind and in cash towards the various research projects is given in the respective budgets. Similar contributions are envisaged towards WARDA's Development Projects.

The Coordinated Trials are now mainly financed from USAID and The Netherlands funds strictly on an annual basis. By its very nature, such bilateral funding does not assure continuity and forms a rather weak basis for executing long term rice research programmes. As Coordinated Trials would serve as an outreach programme for testing research findings from the International Research Institutes, National Research Centres of Member Countries and WARDA, and since Coordinated Trials appear to be the surest way of improving farmers' rice yields, the Coordinated Trial programme is probably the most efficient way of deploying to the best advantage the limited technical, financial, economic and social resources of the WARDA region for maximising rice production at minimum cost. This approach will assure good results with effective linkages with IRRI, IRAT and IITA and with the on-going research at the National Research Centres in the region. In this way, WARDA should become a channelling agency to the International Institutes in the region for rice research in West Africa. Funds from bilateral sources could then be used largely to finance WARDA's development projects. As WARDA's development schemes are already well defined, they in fact lend themselves better to short term financing and commitments.

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WARDA is seeking TAC's support for long term financing by the Consultative Group on International Agricultural Research rather than short-term bilateral aid for its Coordinated Trials (Project W1) and the associated projects such as: the operation costs of the Seed Storage and Service Centre to be based in Monrovia, and funds for strengthening the Regional Plant Quarantine Station at Ibadan with a view to expedite WARDA's rice introduction and distribution programmes. This financial support will however be continuously supplemented from the contributions of the WARDA member countries. This should enable better planning and a steady flow of rice research findings for increasing rice production in West Africa. The Special Research Projects W2, W3 and W4 are to be financed strictly from other sources.

APPENDIX 1

TEST LOCATIONS IN THE WARDA REGION

Country:

Stations:

Mauritania  
Senegal  
The Gambia  
Sierra Leone  
Liberia  
Ivory Coast

Kaédi  
Djibélor, Séfa, Richard Toll  
Jenoi, Sapu  
Rokupr, Mange  
Suakoko  
Bouaké, Man, Odienné,  
Ferkessedougou  
Kpong, Nyankpala  
Mission Tové, Sotouboua  
Houéda, Ina  
IITA (Ibadan), Baðeggi, Bernin  
Kebbi, Ilushi  
Kolo  
Mopti, Sikasso, Kogoni  
Banfora, Vallée du Kou  
Koba

Ghana  
Togo  
Dahomey  
Nigeria  
  
Niger  
Mali  
Upper Volta  
Guinea

## APPENDIX 2

### WEST AFRICA RICE DEVELOPMENT ASSOCIATION.

COORDINATED VARIETY TRIAL - Deep flooded and Mangrove Swamp conditions, long duration.

#### General guidelines for conducting this Experiment.

##### Experiment No.6.

##### Objective:

To study the performance of long duration varieties under deep flooded and mangrove swamp conditions.

##### Locations:

All locations as decided during the January 1973 Seminar.

##### Layout:

Randomized block experiment.

##### Number of replications:

In case of transplanting: at least 5. In case of direct seeding: at least 6. At some locations it may be advisable to increase the number of replications.

##### Varieties: 11 or 12, viz:

- |                |                           |
|----------------|---------------------------|
| 1. RH 2        | 7. L78 - 9148             |
| 2. CP 4        | 8. IM 16                  |
| 3. Nachin II   | 9. Gissi 25               |
| 4. HKG 98      | 10. Gambiaka              |
| 5. Phar Com En | 11. Local choice          |
| 6. Oma Rosso   | 12. Local choice (if any) |

##### Methods of transplanting or sowing:

A. For a transplanted crop: Age of seedlings at transplanting: between 3 and 4 weeks. Spacing: 20 cm between rows and 15 cm between hills within a row. Seedlings per hill: 3. Gapfilling: All missing hills should be replanted for the first time at about 6 to 9 days after transplanting and this procedure should be repeated, if necessary, at about two weeks after transplanting.

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B. For a direct sown crop: Preferably sowing in lines about 20 to 30 cm apart. Required seed rate in this case: about 60 to 80 kg/ha. When broadcast sown, the seed rate may be around 80 to 100 kg/ha. Try to obtain a good and even stand of the crop.

Gross plot size:

About 15 sq. m. and preferably not less.

Net plot size:

Depending on actual plot size and row spacing remove either 1, 2 or 3 border rows. The net harvested area per plot should preferably be not less than 8 square metres.

Basal application of P and K:

An adequate amount of phosphate and potassium should be applied. Actual rates to be given depend on soil characteristics, local knowledge and experience.

Topdressing of K:

This may be applied when a split application of K is better than a basal application of K.

Nitrogen application:

The total amount should be equal for each plot and each variety. The times and rates of N application may depend on soil characteristics, local knowledge and experience. Methods and times of application should ensure a maximum crop response.

As far as the total quantity of N is concerned: this may vary from location to location as no optimum rate can be given. Local knowledge and experience and careful crop observations should decide how much nitrogen should be actually applied. This amount should be neither too low (poor crop growth, low yields), nor too high (severe lodging of tall and weak-strawed varieties). With split applications

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of nitrogen it should not be too difficult to obtain a good and adequate growth in this trial.

Cultural practices, insect and weed control:

This should be carried out carefully and according to best local knowledge and experience. Careful observations and timely action should result in a good crop growth and in reliable yield data.

Bird control:

Bird control is extremely important during the period between full heading and maturity. It may be wise to have the field trials located in such a way that the crop in the surrounding area is about two weeks earlier in maturity.

Rogueing and seed supply:

Incidental rogues and off-types should be timely removed so that the seed of each variety can be used for future trials. When certain varieties have too many off-types, rogueing may be deleted for these varieties as otherwise no proper yield evaluations are possible. In this case, timely measures are necessary to procure pure seed of these varieties well in time before the next growing season.

When more seedlings are available than for transplanting and gapfilling, or when more seed is available than for sowing this experiment, the left-over seedlings may be transplanted (or the left-over seed may be thinly sown) in another field for seed multiplication.

By adopting rigid rogueing procedures, good quality seed may be obtained for future use. Each station should try to become self sufficient in seed supply once a new variety has been introduced. This is the reason why more seed has been supplied than was actually needed for this experiment.

## VISUAL OBSERVATIONS AND CROP MEASUREMENTS.

### 1. Growth of the plants:

Rate crop growth (plant height, tillering, general appearance) every three weeks by using a scale from 1 to 10.

1 =extremely poor growth.

10 =extremely good growth.

### 2. Incidence of pests and diseases:

Individual plots should be scored for attacks by diseases and pests at suitable times. For pests, a rating scale from 0 to 5 may be used; 0 = no attack, 5 = severe damage. Please note down which diseases or pests are attacking the varieties. For visual scorings for disease attack, international standards will be followed; details will be issued later.

### 3. Days to 50% flowering:

Note down the date on which 50% of the panicles are flowering.

### 4. Days to maturity:

Note down the date when the plots are ready for harvest and calculate the number of days from sowing (or soaking the seed) until maturity. The date of actual harvest is sometimes later and is as such not a valid varietal characteristic.

### 5. Lodging:

Visual scorings for lodging should be done at two times: at one week after flowering, and at maturity. Ratings to be done on a percentage basis of the lodged area per plot and by using a scale from 1 to 10. In this way, when 10% of a plot is lodged the rating will be 1. When 50% is lodged, the rating will be 5, and when the whole plot is flat, a rating of 10 should be given.

6. Plant height:

Measure at random 10 to 15 plants (hills) per plot and determine average plant height. These measurements should be made during the period between one week beyond flowering and maturity. Measure the plants from the ground surface up to the tip of the tallest panicle.

7. Grain Yield per plot:

Weighing of the seed and the determination of moisture content should be done at the same time. Grain yield data should then be converted to 14% moisture content. Calculate carefully the net harvested area of each plot.

8. Yield components and other crop characteristics:

Sampling: For a transplanted crop: take 10 hills at random in each plot. For line sowing: take 2 samples per plot, each containing exactly all plants over a distance of 1 metre in a row. For broadcast sowing: take 2 samples, each of 50 x 50 cm per plot.

Procedure:

Cut all plants (from the sampled hills or area) carefully at the ground level, put them in bags, label them properly and dry them carefully. After drying, cut off all panicles from the stem at the panicle base and weigh separately;

- a. all straw
- b. all panicles, including loose grains.

The ratio  $\frac{b}{a}$  can be considered as the grain/straw ratio. Count all panicles, and as the sampled area is known, one can calculate the number of panicles per square meter. In case of borer attack, one can also count the number of white ears (panicles) and convert this figure on an area basis. Optional measurements and countings may provide information on:

1. panicle length,
2. number of spikelets per panicle,
3. spikelet sterility (in %).
4. 1000-grain weight.

9. Water level:

For deep flooded and floating rice the level of standing water in the field should be measured twice a week. For mangrove swamp rice, a weekly description of the water situation will be appreciated.

10. Tillering of the varieties:

Determining the tillering ability of the varieties is very useful, but is not compulsory for each trial. Information obtained in this respect may please be forwarded to WARDA along with the other trial information data. A handy method is to count all panicle-bearing tillers and all unproductive tillers (without a panicle) at about one week after flowering. The total number represents the tillering ability of the variety, and the number of panicle-bearing tillers represents the effective tillering of the crop.

Recommended sample size for counting:

- a). for a transplanted crop: 15 hills per plot.
- b). for a direct sown crop: 2 samples, each having all plants over a distance of 1 metre in a row.
- c). for broadcast sowing: 2 samples, each of 50 x 50 cm per plot.



FIELD LAYOUT FOR EXPERIMENT No.6.

a). In case of 6 replications:

V A R I E T I E S	Rep. I	II	III	IV	V	VI
	7	3	8	10	1	2
	6	10	1	3	6	5
	9	12	3	9	10	1
	11	7	5	12	9	8
	4	5	10	6	5	4
	10	8	9	7	8	7
	1	11	2	11	2	3
	2	4	6	5	4	12
	12	6	12	8	12	11
	8	2	4	4	3	6
	5	1	11	2	7	10
	3	9	7	1	11	9

b). In case of 8 replications:

V A R I E T I E S	Rep. I	II	III	IV	V	VI	VII	VIII
	7	3	8	10	1	2	4	9
	6	10	1	3	6	5	3	7
	9	12	3	9	10	1	12	2
	11	7	5	12	9	8	11	4
	4	5	10	6	5	4	9	1
	10	8	9	7	8	7	7	10
	1	11	2	11	2	3	10	6
	2	4	6	5	4	12	5	8
	12	6	12	8	12	11	1	3
	8	2	4	4	3	6	6	11
	5	1	11	2	7	10	8	12
	3	9	7	1	11	9	2	5

WEST AFRICA RICE DEVELOPMENT ASSOCIATION

Trial Information Sheet

Coordinated Variety Trials

Please provide below the requested information whenever applicable.

Experiment No.: -----(Fill out 1, 2, 3, 4, 5, 6 or 7)

Location: ----- Country:----- Season:-----

Number of varieties: ----- No. of replications -----

Statistical layout: -----

Soil tillage: burning: -----

clearing: -----

ploughing: depth: -----

implement: -----

dates: -----

harrowing: implement: -----

dates: -----

levelling: dates: -----

Method of sowing:

a. sowing on dry soils: ----- cm deep.

b. sowing on puddled soils, seed incubated for  
----- hours.

Date of sowing: ----- Date of emergence: -----

Seed rates, in case of:

a. broadcasting: ----- kg/ha

b. sowing in lines: ----- kg/ha

row spacing: ----- cm apart.

Methods of transplanting:

Seed soaked on: ----- Seed sown on: -----

Date of transplanting: ----- Spacing: ----- x ----- c.m.

Seedlings per hill: -----

Gross plot size: \* length: ----- m width: ----- m.

Net plot size: \* length: ----- m width: ----- m.

Basal application of fertilizers:

----- kg N/ha, applied on: -----

Source of N: -----

----- kg  $P_2O_5$ /ha, applied on: -----

Source of P: -----

----- kg  $K_2O$ /ha, applied on: -----

Source of K: -----

Applied on a drained soil, or into ----- cm water.

Incorporation of fertilizers: Yes/No, by means of: -----

----- and ----- cm deep.

Reflooded with ----- cm water after ----- days.

First topdressing, in case of dry soils:

----- kg N/ha, applied on: -----

Source of N: -----

----- kg  $K_2O$ /ha, applied on: -----

Source of K: -----

Incorporation of fertilizers: Yes/No, by means of: -----

----- and ----- cm deep.

\* If not possible, state the measurements in feet or yards.

Soil and weather conditions at the time of topdressing: -----

-----  
-----  
Second topdressing, in case of dry soils:

----- kg N/ha, applied on: -----

Source of N: -----

Incorporated: Yes/No, by means of: -----

----- and ----- cm deep.

Soil and weather conditions at the time of topdressing: -----

-----  
-----  
-----  
Details on: -----

Third topdressing (if any) -----

-----  
-----  
-----  
-----  
-----  
-----  
First topdressing, in case of puddled or flooded soils:

----- kg N/ha, applied on: -----

Source of N: -----

Applied on a drained soil, or into: ----- cm water.

Reflooded with ----- cm water after ----- days.

Incorporated: Yes/No, by means of: -----

----- kg  $K_2O$ /ha, applied on: -----

Source of K: -----

Method of application: -----

Second topdressing, in case of puddled or flooded soils:

----- kg N/ha, applied on: -----

Source of N: -----

Applied on drained soil, or into: ----- cm water.

Reflooded with ----- cm water after: ----- days.

Incorporated: Yes/No, by means of: -----

Details on: -----

Third topdressing (if any) -----

Times and methods of weed control:

Handweeding on (dates): -----

Mech. weeding on (dates): -----

In case of chemical weeding: Herbicide(s): -----

Rate of application: -----

Date(s) of application: -----

Pest control:

Chemical: ----- Chemical: -----

Rate of application: ----- Rate of application: -----

Date of application: ----- Date of application: -----

Major pest: ----- Major pest: -----

-----

Chemical: ----- Chemical: -----

Rate of application: ----- Rate of application: -----

Date of application: ----- Date of application: -----

Major pest: ----- Major pest: -----

-----

Soil type: ----- pH: -----

% clay: ----- % sand: -----

% silt: ----- % Org. matter: -----

Other soil characteristics: -----

-----

-----

-----

Cropping pattern of experimental site:

-----

-----

-----

-----

-----

Date of harvest of the experiment: -----

Market preference for certain varieties:

Please state which of the varieties tested are preferred on the market for their grain quality: -----

-----

Which varieties in this experiment are considered of poor grain quality in your region? -----

-----

In case of market preferences for rice, can you give some examples of price differences between some varieties? If so, please give details below: -----

-----

Rainfall data: Please fill out the attached form from the month of sowing through the month of harvest: -----

-----

Reasons why yields were below expectation: -----

-----

-----

-----

-----

General remarks on the performance of the trial:

-----  
-----  
-----  
-----  
-----  
-----  
-----

Special problems encountered with this trial:

-----  
-----  
-----  
-----  
-----  
-----  
-----

WARDA likes to thank you very much for your kind cooperation!



## RAINFALL DATA

Date of sowing:.....Date of harvest:.....

[illegible]



### APPENDIX 3

#### SUMMARY DATA

Project Location: Monrovia, Liberia

Subject Matter: Establishment of Seed Storage and Service Centre

Executing Agency: West Africa Rice Development Association

Capital Costs: US \$ 52,000.00

Operational Costs: US \$ 36,000.00

Duration of Project: One Year

Subsequent Annual Recurrent Expenditure: \$ 38,000.00 US.

## SEED STORAGE AND SEED SERVICE CENTRE AT MONROVIA

### Introduction:

During the Seminar on Varietal Improvement in January 1973, plans were made to conduct coordinated variety trials at 30 test locations in the WARDA Member Countries. These trials will be conducted under all major types of rice cultivation in the region. The varieties for 7 trials were nominated; the total number of experiments in the field is estimated at 68. The number of different varieties to be tested is about 60 to 70 for the present year.

For effectively implementing the coordinated variety trials, it is necessary to collect the seed material from various sources and countries at Monrovia, have the seed properly cleaned and stored, have it treated with hot water (against nematodes) and chemicals to comply with the phytosanitary rules and regulations. Well in time before the next rice growing season, the relevant material should be weighed out, packed, and parcels containing the complete set of seeds for individual trials should be despatched to the various test locations.

When drafting the original plans and budgets for Varietal Improvement work and Research Coordination, the need for a Seed Storage and Seed Service Centre has been overlooked.

### Proposal:

As the need for a Seed Storage and Seed Service Centre is unquestionable, the proposal is to have such a centre established at Monrovia. At present the number of varieties is still limited as in the total quantity of seed to be handled for the main rice growing season (about 1 - 1½ ton), but both the number of varieties and the total seed quantity may increase considerably as breeding work and varietal testing are carried

out on a much larger scale in the future.

Likewise, for the Seed Multiplication Centre at Richard Toll, it is necessary to obtain the original seed stock from the various countries and have it properly treated before onward shipment to Richard Toll.

In this respect it may be noted as well that movement of rice seed between the WARDA Member Countries is allowed only when:

- a. the material carries a valid phytosanitary certificate,
- b. the material has undergone a hot water treatment to kill nematodes which might be present.

A permanent and suitable site for this Seed Storage and Seed Service Centre is considered to be at the University Farm of the College of Agriculture. In this way, the Centre may also be used to advantage to train and teach students of the Agricultural University in handling seeds. With adequate space and equipment, the Centre can also be used to store and test seeds of other agricultural crops.

#### Factors Affecting the Storage Quality and the Health Status of Rice.

Seed storage and phytosanitary certification (before distribution) constitute the main objectives of this programme. These imply that all factors that may significantly affect the storage quality and health status of the rice seed must be critically examined and duly considered. These factors include:

##### Seed Spoilage Micro-organisms:

A number of micro-organisms are known to be notorious seed spoilage agents on rice. Some of them like Aspergillus, Penicillium and Rhizopus sp. cause storage mould while others like Helminthosporium oryzae may reduce seed viability.

##### Physiological Condition of the Seed:

The physiological condition of the seed determines, to a large extent, its storage keeping quality. This is because certain physiological conditions like cracks in the seed and high moisture content are conducive to seed attack by the various seed spoilage agents.

### The Storage Environment:

The storage environment also has profound effect on the storage keeping quality of the seed in the sense that high humidities in storage are conducive to seed attack by storage moulds while high temperatures reduce seed longevity (period of viability).

The processing of rice seeds for storage and certification must therefore aim at solving the problems arising from the above factors.

### Rice Seed Processing for Storage and Certification Cleaning and Purification:

As soon as consignments are received at the station, seeds should be thoroughly cleaned free of extraneous materials and cracked pieces. Such contaminations like pieces of straw, soil particles and other forms of organic matter could harbour dangerous disease and seed spoilage micro-organisms and/or act as media for the multiplication of such organisms in storage. Cracked seeds are also highly susceptible to fungi attack. Weed seeds should be picked off as they may subsequently prove aggressive in the field.

### Seed Health Testing:

In order to ascertain seed freedom from disease and spoilage microorganisms, the seeds should be subjected to laboratory health testing. By this process, representative samples of the seeds should be plated on wet sterile blotters within petridishes which should then be incubated under a 12-hour alternating light and darkness for 7 days. By this, the various micro-organisms harboured on any of the seeds would have developed enough to enable them being detected by subsequent examination under stereoscopic microscope. The percentage germination of the seed should be recorded at this stage from the plates.

The results of the seed-health test should be used as a basis for Phytosanitary Certification which is a report on a Government International Certificate (Phytosanitary Certificate). Such certificates require that the seeds be 'substantially'

free from dangerous pests and diseases and will be needed to enable the seeds subsequently enter other WARDA member countries during seed distribution for coordinated trials.

Seed Treatments. Treatment against pests and diseases should be based on health-testing results. Hot water treatment at 55°C for 15 minutes must be given against nematode infection and as a matter of routine. However, organo-mercurial seed treatment should only be used when justified by seed health results e.g. above 10% infection by Helminthosporium oryzae and 5% Pyricularia oryzae.

After hot water and/or organo-mercurial treatment, the seeds should be dried (slowly at first) to low moisture content (about 8-10%). A moisture tester can be used to ascertain whether the drying process is complete or not.

Packing and Storage:

After drying, the seeds should be allowed to cool within a dry atmosphere and then carefully packed and labelled ready for storage. Pellets of chemical seed fumigants (e.g. phostoxin tablets) may be packed among the seeds to prevent insect attack in storage.

The packages should be adequately labelled and arranged in shelves within a store room continuously maintained cool (15°C) by air-conditioning and kept relatively dry by dehumidifiers. As mentioned earlier high humidity in storage is conducive to mould attack while moist storage conditions may give rise to seed germination. High storage temperatures may adversely affect the period during which the seeds retain viability.

The seed store itself should be subject to limited access and provided with insect proofing to prevent storage pests mainly insects and rodents getting into and multiplying within the seeds.

PHYSICAL FACILITIES.

A main seed service block should be provided to accommodate a seed health testing and certification complex, a seed treatment and packaging unit, a seed store and a general office as well as staff conveniences.

### EQUIPMENTS AND SUPPLIES

The health certification, treatment, packaging, handling and storage processes earlier described will require specialised equipments and supplies.

Seed cleaners and sieves will be required for the general cleaning. Petridishes, seed blotters, needles and forceps will be required for seed plating while 'Dexion' shelving materials, near ultraviolet light and/or daylight fluorescent light assemblies, daily cycle time switches etc. will be required for seed incubation. Health inspection itself will require supplies of stereoscopic microscopes, etc.

For seed treatments, hot water baths, fumigation chambers, chemical seed dressings and seed driers or large thermostatically controlled ovens will be required.

As mentioned earlier, the seed store must be equiped with mechanical dehumidifiers or suitable chemical drying agents while the seed health testing laboratory, the incubation room, the seed store and (if possible) the treatment room should be airconditioned.

### Personnel:

A superintendent will be required to take charge of the station. During the construction phase of the building he should be given training in seed technology. One junior assistant should be provided to work at the centre. Two night watchmen may be required for security purposes. During peak seasons additional labour is required to assemble and pack the seed parcels for quick distribution to the various research stations.



## APPENDIX IV.

### SUMMARY DATA

Project location:	Ibadan Nigeria
Project Subject:	Strengthening the Ibadan Regional Plant Quarantine Station with facilities to execute WARDA's improved rice varieties introduction programme.
Executing agency:	Ibadan Regional Plant Quarantine Station.
Capital Costs:	US \$ 75,000.00 )
Initial operating costs:	23,900.00 ) US \$ 98,900.00
Annual recurrent expenditure:	US \$ 50,000.00

The successful implementation of WARDA's development programmes depends very much on the introduction of new rice germ-plasm and the distribution of improved rice materials within member countries. Such materials must of necessity be processed in quarantine in order to eliminate the risk of introducing foreign dangerous rice diseases. Among the two alternatives open to WARDA for implementing her Rice Quarantine Programme is the establishment of a Quarantine Station at Monrovia - the implications of which have been fully set out in another document entitled 'WARDA Rice Quarantine Project, Alternative A'.

This document defines and analyses the implications of a second alternative that was recommended at the WARDA Plant Protection Seminar held from 21st to 29th May, 1973. That part of the resolution on which this project is based reads inter-alia:

"After a full consideration of the various factors involved in the resolution of the Governing Council of WARDA of April, 1973 on the Plant Quarantine processing of rice introductions by WARDA, the seminar took cognisance of:

- the exorbitantly high cost involved in the establishment and running of a quarantine station, as well as, the delay to importation that will be caused by the time lag constituting the establishment phase.
- the fact that the Inter-African Phytosanitary Council (IASPC) does not allow any institutions other than its member Governments to set up and run Plant Quarantine Stations;
- the guiding principle that WARDA should utilize to advantage any existing facilities situated within its member countries.

RECOMMENDS that WARDA should:

- (a) strengthen the existing post-entry Plant Quarantine facilities at Ibadan, Nigeria, with subordinate personnel and facilities in such a way as to expedite its rice introduction programmes without delay."

THE IBADAN REGIONAL QUARANTINE STATION

is the only functional quarantine centre situated within WARDA member countries and it is also the only station so far established out of the two Regional Centres proposed by the Inter-African Phytosanitary Council (IAPSC) to serve the plant quarantine needs of West and Central Africa.

Established by the co-operative efforts of the Federal Government of Nigeria and the United Nations Development Programme (UNDP) at a cost of well over \$1,750,000, the station is at present manned by five FAO Plant Quarantine Experts and their Nigerian counterparts specializing in various fields such as Plant Quarantine Procedures and Management, Plant Quarantine Pathology, Seed Pathology, Plant Quarantine Entomology, Glass-house horticulture and Plant Quarantine Training. They are to be joined very soon by a utility and instruments maintenance Engineer and probably a tissue culture specialist. Consultant services in Nematology, Specialised bacteriology and virology are also provided by the staff of the Federal Department of Agricultural Research which serves as the Government Cooperating Agency. The supporting technical and administrative staff now number over 75.

The station is at present one of the best functional plant Quarantine Stations in the world, being equiped with all that is required of a first class post-entry quarantine station. Among its facilities are a closed quarantine seed health testing complex, controlled environment glasshouses, mechanized soil sterilization and potting complex, phytotrons (for processing very high risk plants), tissue culture laboratory (for freeing plants from diseases), screenhouses, index plant propagation houses, utility and instruments maintenance workshop, an export certification block and an International Plant Quarantine Training Centre.

At present, the Ibadan Regional Quarantine Station has been requested by the IAPSC to extend its services to all African countries that might request for it.

It has therefore recently become unavoidable that many prospective plant importers are requested to take their turn waiting for available quarantine space.

#### OBJECTIVES OF THE PROJECT

The project objective is to strengthen the existing facilities of the Ibadan Regional Quarantine Station in such a way as to facilitate a prompt and effective quarantine processing of WARDA's introduced rice materials. This implies among other things that:

- (a) The deficiencies for large scale quarantine processing of rice at Ibadan should be identified.
- (b) The Ibadan Regional Quarantine Station should be supplied with such facilities as will be needed to rectify the deficiencies so identified.
- (c) Arrangements should be made to ensure an unimpeded continuation of the stations services to WARDA.

#### THE LIMITATIONS OF IBADAN REGIONAL QUARANTINE STATION IN COPING WITH MASSIVE PLANT INTRODUCTIONS

The proposals for the establishment of Ibadan Regional Quarantine Station had been concluded long before the creation of many large Agricultural Research and Commercial Institutions like the IITA, the Nigerian Sugar Company, the Tobacco Companies and of course WARDA. As such, the station has not been established on a scale large enough to cope with the massive plant introduction programmes recently embarked upon by such institutions. Of course, when plant materials arrive in thousands for processing within a station equipped to handle only a few hundreds, the stations facilities of necessity becomes a limiting factor, causing a 'back-log' in workload and giving rise to 'unpleasant' delays in granting quarantine processing concessions to subsequent prospective importers. The only practical solution to such limitation is expansion which in itself poses the problem of finance - a problem which each institution has to find one way or the other to solve in order to meet her demands.

Of late, both the IITA and the Nigerian Sugar Company have made bilateral arrangements by supplementing the stations facilities in such areas that are essential for the quarantine processing of their respective plant materials. The station in return has granted each of them "priority of use" guarantee in respect of the additional facilities so provided. With these arrangements, the institutions have succeeded in achieving prompt and efficient quarantine processing of their introduced plant materials. For WARDA to enter the same type of arrangement, it will be necessary now to determine the deficiencies in Ibadan's facilities for coping with WARDA's proposed rice introduction programme.

THE REQUIREMENTS OF SUPPLEMENTARY FACILITIES FOR PROCESSING  
WARDA'S PROPOSED RICE INTRODUCTIONS

As a Regional Quarantine Station, it should be expected that Ibadan has obligation to render certain amount of service to WARDA free of charge. Workload and facilities permitting, the extent of such free service may be assumed to cover about 500 lines of rice per year. Since WARDA's rice introduction programme is set at about 2,020 lines per year, there is no doubt that the excess of about 1,500 lines will constitute an "overload" on the station and for which the stations facilities may be deemed 'deficient'.

The above deficiency will, of course, be reflected in facilities required for all phases of rice processing in quarantine - right from the clearing of consignments from the port of entry through the processes of registration, pre-health inspection services, seed incubation, health inspection, seed treatments, compilation and preparation (typing) of seed health results, glasshouse quarantine up to seed release or destruction.

In general, the station's existing professional staff is capable of adequately supervising the processing of WARDA's introduced rice materials while the station's first class infrastructure makes any additional provision of many physical

facilities like office space, seed incubation rooms, seed treatment space, seed storage rooms and general laboratory space unnecessary. However, supplementary facilities will be required in terms of:

1. Supplementary Supporting Staff:

These will be fully devoted to the prompt execution of WARDA's rice introduction programmes under the supervision of the station's professional staff.

A Technical Officer (Agriculture) trained in plant quarantine duties will be required as a programme coordinator. He will be responsible for sorting out WARDA's introduced plant materials from those imported by the numerous other institutions. He will see to the prompt collection of consignments from the ports of entry, distribution for processing to the appropriate officers responsible for various phases of the operation, follow-up to ensure that no consignment gets stuck somewhere, collection and collation of seed health results and finally, re parcelling and dispatch back to WARDA. He will also be responsible for disease detection on seeds.

Junior Seed Analysts:\* will be required for seed health testing and for pre-health inspection processing like seed plating, seed incubation, sterilization of equipments and preparation of culture media.

Laboratory Assistant:

One will be required especially for carrying out hot water treatment and organo-mercurial seed-dressings.

One Labourer will be responsible for washing up used seed testing plates and packing them ready for sterilization. He will also undertake the general cleaning of the laboratories, seed treatment and seed incubation rooms as well as the seed inspection cubicles.

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\*Seed analysts should receive 6 months training in seed health testing at the Danish Government Institute of Seed Pathology for developing countries. The Danish Government will be much willing to offer them fellowships.

Glasshouse Assistant:

He will be required for soil sterilization and potting for use in glasshouses, but will be assisted by a labourer who will be responsible for plant care (watering, thinning spraying etc.) in the glasshouses. Two other glasshouse labourers, who will undertake the cleaning of glasshouse tops and glasshouse surroundings as well as transportation of soils and potted plants, are also required.

Administrative Staff: The seed health results are usually very voluminous since the inspector gives report on all pathogens found on each single seed. The compilation, collation and typing of such results constitute one of the most time-consuming phases in quarantine seed processing. It will therefore be necessary to secure the services of two typists who will also be responsible for any related correspondence duties like registration and dispatch. A driver/mechanic will be required for prompt collection of consignments from the various ports of entry.

2. Supplementary Physical Facilities:

The station's existing number of seed inspection cubicles and glasshouses will need to be supplemented in order to accommodate the large number of rice introductions since each line of introduction must be processed in isolation of the other. Based on the 1,500 lines per year 'overload' on the station, an additional 3 closed quarantine seed inspection cubicles and 4 glasshouses will be required.

3. Equipments and Supplies:

The necessary equipments and supplies required include glasshouse airconditioners, airconditioning for closed quarantine seed-inspection cubicles, extractor fans (fitted with spare filters) for glasshouses and inspection cubicles, materials for glasshouse benching, as well as, seed incubation platforms, seed inspection microscopes, seed treatment hot water baths and chemicals, autoclave for prompt sterilization of instruments and media laboratory bench lamps, pathogen stimulating ultra violet light assemblies, steri-lamp assemblies, miscellaneous

expendable items like seed plates (petridishes), seed blotters, laboratory forceps, needles etc. as well as one vehicle for prompt collection of consignments from the Port of Entry:

### PROJECT BUDGET

The budget required for supplementing the existing rice quarantine facilities at Ibadan to ensure a prompt and efficient processing of WARDA's introduced rice materials can be summarised as follows:

1. Capital costs initial investments:

<u>Installations</u>		<u>US \$</u>
4 Glass houses	US \$36,500	
3 Seed inspection articles	<u>2,000</u>	38,500
<u>Equipment and Supplies</u>		
Laboratory equipment and supplies	10,260	
Glasshouse " " "	9,900	
Furniture and fittings and general	<u>6,500</u>	26,660
<u>Others:</u>		
Training	6,000	
Sundries	420	
Unforseen	<u>3,420</u>	9,840
Total investment		75,000

2. Project operational costs as far as expected during the initial implementation of the project (6 months) while seeds samples are already coming in.

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	<u>US \$</u>
Supplementary staff salaries, wages	21,600
Vehicle operation and maintenance	600
Freight, harbour dues and handling charges for consignments	1,000
Utility Outfit	200
Miscellaneous	500
	<u>23,900</u>

SUBSEQUENT ANNUAL RECURRENT EXPENDITURE

After the initial capital investments which constitute the 'project phase, subsequent annual running expenses to maintain the continued execution of WARDA's annual introduction programme will have to be made. This should consist of:

	<u>US \$</u>
Staff salaries, wages etc.	43,200
Maintenance, repairs and replacement of equipment	3,000
Maintenance of installations	1,000
Freight, harbour dues etc.	1,000
Maintenance and running of vehicles	600
Office supplies and General	200
Miscellaneous	1,000
Total annual recurrent expenditure	<u>50,000</u>

## APPENDIX V

AGREEMENT BETWEEN THE GOVERNMENT OF THE REPUBLIC OF SIERRA LEONE AND THE WEST AFRICA RICE DEVELOPMENT ASSOCIATION (hereinafter called WARDA or the ASSOCIATION)

### WHEREAS

The Government of the Republic of Sierra Leone is a Member State of the West Africa Rice Development Association;

### WHEREAS

Article II of the WARDA Constitution provides that

- the Association and its staff, as well as persons attending sessions of its organs in an official capacity, shall be granted in the territory of Member States the immunities, privileges and facilities which may be required for the proper exercise of the functions conferred on them by this Constitution or by virtue of decisions taken thereunder by the appropriate organs of the Association;
- the scope of privileges and immunities of the Association, its property, funds and assets and its staff shall be determined, mutatis mutandis in accordance with the provisions of the Convention on Privileges and Immunities of the Specialized Agencies of the United Nations

### WHEREAS

Article IV of the WARDA Constitution provides that the Member States of the Association shall:

- make available training and research facilities and land on such terms and conditions as may from time to time be agreed with the appropriate organ of the Association

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- make available national personnel on such conditions as may be agreed upon by the appropriate organ of the Association;
- supply the Association with such samples of plants, rice, seeds, soil and other material as required.

WHEREAS

Article X of the WARDA Constitution stipulates that:

"under the authority of the Governing Council.....  
the Executive Secretary shall be responsible for.....  
representing the Association in its relations with States and  
Organisations and entering into contractual relations, on behalf  
of the Association; with any individuals, corporations or other  
bodies or entities as may be necessary for the purpose of executing  
the approved programme of the Association within the limits of the  
budget of the Association";

WHEREAS

Article XI of the WARDA Constitution provides that:

- Member States may be required to make special contributions in kind or cash, in respect of programmes or projects carried out in their territories, the nature and extent of such contributions being determined by the Governing Council by means of agreements entered by the parties concerned;
- the Association shall have the power to accept gifts, legacies, grants, loans and other contributions in kind or in cash from Governments and International or National Organisations or Institutions and from other sources, provided that such gifts, legacies, grants, loans or other contributions are intended for the furtherance of the purposes of the Association;

...../

- The Governing Council shall determine, by means of financial regulations or otherwise, the conditions under which the Executive Secretary may accept gifts, legacies, grants, loans and other contributions and enter into appropriate agreements with donors without a special authorisation from the Governing Council, and

WHEREAS

Financial Regulation K provides that gifts, legacies, grants, loans or other contributions in kind or in cash.....from Governments and International or National Organisations or Institutions may be accepted by .....the Executive Secretary..... it being understood that the acceptance of any voluntary contributions which directly or indirectly involves additional obligations for Member States shall in any event require the consent of the Governing Council.

NOW THEREFORE

The Government of the Republic of Sierra Leone (hereinafter called the "Government") and the West Africa Rice Development Association have appointed as their representatives:

For the Government of the Republic of Sierra Leone

.....

Minister of Agriculture & Natural Resources

For the West Africa Rice Development Association

Mr. Jacques Diouf

Executive Secretary

who hereby agree as follows:

...../

Article 1:

Implementation of the Programme of the Association in Sierra Leone shall start in 1973. The Government will be informed at least three months in advance of the dates contemplated for the execution of the various sectors of the Programme so as to leave sufficient time for an adequate preparation.

Article 2:

The Association shall provide the international staff needed for the implementation of the projects. The Association and its staff shall enjoy in the territory of the State immunities, privileges and facilities which may be required for the proper exercise of the functions conferred on them, pursuant to Article II of the Constitution referred to in the Preamble of this Agreement.

The Association shall:

- (1) Organise Seminars on specific subjects and pay for the travel and per diem expenses of the participants;
- (ii) supply the Government with foundation seed of high yielding varieties;
- (iii) assist the Government in identifying and formulating projects;
- (iv) finance certain projects within its financial resources, according to modalities to be defined with the Government and subject to the approval of the Governing Council;
- (v) supply scientific and technical documentation, including micro-fiches and micro-films, on rice production and research;

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- (vi) provide consultant services upon the request of the Government on such matters as:
  - (a) research;
  - (b) extension;
  - (c) production;
  - (d) storage and processing;
  - (e) marketing of rice.
- (vii) assist the Government in carrying out or promoting any other measures or activities at the regional as well as the national level for the purpose of developing rice production and marketing in Sierra Leone.

Article 3:

The Government shall provide: housing and offices of the staff required for implementing the Programme of work adopted by the Governing Council as well as premises and land for carrying out the breeding programme for the improvement of mangrove rice, Soil Chemistry Programme and Rice Entomology Programme at Rokupr as well as for carrying out:

- (a) uniform co-operative variety trials at Rokupr (rainfed and mangrove) and Mange (irrigated rice);
- (b) fertilizer trials at Rokupr and Mange;
- (c) weed control trials at Rokupr and Mange;
- (d) mechanisation trials at Rokupr.

The Government shall supply any other facilities referred to in the Preamble to this Agreement, as provided for in the Constitution of the Association. Further provisions will define the modalities of application of this Article.

Article 4:

This Agreement is concluded for a period of five years, and is renewable by the mutual agreement of the Government and the Association.

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Article 5:

INTERPRETATION AND ARBITRATION

Any question in dispute that may arise concerning the interpretation or application of any provision of the Agreement, which cannot be settled by the parties concerned, shall be submitted to arbitration by an Arbitral Commission. The Arbitral Commission shall be composed by three members nominated as follows:

- (i) Each party shall nominate one arbitrator;
- (ii) The third arbitrator, who shall be the President of the Arbitral Commission, shall be chosen by agreement between the arbitrators nominated by the parties.

The decision of the Arbitral Commission shall be binding on the parties.

These provisions shall be without prejudice to the choice of any other mode of settlement that the parties concerned may jointly decide upon.

In case no agreed settlement is achieved, the question shall be submitted to the Governing Council for final settlement.

Article 6:

TEXT OF THE AGREEMENT

This Agreement has been drawn up in two original copies in English.

Article 7:

ENTRY INTO FORCE

This Agreement shall enter into force on the date of its signature.

Undersigned on behalf of the parties in Freetown.

For the Government of the  
Republic of Sierra Leone

For the West Africa Rice  
Development Association

Signed:

Signed: JACQUES DIOUF  
Executive Secretary

Date:

Date:

LINKAGES WITH INTERNATIONAL INSTITUTES

The coordinating centre for WARDA's research activities is at its headquarters in Monrovia. Effective linkages with the International Institutes, a strong coordination of on-going research at the National Research Centres of member countries and a large number of well designed coordinated trials are of paramount importance for increasing rice production in West Africa. In this respect, it should be realized that many research stations in the region are poorly staffed and equipped, and that national boundaries quite often limit the free flow of information, experience, experimental results and breeding material. It is WARDA's task to overcome these hurdles and to make maximum use of existing manpower and facilities in the region. The planning of assistance in staff, equipment and facilities with regards to the existing organisations in the region has been done in such a way as to avoid duplication of effort with maximum returns. As such, maximum use will be made of the infrastructure available at certain major centres, like IITA Bouaké, (Ivory Coast), Richard Toll (Senegal), Mopti (Mali) and Rokupr (Sierra Leone) and of an organization like IRAT. In this respect, it should be noted that IRAT has contracts with many francophone countries of West Africa for assistance in carrying out research at their national centres.

To tap all available research findings in the region, Seminars on specific topics will be organised by WARDA as one of its permanent features. These will be attended by rice scientists from the International Institutes and the National Research Centres in the region. In the first half of 1973, three seminars on Rice breeding and varietal improvement, Soil fertility and fertilizer use and plant protection for the rice crop were held in Monrovia, Liberia to pool information on rice research in West Africa, draw up plans for the coordinated trials (W1) and further improve on the WARDA special research projects (W2, W3 and W4). The seminars were well attended by

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scientists from IRAT, IITA, IRRI, FAO, UNDP, ECA, OAU/STRC, the Quelea Project in Chad, all member countries and Upper Volta. The USAID, The Netherlands, France, United Kingdom also sent representatives.

To further improve the linkage with WARDA policy making bodies, the Governing Council at its April 1973 meeting in Monrovia admitted IRRI and OAU(STRC) as members of its Advisory Committee to join IRAT, IITA, FAO and the UNDP which are already members. In addition, Mr. G. Vallaeys (IRAT) and Dr. Chandler (former Director of IRRI) are members of the 7-man Scientific and Technical Committee of WARDA.

Yearly, WARDA will have its Review Meeting at which a Research Report containing the results from coordinated trials, will be presented along with the results from its special Research Projects. Proposals have been sent out to all member countries, IRAT and IITA (also involved in this project) to include also in this report the major findings of the rice research centres in the member countries and those of the international research organisations in the region. In this way, WARDA's Annual Research Report may prove to be an up-to-date and handy document eminently suited to all persons and organisations involved and/or interested in rice research in West Africa.

Consultants will also be hired from IRRI, IITA and IRAT to make a round trip to all WARDA trials accompanied by the WARDA Research Coordinator and his two assistants. This will provide useful contact with on-going work and the latest findings in specific fields at the International Institutes. It will also provide an opportunity for scientists from International Institutes to compare the field performances of materials sent from their Institutes with those at their various stations.

WARDA will welcome the setting up of a Controlling Committee by TAC with members from IRAT, IRRI, IITA, FAO, WARDA and any other organization from which WARDA could benefit. The Committee will function on a permanent basis for consultation on rice research in West Africa and is expected to review the research

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work of WARDA financed by the Consultative Group from time to time and to make suggestions for improvement. It will also assure exchange of research information at an international level and control the funds allocated for WARDA's research projects by the Consultative Group. In order to discharge its functions effectively, financial provisions are envisaged to cover the cost of travel of Committee members either for attending Research and Review meetings or for visits to the trials in the member states.

A budget for the linkages with the International Institutes extracted from the budgets of Projects W1, W2, W3 and W4 is shown below:

BUDGET FOR EFFECTING LINKAGES WITH  
INTERNATIONAL INSTITUTES

W1:	Annual Review Meeting	\$ 38,500	
	Travel	16,500	
	Consultants	5,500	
	Seminar	35,000	
	Control Committee	11,000	\$ 106,500
W2:	Travel	10,300	
	Consultants	4,400	14,700
W3:	Travel	5,500	
	Consultants	4,400	9,900
W4:	Travel	13,200	
	Consultants	13,200	26,400
	Grand Total		\$ 157,500

PROJECT W1: COORDINATED TRIALS

Introduction

The concept of coordinated trials as one of the most efficient ways for obtaining quick and reliable results was well accepted during the three WARDA seminars on Rice Breeding and varietal improvement, soil fertility and fertilizer use and plant protection for the rice crop held at Monrovia in January and May 1973. At the Seminars, the plans of operations were presented, discussed and adopted for implementation. General agreement was also reached on the treatments to be included in the trials, the standardation of working procedures and uniformity of data collection. It is gratifying to note that member countries, IITA, IRRI and Thailand have made available in time the required seed rice for cooperative testing starting in June 1973.

The coordinated trials are fairly simple in design and handling so that they can be successfully conducted at a large number of test locations. They can be considered as the final stage of testing varieties, fertilizers, cultural practices, and of control measures against insect pests and weeds. Coordinated trials can also serve as an out-reach programme for testing research findings from the International Institutes and those from the National Research Centers of Member Countries. With proper linkages, both with Research and the National Extension Services of member countries, it should have a direct impact on rice production in the region.

Work programme

During the main season of 1973 (starting in June-July) about 100 coordinated trials (on varieties and fertilizers) are being conducted at about 30 test locations in West Africa (Appendix 1) under the supervision of a Research Coordinator, a Varietal Trials Coordinator and a Fertilizer Coordinator.

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These trials will be repeated later in 1973 in member countries with a second rice crop.

During the Plant Protection Seminar of May 1973, it was also decided that coordinated trials on insect pests and weed control should be started in the second crop season of 1973.

It is expected that the total number of trials in 1973 will be around 175, and that these will increase to 225 in 1974. The number of test locations, likewise, is expected to increase during the coming years and the trials are likely to be 275 in 1975, 325 in 1976 and 375 in 1977.

For each trial, detailed guidelines and instructions are issued along with data collection and trial information sheets to enable a proper interpretation of the results obtained (as an example for one trial, see Appendix 2).

Closely tied up with the coordinated trial programme is the training of field staff for the standardization of observations and data collection. The first three-week training course for Field Assistants was organized in February 1973 at the University of Liberia farm in Johnsonville, Liberia. These activities will be continued and expanded in the future.

A Seed Storage and Seed Service Centre is being established in cooperation with the University of Liberia to import seed rice from member countries, treat and process them and to dispatch adequate quantities to all test locations where variety trials are being conducted (Appendix 3). The establishment of this centre is being financed by USAID. It is hoped that TAC's support for financing the operating costs will be given.

Strict Plant Quarantine Regulations in West Africa and the limited facilities at the Plant Quarantine Station at Ibadan (Nigeria) for handling large numbers of rice introductions is hampering WARDA's programme on varietal improvement. This has adverse effects on the Coordinated Trials (W1) since new varieties may not be injected into the project as required.

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To overcome this serious bottleneck, a proposal is made to solve this problem by supplementing the facilities at the Ibadan Regional Plant Quarantine Station such that it can cope effectively with WARDA's introduction programme (Appendix 4).

In the field of coordinated trials, linkages have been established with International Research Organizations, like IRRI, IITA, IRAT and research organisations in Thailand and India from which WARDA has received seed rice for observation and testing. On weed control, IRRI has agreed to make promising herbicides available for testing in WARDA's coordinated trials. Also in the field of insect control, much assistance is expected from IRRI. In line with WARDA's efforts to seek proper linkage with all rice scientists in the region, three ad-hoc committees composed of persons drawn up from IRAT, IITA and WARDA member countries are to prepare three field manuals on Rice diseases, insect pests and weeds. The FAO/UNDP Quelea Project in Chad is willing to assist WARDA in preparing a brochure on Rice Eating Birds.

Contributions in kind and cash up till now were mainly supplied by USAID and the Netherlands. Member countries are providing houses for the field staff, working space and the necessary land for the field trials. TAC is therefore requested to recommend to the Consultative Group the financing of the balance of the amount needed for the Project.

TABLE 1

BUDGET W1 - COORDINATED TRIALS

	1974	1975	1976	1977	Total
<u>Capital Cost (Investment)</u>					
Total	110,900	5,500	9,000	5,500	130,900
composed of: Equipment	30,960	-	3,500	-	34,460
Installation	46,200	5,500	5,500	5,500	62,700
Others	9,840	-	-	-	9,840
Initial Investment	23,900	-	-	-	23,900
<u>Operating Cost</u>	656,650	714,750	731,250	747,750	2,850,400
<u>Personnel</u>					
Experts	5	5	5	5	
Technical Assistants	3	3	3	3	
Jr. Technical Staff	58	70	70	70	
Others	14	14	14	14	
<u>Project Costs W1-1974-77</u>	767,550	720,250	740,250	753,250	2,981,300
<u>Initial Expenditure in 1973 financed by bilateral aid</u>					
Total	370,000	146,000	-	-	
USAID	257,000	58,000	-	-	
Netherlands	100,000	75,000	-	-	
U.K.	13,000	13,000	-	-	
<u>For additional support from international aid *</u>	621,550	720,250	740,250	753,250	2,835,300
<u>Contributions Member States (not in budget)</u>					
Total	113,500	116,000	119,500	122,500	471,500
<u>Housing, offices, fields and local management</u>	36,500	44,000	45,500	47,000	173,000
<u>HQ Service (10% of Project Costs)</u>	77,000	72,000	74,000	75,500	298,500

\* TAC

## PROJECT W2: VARIETAL IMPROVEMENT

### Introduction

WARDA's objectives for special research projects on varietal improvement are the reinforcement of breeding work at Mopti (Mali) for deep water and floating rice and for mangrove swamp rice at Rokupr (Sierra Leone).

Research on deep water and floating rice in West Africa is very weak. This type of rice cultivation however accounts for 30% of the acreage and 40% of the total rice produced in the region. The relevance of this work lies in the fact that some member countries e.g. Mali and Niger depend almost entirely on this type of rice cultivation. Positive achievements could therefore on the long run improve their rice requirements and economy.

Varietal improvement work for mangrove swamp rice cultivation has a high priority as large areas can be brought under cultivation once high yielding and suitable varieties have been developed. It is estimated that about 15 million hectares of mangrove soils exist in the world and that a sound varietal improvement programme by WARDA for these problem soils could result in a big spin-off for similar regions elsewhere in the world.

Much breeding work is in progress on rainfed rice at Bouaké (Ivory Coast) and at IITA (Ibadan). WARDA's role will therefore be limited to providing a Research Assistant for Bouaké only since the IITA has adequate staff to cope with its research.

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No research work is planned for irrigated rice in view of the adequate research on it in the region and especially at the International Institutes.

#### Work Programme

A plant breeder is to be appointed for Mopti to be assisted by a Research Assistant. Supporting clerical staff, equipment and supplies will be provided by WARDA, whereas the host country (Mali) will provide furnished houses, office and laboratory space and 10 hectares of experimental fields.

Since new and promising deep water or floating rice varieties exist in Thailand, IRRI and elsewhere, contacts have been made to obtain them for Mopti where they will be screened and tested against local varieties. The plant breeder will later combine the good characteristics from local and introduced varieties through a hybridization programme.

The rice breeder for Rokupr is to be provided by the United Kingdom and his assistant will be paid by WARDA. Supporting costs and contributions from the host country (Sierra Leone) are similar to those provided at Mopti. The implementation of an FAO/UNDP/IITA development project also at Rokupr will be mutually beneficial and provide the WARDA breeder an opportunity to reinforce the work of the FAO/UNDP/IITA scientists.

Besides an active breeding programme, screening of large numbers of selections and varieties for resistance to iron toxicity, salinity and physiological disorders will need much attention. These are to be supplied by IRRI.

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TABLE 2

BUDGET W2 - VARIETAL IMPROVEMENT

	1974	1975	1976	1977	Total
<u>Capital Cost (Investment)</u>					
Total	49,500	7,700	10,300	-	67,500
composed of: Equipment	29,000	-	9,000	-	38,000
Installation	16,000	7,000	-	-	23,000
Others	4,500	700	1,300	-	6,500
<u>Operating Cost</u>	174,000	174,000	174,000	174,000	696,000
Personnel					
Experts	2	2	2	2	
Technical Assistants	4	4	4	4	
Jr. Technical Staff	4	4	4	4	
Others	5	5	5	5	
<u>Project Costs W2-1974-</u>					
<u>1977</u>	223,500	181,700	184,300	174,000	763,500
Initial Expenditure in 1973 financed by bilateral aid					
Total	253,930	68,000	-	-	-
USAID	185,930	-	-	-	-
U.K.	68,000	68,000 (Follow-up commitment)			
For additional support from other sources	155,500	181,700	184,300	174,000	695,500
Contributions Member States (not in budget)					
Total	40,000	35,500	36,000	35,000	146,500
Housing, offices, laboratory facilities and fields	17,500	17,500	17,500	17,500	70,000
HQ Service (10% of Project Costs)	22,500	18,000	18,500	17,500	76,500

## PROJECT W3: SOIL FERTILITY AND SOIL MANAGEMENT

### Introduction

The major challenge in this programme is to solve the existing problems of mangrove soils and those of other problem soils in the region. Senegal, Nigeria and Sierra Leone are interested in rice development projects on mangrove swamp soils. As pointed out by IRRI scientists, this project could have a worldwide impact as many million hectares of mangrove swamp soils could be brought under rice cultivation.

### Work programme

This project will be executed largely at Rokupr (Sierra Leone) where WARDA is planning to base a Soil scientist and a Research Assistant.

Another Research Assistant will be posted to Richard Toll (Senegal) to assist the IRAT pedologist in the soils programme.

Arrangements for supporting costs and provisions by the host countries (Sierra Leone and Senegal) are similar to those for the other research projects.

With close and effective cooperation among all soil scientists in the region and as adequate number of coordinated fertiliser trials are carried out, it is expected that existing soil problems can be diminished and that sound fertiliser recommendations and practices can be developed for the rice farmers. Rice varieties tolerant of the various adverse soil conditions will be introduced from IRRI and screened to determine those adapted to West African soils.

### Budget

The relevant budget is presented in Table 4.

TABLE 3

BUDGET W3 - SOIL FERTILITY AND SOIL MANAGEMENT

	1974	1975	1976	1977	Total
<u>Capital Cost (Investment)</u>					
Total	38,100	-	3,900	-	42,000
<u>Composed of:</u>					
Equipment	26,400	-	3,600	-	30,000
Installation	6,500	-	-	-	6,500
Others	5,200	-	300	-	5,500
<u>Operating Cost</u>	85,500	85,500	85,500	85,500	342,000

**Personnel**

Experts	1	1	1	1	
Technical Assistants	2	2	2	2	
Jr. Technical Staff	1	1	1	1	
Others	2	2	2	2	
<b>Project Cost W3 1974-1977</b>	<b>123,600</b>	<b>85,500</b>	<b>89,400</b>	<b>85,500</b>	<b>384,000</b>

<b>Left for financing from other sources</b>	<b>123,600</b>	<b>85,500</b>	<b>89,400</b>	<b>85,500</b>	<b>384,000</b>
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<b>Contributions Member States (not in budget)</b>					
Total	20,500	16,500	17,000	16,500	70,500

<b>Housing, Offices, Lab. facilities and fields</b>	<b>8,000</b>	<b>8,000</b>	<b>8,000</b>	<b>8,000</b>	<b>32,000</b>
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<b>HQ Service(10% of Project Cost)</b>	<b>12,500</b>	<b>8,500</b>	<b>9,000</b>	<b>8,500</b>	<b>38,500</b>
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PROJECT W4: PLANT PROTECTION

Introduction

Research activities on insect pests, diseases and weeds have been integrated into one project.

The main objectives in entomology are the screening of varieties and large numbers of selections for resistance or tolerance to insect pests; the development of suitable control measures and assistance to regional breeders in developing resistant varieties.

For diseases, major emphasis will be on research on Piricularia oryzae, the causal organism of the most important fungus disease of rainfed rice in West Africa. Regional screening tests, including all breeding material from West Africa along with large numbers of introductions from abroad, will be conducted at suitable locations to identify donors and promising material for resistance. Very close cooperation with the rice breeders in the region is the key factor for success as chemical control measures lie far beyond the scope of the ordinary rice farmer.

In weed control, major emphasis will be on controlling the various types of wild rices in commercial plantings, as wild rice is one of the most important noxious weeds in West Africa resulting in serious yield losses in various regions.

The effective application of plant protection measures may result in an overall yield increase of about 50 per cent.

### Work programme

The entomologist and his assistant will operate from Rokupr (Sierra Leone). The choice of this location is deliberate with respect to working facilities and existing insect problems at the farmers' level.

WARDA plans to station a pathologist with an assistant at IITA (Nigeria) where maximum use will be made of existing facilities.

The weed specialist will be based at Mopti (Mali) as wild rice is one of the major yield limiting factors in that country. Two research assistants for weed control are to be based at Richard Toll (Senegal) and Rokupr (Sierra Leone). Together with the other weed specialists working in the region (such as in the Casamance and Ivory Coast) and in close liaison with IRRI, it is expected that suitable control measures can be worked out for the major weed species.

The host countries, Mali, Senegal and Sierra Leone, will provide land for the experiments, accomodation, office and laboratory space for the scientists, while WARDA will provide supporting staff, equipment and supplies.

### Budget

The budget for the Plant Protection Project is presented in Table 4

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Table 4

BUDGET W4 - PLANT PROTECTION

	1974	1975	1976	1977	Total
<u>Capital Cost (Investment)</u>					
Total	32,000	-	3,500	-	35,500
composed of: Equipment	15,400	-	3,500	-	18,900
Installation	13,200	-	-	-	13,200
Others	3,400	-	-	-	3,400
<u>Operating Cost</u>	190,000	190,000	190,000	190,000	760,000
<u>Personnel</u>					
Experts	3	3	3	3	
Technical Assistants	4	4	4	4	
Others	4	4	4	4	
<u>Project Costs W4 1974-1977</u>	222,000	190,000	193,500	190,000	795,500
Initial Expenditure in 1973 financed by bilateral aid					
Total	174,570	19,000	-	-	
USAID	155,570	-	-	-	
U.K.	19,000	19,000	(Follow-up commitment)		
For additional support from other sources	203,000	190,000	193,500	190,000	776,500
Contributions Member States (not in budget)					
Total	40,500	37,500	38,000	37,500	153,500
Housing, offices, laboratory facilities and fields	18,500	18,500	18,500	18,500	74,000
HQ Service (10% of Project Costs)	22,000	19,000	19,500	19,000	79,500

TABLE 5

BUDGET SUMMARY W1 + W2 + W3 + W4

1. For TAC Support:

	1974	1975	1976	1977	Total
W1	621,550	720,250	740,250	753,250	2,835,300

2. USAID, Netherlands and U.K. Support and Commitments:

W1: USAID	58,000	-	-	-	58,000
Netherlands	75,000	-	-	-	75,000
U.K.	13,000	-	-	-	13,000
Total	146,000	-	-	-	146,000
W2: U.K./Total	68,000	-	-	-	68,000
W4: U.K./Total	19,000	-	-	-	19,000
Total: USAID	58,000	-	-	-	58,000
Netherlands	75,000	-	-	-	75,000
U.K.	100,000	-	-	-	100,000
Total Support W1, W2, W4	233,000	-	-	-	233,000

3. Still Left for Bilateral Support (Other Sources):

W2:	155,500	181,700	184,300	174,000	695,500
W3:	123,600	85,500	89,400	85,500	384,000
W4:	203,000	190,000	193,500	190,000	776,500
Total W2, W3, W4	482,100	457,200	467,200	449,500	1,856,000

4. Total Budget:

W1:	767,550	720,250	740,250	753,250	2,981,300
W2:	223,500	181,700	184,300	174,000	763,500
W3:	123,600	85,500	89,400	85,500	384,000
W4:	222,000	190,000	193,500	190,000	795,500
Total	1,336,650	1,177,450	1,207,450	1,202,750	4,924,300

Grand Total Project  
Costs W1+W2+W3+W4  
1974-1977

\$ 4,924,300



APPENDIX 6

BASIC DATA USED FOR COSTING OF ITEMS IN THE BUDGET

Operating Costs:

Annual Total Costs for:

Expert	\$ 33,000
Technical Assistant	10,000
Jr. Technical Assistant	3,300
Bilingual Secretary	10,000
Secretary	6,000
Clerk-typist	3,300
Typists	2,500
Driver	1,200
Labourer	1,000
Watchman	800
Operational Cost for field trial	330

Capital Costs (Investment):

Car and renewal	7,900 (4,400 + 3,500)
*Furnished house for Expert	30,000
*Furnished house for Res. Assistant	20,000
*House for Jr. Technical Assistant	5,000
*Cost for 1 ha field trials	300
*HQ Services = 10% of Project Costs	
*Housing, offices, laboratory facilities and fields = 10% of Capital Cost	

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\* Not in budget (Contributions in cash and in kind of Member States)

APPENDIX 6 (Cont'd)

Distribution of Capital Cost per Project and Experimental Station:

W1: Investment per Trial      \$ 110

	<u>Mopti</u>	<u>Rokupr</u>	<u>Bouake</u>	<u>Rich.Toll</u>	<u>Ibadan</u>	<u>Total</u>
W2: Investments						
Total	26,500	32,000	9,000	-		67,500
Equipment	15,000	15,000	8,000	-		38,000
Installation	9,000	14,000	-	-		23,000
Others	2,500	3,000	1,000	-		6,500
W3: Investments						
Total		39,800		2,200		42,000
Equipment		30,000		-		30,000
Installation		6,500		-		6,500
Others		3,300		2,200		5,500
W4: Investments						
Total	11,600	13,800			10,100	35,500
Equipment	3,300	5,500			10,100	18,900
Installation	6,600	6,600			-	13,200
Others	1,700	1,700			-	3,400