WARDA
Research Department

1981 ANNUAL REPORT

West Africa Rice Development Association
P.O. Box 1019, Monrovia, Liberia

CONTENTS

WEST AFRICA RICE DEVELOPMENT ASSOCIATION

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Rice is a staple food of growing importance in West Africa. An estimated 700,000 farmers grow rice in this region, but yields generally are appallingly low. Despite the tremendous potential in physical and ecological resources available for growing much large quantities of rice, West African countries spend larg amounts of their scarce foreign exchange resources to import rice to supplement local production.

The West Africa Rice Development Association (WARDA) is a cooperative intergovernmental regional organization aimed primarily at making the region self-sufficient in rice. It was started in December, 1971. Its members are Benin, Gambia, Ghana, Guinea, Guinea-Bissau, Ivory Coast, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo and Upper Volta.

WARDA is financed by member countries as well as by many donor countries and international organizations. The Consultative Group on International Agricultural Research (CGIAR) has been financing the coordinated trials aspect of WARDA's research program since 1974. The aim of WARDA is to promote and increase the quantity and quality of rice produced in West Africa through carefully planned research, development and training programmes. The Scientific and Technical Committee of WARDA reviews the Associations' programme, while the Governing Council formulates its policies.

Research Activities

WARDA's research projects are aimed at providing useful information and improved plant material which can be used for increased rice productivity. The overall programme includes:

- Coordinated trials of varieties and crop protection at various locations in the region.
- 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.
- Research coordination which invloves planning, project formulation, negotiation for funding, and the implementation and supervision of the approved budgets.

WARDA's coordinated trials have provided interested international research centers with opportunities for testing new rice types throughout West Africa. A sound programme of coordinated trials and effective links between WARDA and the national extension services had led to the introduction of improved varieties and better cultural practices among the rice farmers in West Africa.

To speed up the introduction of rice materials into the region, three glasshouses and three seed testing facilities have been built at the Regional Plant Quarantine Station, Ibadan, Nigeria. A nursery farm where new introductions are multiplied before entering them into the coordinated trials has been established at Suakoko, Liberia as well as a seed laboratory at Fendall, also in Liberia.

WARDA conducts a research review meeting, every year, at which a research report incorporating all the results obtained from the coordinated trials and national programmes are presented and discussed.

SUPPORT TO NATIONAL RESEARCH

In supporting national institutions, WARDA aims to assist in establishing capable national institutions, providing adequate facilities to local scientists, establishing a strong working relationship with national teams, solving local agronomic production problems and in strengthening particular aspects of national research programmes that have regional value. WARDA also backstops specific local research problems through its regional scientists and exchange of research information, and through assistance to countries trying to identify and draw up national research programmes. Presently, WARDA continues to strengthen national research facilities by supplying needed laboratory and field experiments. An integrated training programme to assist in the training needs of member states for research personnel is run yearly.

The programmes of the international centers such as IRRI and IITA and of WARDA are linked together with mutual benefit. WARDA helps to make the research findings of the international centres effective among its member states, while the international centres benefit from feedback from WARDA. In this light, WARDA has cooperative agreements with these centres in the area of training and research.

DEVELOPMENT ACTIVITIES

Since it is primarily a development association, WARDA has assembled a team of agronomists, irrigation and rural engineers, economists and loan specialists, rice storage and processing engineers and extension specialitists, as well as statisticians and data processing experts. This group is responsible for identifying, preparing and evaluating projects in member states either at their request or in collaboration with international financing institutions.

WARDA's main development activities are: the assembling of as much data as possible on production and consumption of rice and their trends; stimulation of rice production in the region in order to achieve self-sufficiency within this decade.

To achieve this, WARDA is helping to implement as many viable rice development projects as possible; helping member states to find funds for new projects; and monitoring improvements in the ongoing projects as regards to better cultural practices, water management, storage and processing as well as marketing, both within and among member countries.

Since the exchange of ideas among field workers in member states is very important, the development team undertakes case studies of specific projects for dissemination among member states; it also arranges seminars on specific issues in development, and helps personnel from one country to visit project in another. Member countries often call on WARDA for consultancy services in specialized areas of projection, production, processing and marketing.

TRAINING ACTIVITIES

One of the major drawbacks in increasing rice production in West Africa is shortage of trained personnel who can quickly convert accumulated research findings into rice production. WARDA's training center became fully operational in mid-1976 at the farm of the University of Liberia, Fendall. All courses are given both in English and French. The training centre conducts among others the following courses:

Rice Production Specialist Course: A six-month course designed to produce specialists who are to return to member countries to organize, manage and conduct training courses for extension workers, who, in turn, will assist rice farmers to increase their yields. The long training period allows adequate emphasis on all aspects of rice cultivation and processing as practised at the farm level.

Research Assistants Course: This is closely linked with the successful implementation of WARD's coordinated trials. This program will aid in ensuring standardization of observations and data collection.

Specialized Rice Courses: These are designed to meeting training requirements of member countries in seed technology, processing, storage and marketing. A total of 600 people from member states have been trained.

Documentation and Seminars

The Documentation Division collects, analyses and disseminates information relevant to rice in West Africa. Two current bibliographies and two world references on rice for West Africa have since been published. WARDA's documents are available on microfiche.

Seminars are organized regularly to tap existing rice knowledge in the region and elsewhere. Seven have been held on varietal improvement, soils and fertilizer use, plant protection, socioeconomic aspects of rice cultivation, management of rice projects, integrated pest management and transfer of technology.

Communication's Activities

The objectives of the Communications Division are: to ensure the timely production and distribution of all the Association's publications and documents; to carry out the information activities to sustain political and financial interest in the programmes in the region;and to remove the language barrier among scientists and research and development workers in the number states.

To achieve these objectives, the Division conducts the following actities: translation and editing; public relations; scientific and technical communication. It also operates a printing shop and a language laboratory.

PROFESSIONAL STAFF LIST FOR 1981

A. HEADQUATERS

Research Coordination

B.A.C. Enyi, mSc. Ph.D., F.L.S.. F.R.S.A. F.IL Bio., L.F.I.B.A.	—	Director of Research
G.A. Paku, Ph.D.	—	Agronomic Statistician
G. Varango, B.Sc. DPLG.	—	Architect

Technical Support Services

M.A. Choudhury, Ph.D.	—	Senior Rice Breeder
A.O. Abifarin, Ph.D.	—	Senior Rice Breeder IITa Liaison Scientist
D.K. Das Gupta, Ph.D.	—	Senior Agronomist
V.A. Awoderu, Ph.D.*	—	Senior Rice Pathologist
E.A. Akinsola, Ph.D.	—	Rice Entomologist
A.K. Koroma, Dr. Sc. Agric., Dipl. H. Ed., M.I. Biol.	—	Assoc. Rice Breeder
N.S. Bangura, M.Sc.	—	Assoc. Rice Pathologist
B.A. Larinde, M.S.	—	Seed Technologist
L. Kandakai (Mrs. BSc.)	—	Asst. Seed Technologist.

B. SUB-REGIONAL COORDINATION

ZONE I

R.B. kagbo, M. S., Ph.D.	—	Sub-regional Coordinator
K.M. Shambuyi, M.Sc.	—	Asst. Sub-regional Coordinator

ZONE II

S. Diatta, Ing. Pedologue, DEA*	—	Sub-regional Coordinator
S.D. Bangura, Ing. Agronome	—	Asst. Sub-regional Coordinator

ZONE III

S. Assegninou, Ing. Agronome, DEA*	—	Sub-regional Coordinator
M. Diakite, Ing. Agronome*	—	Asst. Sub-regional coordinator

* Joined during the year + On study leave.

ZONE IV

J.O. Oluforwote, M.Sc.*	—	Sub-regional Coordinator
D.C. Pankani, M.Sc.	—	Asst. Sub-regional Coordinator

ZONE V

O. Doffi-Tessio, Ing. Pedologue	—	Sub-regional Coordinator
M. Daffe, Ing. Agronome*	—	Asst. Sub-regional Coordinator

*Joined during the year.
+ On study leave.

C. SPECIAL RESEARCH PROJECTS

1. Mangorve Swamp Project - Rokupr, Sierra Leone

E. Jones, M.Sc.	–	Soil Scientist and Head
M. Agyen-Sampong, Ph.D.	–	Rice Entomologist
J. Stenhouse, Ph.D.	–	Rice Breeder
K. Prakah-Asante, Ph.D.	–	Agric. Economist
M.Jones, M.Sc.	–	Assoc. Breeder
C.A. Dixon, M.Sc.	–	Assoc. Soil Scientist
S.N. Fomba, M.Sc.	–	Assoc. Pathologist
S.J. Fannah, B.Sc. +	–	Research Assistant - Entomology
H.M. Barnard, B.Sc.	–	Research Assistant - Weed Science

ii. Irrigated Swamp Project - Richard-Toll/Fanaye, Senegal

H. Van Brandt, M.Sc.	–	Soil Scientist and Head
A. Coly, Ing. Agronome, Ph.D.	–	Rice Breeder
T. Diop, B.A.C. (Agricole) +	–	Research Assistant - Entomology
I. Camara, B.S.P. +	–	Research Assistant - Soil Science
A.M. Diop, Agronome	–	Research Assistant - Weed Science
J. Dome, Ing. Agronome	–	Associate Breeder

iii. Floating Rice Project - Mopti, Mali

S. Koli, Ph. D.	–	Agronomist and Acting Head
M. Goita, M.Sc. +	–	Assistant Breeder
A. Diarra, M.Sc. +	–	Assistant Weed Scientist
A. Toure, Ing. Agronome	–	Research Assistant - Agronomy
A. Dembele, Ing. Agronome	–	Research/Extension Officer.

Upland Rice Special Project - Mouake, Ivory Coast

J. Dallard, D.F.a.	–	Agronomist

ODA Training Programme

Rice Research Station - Rokupr Project

Mr. John McWilliam, B.Sc.	–	Agronomy
Mr. Mike Brown, M.Sc.*	–	Agric. Economics

*Joined during the year.
+ On study leave.

FOREWORD

This report covers the activities of the Research Department in 1981. Details are not included. Persons interested in the details are to contact the appropriate scientist (s) involved directly or through the Executive Secretary of WARDA.

Although much has been achieved in the few years of existence of the Association, nevertheless, much needs to be done. We realize the need to re-double our efforts and resources in the ultimate goal of assisting the member states to reach self-sufficiency in rice production and improve the economic and social well-being of the many small farmers in the West African region.

We wish to thank all our numerous donors for their support, without which next to nothing would have been achieved.

Sidi Coulibaly
Executive Secretary

HIGHLIGHTS OF CONDUCTED TESTS/TRIALS

Initial Evaluation Tests (IETs)

The Initial Evaluation Tests were used to screen a wide range of rice germplasm. In 1981 three IETs, one each for upland, lowland and deep-flooded condition were conducted in the region invloving 615 rice varieties at 39 locations, out of which 24 gave useful results. In the 1980-81 dry season, another IET was conducted at two locations. Varieties with higher yields, suitable maturity period, desirable plant height and disease resistance were identified from the IETs for further tests.

Coordinated Variety Trials (CVTs)

Coordinated Variety Trials were conducted at various locations in the WARDA region with the aim of having a direct impact on rice development. In 1981, thirteen sets of CVTs, three for upland, six for irrigated, and one each for cold tolerance, mangrove swamp, deep-flooded and floating conditions were conducted in the WARDA countries. Each set of trials consisted of 14 entries. A total of 54 locations was involved in this programme. The results of each trial are presented in this report and most promising varieties are hiegh-lighted.

On-Farm Trials

Ninety-five on-farm trials were conducted in four out of the five zones. There were no on-farm trials in Liberia and Sierra Leone of Zone II. Trials in Guinea, the other Mmember of Zone II did not give any meaningful results.

Promising varieties with high yielding ability (selected from the WARDA CVTs) and local check varieties were included in the on-farm varietal trials. In some member countries on-farm agronomic trials such as weed control, varietal response to fertilizers and cultural practices were conducted in the 1981 season. Promising nerbicides (selected from the WARDA CVTs) were included in the on-farm weed control trials.

TECHNICAL SUPPORTING SERVICES

The Technical Support Services (TSS) continued to perform its roles in 1981. Highlights of the various units and programmes of the TSS are presented below:

Seed Nursery Farm (SNF) served as an important unit for screening a total of 2226 rice varieties and lines. Associated with SNF activities was the seed multiplication for 286 varieties at Richard-Toll.

Seed Laboratory

The WARDA Seed Laboratory continued to supply high quality rice seed of newly introduced/developed varieties for the WARDA research and germplasm exchange activities. The activities of the laboratory included routine seed handling, seed supplies for WARDA research activities and germplasm exchange; and research and training in seed handling. In 1981, 1137 varieties and lines, received mainly from WARDA special resreach projects, were processed in the laboratory.

Agronomy

In a yield constraints study, it was found that in a fallow-rice-rice systems yields could be increased 100% over traditional yield by adopting a package consisting of line sowing + fertilizer + weeding. The productivity of the soil in a bush fallow-rice-rice system could be maintained by application of 40-60 Kg N/ha. Compound fertilizer (15-15-15) was the least effective source of nitrogen while Tunisia phosphate rock was the most effective as a source of phosphorus in the nitrogen and phosphorus studies respectively.

Entomology

Constant surveillance of insect pests of rice was carried out at Suakoko throughout the year. There were no pests of economic importance. Low incidences of lady-bird beetle, **Apilachna similis, Diopsis thoracica,** termites and rodents were found. However, **Nymphula depunctalis** caused serious damage to irrigated rice in Fendall, Liberia.

Pathology

Disease monitoring in the region was the main activity of the TSS pathologists. Blast (**Pyricularia oryzea**) was the major disease. Incidences of bacterial blight (**Xathomonas oryzae**) and bacterial leaf streak (Xanthomonas **translucens** f.sp. **oryzicola**) were reported in Sahelian zones.

Germplasm Programme

In 1981 WARDA received a total of 369 collections from IRAT for conservation under the medium-term storage. the collections were made up of cultivars from the Cameroon, Chad, Guinea, Ivory Coast and Mali. Following specific requests from IITA for iron toxicity screening in cooperation with CARI rice breeders at Suakoko, assessment under irontoxicity conditions was carried out. Also some of the collections, earlier identified as tolerant, were further assessed in 1981. The walk-in-cold rooms of our germplasm bank were installed.

INTERNATIONAL RICE TESTING PROGRAM (IRTP)

In 1981, 76 sets from the 1980 rice nurseries were made available in the region. Fourteen ofthe 164 1981 nurseries were planted. The balance will be planted in 1982. Many promising cultivars were identified and have been nominated into WARDA trials or for further testing in national programmes or for hybridization.

INTEGRATED MANAGEMENT OF RICE DISEASES AND INSECT PESTS

As indicated in the previous year, the Plan of Operation document, an Integrated Pest Management of rice in West Africa had been completed. The whole programme, as a package, would be executed upon availability of funds. Meanwhile crop protection activities at the Special Research Projects are being geared toward Integrated Pest Management.

The first step towards implementation of the programm was the hosting of a short course onIntegrated Pest Management co-sponsored by WARDA and the Consortium for International Crop Protection (CICP), University of California, Berkeley, United States of America at Fendall, Liberia. The course, in West Africa.

SUPPORT TO THE VARIETAL IMPROVEMENT PROGRAMME AT IDESSA, BOUAKE

A total of 543 lines were selected from segregating populations for further assessment. In evalution studies IRAT 13, IRAT 104, IRAT 120 and IRAT 156 were found to be the most outstanding upland medium duration cultivars. IRAT 104 is best adapted to the central zone and IRAT 13 to the Western zone of Ivory Coast. The most early-maturing cultivars were IRAT 144 and IRAT 109. Three selection criteria were used to evaluate their relative importance in selection programmes. The studies revealed that selection against stained grains, poor milling recoveries and open glums should be adopted.

SPECIAL RESEARCH PROJECT ON DEEP-FLOODED AND FLOATING RICE AT MOPTI, MALI

The Mopti project is engaged on developing improved varieties and cultural practices in the form of packages fordeep-water rice farmers in West Africa.

Varietal improvement programme in which some progress has been included screening tests, yield trials and a small hybridization programme. Agronomic activities undertaken with encouraging results included land preparation, cultural practices and fertilizer management.

Entomoligical studies undertaken included insect identification, population dynamica, stemborer infestation and chemical control. Promising results were obtained.

Under research extension programme, modern varieties are demonstrated to the farmers. Useful information has been gathered.

RICHARD-TOLL/FANAYE, SENEGAL - IRRIGATED RICE

Virietal Improvement

Most of the research staff left during the year under review for further studies and therefore most of the work was done with the assistance of the Technical Supporting Staff of WARDA in Monrovia and other experts from CILSS and OMVS. The research projects were concentrated at Fanaye, Dagana and Farmers' fields.

Experiments on the long duration (149-162 days) cold tolerant varieties gave yields from 3.6 t/ha as in Shang-Sai-Cha to 5.7/t/ha as in Kon-Chou-Chan. Short duration types (131-137 days) gave yields of 3.2 t/ha (Kayayuki) to 4.0 t/ha (Tatsumi Mochi).

Some rice varieties such as improved Mashuri 1785 and IET 2775 which are cold tolerant and at the same time less susceptible to bird attack were also shown to be high yielding. A number of high yielding varieties were also identified from the International Rice Research Institute, Los Banos, Philippines.

Weed Science

Work on Weed Science focused on collection and identification of weeds in order to set up a herbarium; and studying the efficacy of Basagram PL. The most prevalent weed species were **Aesohynomene indica; ammania auriculta; Cyperus difformis** and **Echinochloa zeylanica.** On the effect of crop density on weed control, trial it was estiblished that increasing the crop density led to a significant decrease in the number and dry weight of weeds.

Entomology

Research activities undertaken at Fanaye and on farmer's field at Guede focused on studying varietal resistance to insects and mites as well as the screening of granulated insecticides. An entomological survey was also carried out in three WARDA member countries (Mauritania, Senegal and the Gambia).

Ekalux and Azodrin reduced damage caused by **Aleurocybotus indicus** and **Olygonychus** sp. Furandan 3G confirmed its superiority over the other insecticides in controlling **Aleurocybotus indicus.** It is recommended that Ekalux and Azodrin be used in the dry season and Furandan in the wet season when borers are more prevalent.

Azolla Project

Attempts were made to evaluate the impact of one or several azolla crops on rice yields in the presence or absence of various nitrogen fertilizer rates.

It was established that the ploughing in of two Azolla crops could lead to the saving of 50% of the Urea in paddy rice fields.

On-farm Trials

Pre-extension on-farm trials were conducted during the dry season. On farmers' plots in the middle valley of the Senegal River and in the wet season on plots in the Delta. The trials were mainly on NPK fertilizer and Urea supergranule tests. The supergranule test showed that substantial savings could be made.

MANGROVE SWAMP RICE-POKUPR, SIERRA LEONE

Activities at the Special Research Project, Rokupr included variety improvement, crop protection, cultural practices including soils and mechanical cultivation, agricultural economics and on-farm trials. Multidisciplinary research approach was continued and results obtained in previous years have been confirmed in farmers' fields. Simple technological packages are not available for the mangrove swamp rice farmers.

RESEARCH ACTIVITIES

INITIAL EVALUATION TESTS

Initial Evaluation Test - Upland

The 1981 upland IET was sent to 14 predetermined locations. Results from 11 locations were useful. The IET was composed of 174 entries of mixed duration, plant height and plant type and of varied drought tolerance.

Yield

Out of 174 entries, one variety, ITA 233, produced a yield of over 3.5 t/ha; 21 varieties, a yield of over 3.0 t/ha; and 77 varieties a yield of over 2.5 t/ha. Among the top 25 entries, 13 came from IRAT, 5 from IITA, 4 from IRRI and 3 from other sources. A total of 131 entries produced a yield of over 2.0 t/ha. Varieties giving over 2.5 t/ha are considered here as good yielding varieties.

MATURITY

Some of the varieties giving a yield of over 2.5 t/ha namely IRAT 146, Dj 11-509 and Dj 8-341 flowered in 71 days; IRAT 144 and IRAT 112 in 72 days; FH 109, IRAT 133 in 72 days; and IRAT 142 in 73 days. These varieties are considered as good yielding early varieties.

Plant Height

The following good yielding varieties are of desirable plant height (100-120 cm):

ITA 233
IRAT 162
IRAT 170
IRAT 166
IRAT 109
IRAT 165
IRAT 168
IRAT 167
IR 3249-19-1-2
IRAT 142
IRAT 130
TOX 378-13-6-B-B
TOX 378-1-6-1
ITA 183
ITA 208
TOX 86-1-3-1
ITA 173
IRAT 169
62-155-G
Sel IRAT 194/1/2
M 18
IRA 165
IRAT 184
IR 5931-81-1-1
C 171-136
IR 4551-409-2-6
ITA 132
IRAT 101
TOX 475-NIDI-SUR
ITA 135
ITA 235
ROK 16
ITA 157
TOX 95-5-1-1-1
IRAT 161

Leaf Blast

Among the varieties giving over 2.5 t/ha of yield, namely Ir 45, IR 5853-198-1-2, IR 8235-84, IRAT 165 and IRAT 166 were noted as highly resistant to leaf blast.

Neck Blast

Among the good-yielders the following were highly resistant to neck blast:

Dj 11-307-3-3-5

Dj 11-307-3-1-5
IR 45
IR 4551-409-2-6
IR 5931-81-1-1
IR 6023-10-1-1
IR 6115-1-1-1
IR 8235-84
IR 8235-84
IR 8235-194
IR 9559-1-2-3
IR 9669-SEZ
IR 9671-1-4-6-8
IRAT 13
IRAT 133
IRAT 142
IRAT 144
IRAT 146
IRAT 160
IRAT 161
IRAT 162
IRAT 165
IRAT 166
IRAT 169
IRAT 184
ITA 132
ITA 135
ITA 183
ITA 208
ITA 233
ITA 234
ITA 235
M 18
ROK 16
Sel IRAT 194/1/2
TOX 95-5-1-1-1
TOX 728-1

Leaf Scald

For leaf scald the most resistant good yielding varieties were:

IR 9671-1-4-6-8
IRAT 142
IRAT 146
IRAT 165
ITA 183
ITA 235

Brown Spot: IRAT 146, IRAT 162, IRAT 166 and IRAT 168 were found to be most resistant to brown spot.

Sterility: Of the good yielders, ITA 233, ITA 234 and ITA 235 only were found to have least or no sterlity of seeds.

INITIAL EVALUATION TEST - IRRIGATED CONDITION

The 1981 IET irrigated conditions was sent to 19 predetermined locations. Results from 12 sites were found encouraging. The IET was composed of 216 entries of mixed behaviour, such as mixed heights, mixed duration, etc.

YIELD

Five varieties, namely IR 14632-22-3, IR 15529-256-1, IR 9784-142-1-3-3, RP 1064-2-2, and RP 103 produced grain yield above 5.0 t/ha. Out of 216 entries, 36 varieties gave yields above 4.5 t/ha and 110 entries above 4.0 t/ha. The following avrieties produced yield of 12.0 t/ha or more at Richard-Toll:

75-8430
MTU 7029
Rajendra Dhan
Pau 128-118-PR 302.
MRC 1476-741
ITA 240
AD-7486

Also at Richard-Toll, 101 varieties gave yield of 10.0 t/ha or more. Very low yields at Contuboel reduced the average yield of varieties. Varieties producing over 4.5 t/ha are considered here as good yielding varieties.

MATURITY

The variety, IR 9715-74-3 (giving 4.5 t/ha or more of yield) was found to be the earliest flowering variety, doing so in 86 days. Seven varieties, namely,

IR 9784-142-1-3-3
IR 9828-41-2-1
75-4830
IR 9715-74-3
IR 9715-74-3
B 2360-6-7-1-4
IR 9861-25-1-1 and
IR 9846-23-2

flowered within 95 days.

Plant Height:

Most of the entries were of desirable plant height under irrigated conditions although many of them were of semi-dwarf types.

Leaf Blast:

The good varieties showing scale '1' in at least two of the three locations were:

IR 9784-142-1-3-3
RP 1064-14-2-2
IR 9814-5-2-2
IR 9828-41-2-1
ECLA-S-112
75-4830
BU 248-1
BR 161-2B-54
CR 218-1002.
B 2850B-Si-2-1
IR 9715-74-3
BR 51-315-4
B 2360-6-7-1-4
IR 9861-25-1-1
IR 9846-23-2
RF 1017-184-5-3-3
IR 3483-109-3-2-3

Neck Blast

Varieties showing scale '1' among good yielders in at least two of the places were:

IR 14632-22-3
IR 9784-142-1-3-3
RP 1064-14-2-2
IR 9828-41-2-1
BG 11-11
ECLA-S-112
75-8430
BW 161-2B-54
BR-52-96-3
B 2850-B-Si-2-1
B-2797B-MR-126-2
THAU 17005
BR 51-315-4
B 2360-6-7-1-4
IR 9861-25-1-1
RP 35-2874
IR 9852-22-5
IGPI-2
IR 3483-109-3-2-3

Leaf Scald

Among the good yielding of scale '1' in at least two of the places were:

IR 14632-22-3
IR 97840142-1-3-3
RP 1064-14-2-2
IR 9814-5-2-2
IR 9828-41-2-1
BG 11-11
PMR 24263
MTU 7029
UPR 322-3-1
BR 131-3-1
Ir 3483-109-3-2-3
IR 9715-74-3
THAU 17005
NIGERSAIL
B 2360-6-7-1-4
IR 9861-25-1-1
RP 35-2874
VIJAYA (SEL)
IR 9846-23-2
IR 9852-22-5
IGPI-2
IR 2071-685-3-05-4-3

Brown Spot

Among the good yielders with scale '1' in at least two of the places were:

IR 15525-256-1
IR 9784-142-1-3-3
RP 1064-14-2-2
IR 9814-5-2-2
IR 9828-41-2-1
BG 11-11
ECLA-S-112
BW 248-1
CR 213-1002
B 2757 D-MR-1226-2
B 2850 B-Si-2-1
IR 9715-74-3
Br 51-315-4
Ir 986125-1-1
IR 9846-23-2
IR 9852-22-5
ICPI-2
IR 2071-685-3-5-4-3
IR 3483-109-3-2-3
BR 52-96-3

Soil Problems

Good yielding varieties showing resistance to iron toxicity at Suakoko were:

BW 248-1
IR 15529-256-1
NIGERSAIL
BR 131-3-1
PUA MUTI-40-PR 504
PMR 24263
PR 103
RP 35-2874
RP 1017-184-5-3-3
THAU 17005
VIJAYA-(SEL)

INITIAL EVULATION TEST - DEEP FLOODED CONDITION

The deep-flooded ITE was sent to six locations in 1981. The test could not provide useful results from six of the sites. At Mopti (Maili), the ITE provided some enteries for further tests. The results are presented under Mopti project.

INITIAL EVALTATION TEST - DRY SEASON 1980-1981

The dry season IET of 1980-81 was conducted only two places. The ten top yielding varieties at Sapu were;

IET 1785	11.3 t/ha	BR 51-46-1/C1	9.8 t/ha
BG 406-1	11.0 t/ha	ITA 6794	9.7 t/ha
IET 6073	10.5t/ha	BG 19-2	9.6 t/ha
IR 9761-47-3	10.2 t/ha	PAUL 64-3-4	9.5 t/ha
BR 167-2B-9	10.0 t/ha	BR 167-2D-22	9.5 t/ha

This ten highest yielding varieties at Gagnoa were:

BrJ-7-73	4.3 t/ha	Dr 303-E-2-9	3.6 t/ha
BR 52-85-7/HR70	4.2 t/ha	RP 79-2	3.6 t/ha
BG 404-1	4.2 t/ha	PAU MUTI-4-1-1	3.6 t/ha
BR 161-2D-59	4.0 t/ha	BG 11-11	3.5 t/ha
		IR 2798-107-3	3.5 t/ha

COORDINATED VARIETY TRIALS (CVTs)

CVT-DRY SEASON 1980 IRRIGATED SHORT DURATION

The dry season short duration trial of 1980-81 was conducted at five locations. Nominated entires of 1980 short duration trial were tested under this trial. The mean grain yield ranged from 2.0 to 6.1 t/ha. BR51-46-5 produced the highest yield of 6.1 t/ha in 111 days followed by IET 3137 with a yield of 4.5 t/ha in 101 days. BG 90-2 produced 5.1 t/ha and BR 51-46-5 from 3.8 to 8.1 t/ha. Due to seasonal effect, plant hieght of most entires was reduced compared to that of the main season's trial. It appears that diseases were minimum at all the places during the season. Considering yield, maturity and plant height, BR 51-46-5 was found to be a very good variety for the dry season. Its erect, non lodging habit and medium fine grain will probably make it a popular variety in the near future. The average yield and other major characters of the entires are shown in Table 1.

CVI-1, 1981: 1SAVANNA UPLAND SHORT DURATION

In 1981, the savanna upland short duration variety trial was conducted at nine locations with satisfactory result at almost all the locations.

Among the varieties, IRAT 110 showed overall superiority over other entries giving 3.5 t/ha and maturing in 100 days. Other entries showing excellent performance were IRAT 144, IRAT 142, IRAT 109 and IRAT 133 each giving 3.4 t/ha. It is interesting to note that all the IRAT entries were superior in yield to non-IRAT entries. IRAT entries were also early maturing. The only disadvantage of IRAT 100 is its shorter height (94 cm).IRAT entries showed resistance to leaf and neck blast, brown spot and leaf scald. The average yield and other major characters are shown in Table 2.

CVT-3, 1981: MOIST ZONE UPLAND MEDIUM DURATION

The moist zone upland medium duration trial was conducted at 14 location in 1981. The performance of the trial was very good at all locations.

Considering grain yield, maturity and plant height, IRAT 170 and IRAT 138 gave the best and similar performance (3.0 t/ha). TOX 515-11-SLR which produced 2.9 t/ha was too short (80 cm) and matured in 131 days. IRAT 1o4 also produced 2.9 t/ha and with acceptable height and maturity. Several varieties including IRAT 170 and IRAT 138 lodged at Ikenne (Nigeria), Farakoba (Upper Volta), and Man (Ivory Coast). Variety X site analysis showed superiority of IRAT 138 over the over entries.

IRAT 170 and IRAT 138 showed resistance to moderate susceptibility to leaf blast, leaf scald and brown sport. The grain yield and other major characters of the entries are shown in Table 4.

CVT-4 1981: SAHEL IRRIGATED SHORT DURATION

The Sahel irrigated short duration trial was conducted at five lo. tions in the WARDA region in 1981. The trial was well conducted at all the places and the yields were good. The mean yield ranged from 2.8 to 6.5 t/ha The variety, 75-8430 (134 days; 93 cm high) produced the hieghest average yield of 5.9 t/ha the minimum and maximum yields being 3.7 t/ha and 8.9 t/ha respectively. BR 13-47-3 (134 days; 93 cm high) gave the second highest yield of 5.8 t/ha. IR 2823-399-5-6 which produced 5.5 t/ha is too short and with longer maturing period.

There was little or no disease in all the locations. Several entries which were thought to be early turned out to be of medium maturity in the Sahel.

Variety X site analysis confirmed the superiority of 75-8430, BR 13-47-3 and IR 2823-399-5-6. The grain yield and other major characters of the entries are shown in Table 5.

TABLE 1 CVT - SHORT DURATION, 1980-81

DRY SEASON, IRRIGATED

DESIGNATION	YIELD (t/ha)	DAYS TO 50% FLOWERING (DT50%F) (DAYS)	MATURITY (DAYS)	HEIGHT (cm)	PAN/m^2
BR51-46-5	6.1	80	111	93	294
IET 3137	5.5	74	101	79	345
BG 90-2	5.1	78	110	83	329
IR3273-P339-2	5.0	90	121	83	362
B 541B-PN-58-5-1	5.0	82	111	94	318
TOX 514-16-101-1	4.9	75	108	82	322
BOUAKE 189	4.7	84	119	97	306
IR2042-178-1	4.7	86	113	85	319
BR168-2B-23	4.6	84	116	85	312
MRC 505	4.5	86	119	84	333
IET 1444	4.4	72	101	84	369
BP1769 X DAWN	4.0	81	111	94	272
MTU 8431	3.9	85	117	93	313
IR27998-107-3	2.7	60	118	72	358

CVT–2, 1981: MOIST ZONE UPLAND SHORT DURATION

The moist zone upland short duration trial was conducted at 16 locations in 1981.

Among entries, IRAT 144 performed best (3.3 t/ha) and matured in 102 days. Other good varieties were IRAT 109, DJ 12–539–2 and IRAT 110. DJ 12–539–2 because of its semi–dwarf character may not be a good variety. IRAT 144 was moderately susceptible to leaf blast at Sotouboua and Rokupr but was moderately resistante to blast at other places. IRAT 144 was moderately susceptible to brown sport, and leaf scald at Suakoko.

Considering the stability of yield, maturity and plant height, it appears IRAT 144 is probably the best variety at the moment for upland both in savanna and moist zones of West Africa. Variety x site analysis also showed the superiority of IRAT 144. The average yield and other major characters are shown in Table 3.

TABLE 2: CVT–1 SAVANNA UPLAND SHORT DURATION, 1981

DESIGNATION	YIELD	50% FLD.	MAT.	HT.	PAN./m^2
IRAT 110	3.5	71	100	94	229
IRAT 144	3.4	73	100	100	184
IRAT 142	3.4	75	101	104	198
IRAT 109	3.4	75	103	110	191
IRAT 133	3.4	73	101	98	179
IRAT 112	3.2	71	98	101	190
IRAT 146	3.1	71	99	100	187
IRAT 147	2.8	69	97	101	158
TOX 516––19–––SLR	2.7	92	120	80	221
M18	2.6	86	115	106	170
62 –155 –C1	2.5	84	113	112	240
C168	2.5	96	121	76	245
TOX 86 –1–3–1	2.2	90	115	115	175
B529C MD–––20–3–6––C1	1.7	97	123	94	217

TABLE 3: CVT–2, MOIST ZONE UPLAND DURATION, 1981

DESIGNATION	YIELD	50% FLD.	MAT.	HT.	PAN./m^2
IRAT 144	3.3	72	102	108	180
IRAT 109	3.3	74	104	100	171
DJ 12–539–2	3.2	81	108	82	217
IRAT 110	3.2	73	103	91	213
M 55	3.1	85	111	106	181
IRAT 133	3.1	72	102	96	175
ITA 117	3.0	83	106	96	210
DJ 8 –341	3.0	73	101	67	259
IRAT 112	2.9	70	99	102	183
ROK 16	2.5	92	120	133	15
TOX 502–13–SLR	2.5	88	113	126	165
CR 1015	2.0	101	129	84	181
DHARIAL	1.7	69	98	113	226
IR 2922–2–A1	1.3	101	129	97	190

TABLE 4: CVT - 3, MOIST ZONE UPLAND MEDIUM DURATION, 1981

DESIGNATION	YIELD (t/ha)	DT50% F (Days)	MAT. (Days)	HT. (cm)	PAN./m^2
IRAT 170	3.0	91	114	114	149
IRAT 138	3.0	90	114	105	189
TOX 515-11-SLR	2.9	106	131	80	213
IRAT 104	2.9	94	119	114	150
SEL. IRAT 194/1/2	2.8	90	114	104	182
DJ11 - 509	2.8	74	102	72	228
IRAT 132	2.7	93	118	109	169
IRAT 156	2.7	92	117	114	157
TOX 516-19-SLR	2.7	96	123	82	195
ITA 116 (TOX 86-1-3	2.5	90	115	118	170
IRAT 136	2.4	95	122	106	139
TOX 494-SLR	2.3	89	114	120	159
C22	2.2	97	123	106	201
COL 38	1.9	109	135	90	188

TABLE 5: CVT–4, IRRIGATED SAHELL SHORT DURATION, 1981

DESIGNATION	YIELD (t/ha)	DT50% F (Days)	MAT. (Days)	HT. (cm.)	PAN./m^2
75–8430	5.9	91	134	93	205
BR13–47–3	5.0	91	130	87	235
IR2823–399–5–6	5.5	96	133	88	256
B2869–11–3–2–9	5.3	95	136	101	278
IET –247	5.3	91	127	93	248
B 2660–8–9–5	5.2	95	137	163	229
IR1529–430–3	4.9	93	128	94	273
IR5179–2–2–Al	4.1	91	122	91	212
KN361–18–6	4.1	83	120	122	216
RASHT 446	4.0	91	123	93	230
IR9782–144–3–3–3	3.9	88	115	83	293
TOX 504–21–120–B–B	3.3	82	127	113	171
TOS 4688	3.3	88	119	104	197
B90–MO–3–3	2.6	21	103	65	279

CVT 5-, 1981: SHAEL IRRIGATED MEDIUM DURATION

The Sahel irrigated medium duration trial was conducted at six locations. The mean yield ranged from 3.7 to 8.2 t/ha. ITA 230 gave the best performance with 6.1 t/ha and matured in 134 days. IR 3274-P239-2 gave 6.0 t/ha but took 138 days to mature. IR 2071-586-5-3 produced 5.9 t/ha and matured in 134days. The other variety of good merit was BR 51-319-9 which produced 5.8 t/ha and matured in 133 days with a height of 107 cm. ITA 232 was also promising.

The variety X site analysis showed superiority of ITA 230 and BR 51-319-9. The grain yield and other major characters of the entries are shown in Table 6.

CVT-6, 1981: ,POST ZONE IRRIGATED SHORT DURATION

The moist zone irrigated short duration trial was conducted at 14 locations in 1981. The trial was very well conducted at most of the locations and yields in general were very good. The mean yield rangedfrom 2.2 to 5.7 t/ha. MRC 505 produce the highest yield of 4.9 t/ha followed by IR 3273-P339-2 and IR 2042-178-1 with grain yield of 4.5 and 4.3 t/ha respectively. Almost all entries showed resistance to moderate resistance to leaf blast, neck blast, brown spot and leaf scale. Most entries showed higher sterility at Suakoko. A varietal difference was observed at Suakoko in relation to soil problems, particularly iron toxicity with MRC 505, IR 3273-P 339-2 and IR 2042-178-1 showing moderate resistance.

Variety X site analyiss indicate that IR 3273-P339-2 and IR 2042- 178-1 are better adapted tothis ecological condition. The grain yield and other major characters in the entries are shown in Table 7.

CVT-7, 1981: MOIST ZONE IRRIGATED MEDIUM DURATION

In 1981, the moist zone irrigated medium duration trial was conducted at 14 locations among the member countries.

IR 4422-98-3-6-1 produced the highest yield of 5.0 t/ha closely followed by ITA 212 and BR 51-118-2 each with grain yield of 4.9 t/ha. Nigersail, which showed promise last year gave 4.7t/ha. Similar trend was observed for most other entries of semi-tall type, except IR 13429-57-1 and IR 9782-144-3-3 whicl were-dwarfts.

IR 13429-57-1, IR 9782-144-3-3-3, BG 375- 1, IR 2071-588-5-6-3 and Nigerisail showed susceptibility to leaf blast while ITA 123 was susceptible to neck blast and IR 422-98-3-6-1 susceptible to brown spot. Most varieties showed susceptability to leaf scal and higher sterility was observed at Suakoko with theexception of Nigersail which was not susceptible to iron toxicity. A varietal difference for iron toxicity tolerance was observed at Suakoko with BW 248-1, IR 2071-588-5-6-3, IR 13429-57-1 and ITA 212 showing some tolerance. The average grain yield and other major characters of the entries are shown in Table 8.

CVT-8, 1981: COLD TOLERANCE TRIAL DRY SEASON 1980-81

The cold tolerance trial was started in 1980/81 dry season for the first time. The trial failed at most places due to management problem. Valid results were obtained from only Valle du Kou, and additional check, IR 1529-680-3 included in the trial gave the highest yield of 7.3 t/ha. followed by IR 7167-33-24 (7.1 t/ha) and KN 14 351 (6.9 t/ha).

CVT-(: SALT TOLERANCE TRIAL

The salt tolerance trial planned for the first time in 1981 could not start. The test will be implemented from 1982.

TABLE - 6 CVT - 5, SAHEL IRRIGATED MEDIUM DURATION, 1981

DESIGNATION	YIELD (t / ha)	DT50% F (Days)	MAT. (Days)	HT. (cm.)	PAN./m^2
ITA 230	6.1	94	134	98	261
IR3273-P339-2	6.0	103	138	98	305
IR2071-586-5-6-3	5.9	96	134	100	312
BR51-319-9	5.8	95	133	107	281
ITA 232	5.7	94	134	107	257
BR51-91-6	5.6	97	136	110	278
BU 170	5.6	104	138	100	335
BR51-46-5	5.4	95	134	111	268
VIJAYA (SEL)	5.4	102	138	94	273
IET 6496	5.3	93	132	97	302
CR 1015	5.3	106	141	101	275
IR4442-165-1-3-2	5.0	92	132	93	303
IMPROVED MAHSURI	5.0	105	139	127	298
B541B-PN-58-5-3-1	4.7	108	141	117	252

TABLE 7: CVT–6, MOIST ZONE IRRIGATED SHORT DURATION, 1981

DESIGNATION	YIELD (t/ha)	DT 50% F. (Days)	MAT. (Days)	HT. (cm.)	PAN. /m^2
HRC 505	4.9	99	126	90	277
IR3273–P339–2	4.5	101	128	91	243
IR2042 178–1	4.3	100	128	94	244
B541B–BR–19 –3–4	4.2	959	125	97	248
BOUAKE 159	4.2	100	128	93	240
KN 144	4.2	93	122	97	242
MTU 2431	4.1	104	120	99	257
BR163 28 25	4.0	99	176	93	254
CR 1022	4.0	101	131	95	252
TOX 514–16–101–1	3.9	95	124	90	260
IR2798–107–3	3.8	104	130	95	244
CNM 31	3.6	95	123	87	251
IET 3137	3.5	89	117	83	288
TOX 504–21–120–5 B	2.6	91	119	112	136

TABLE 8: CVT–7, MOIST ZONE IRRIGATED MEDIUM DURATION, 1981

DESIGNATION	YIELD (t/ha)	DT 50% F (Days)	MAT. (Days)	HT. (cm.)	PAN. /m^2
IR 4422–98–3–6–1	5.8	104	130	107	266
ITA M2	4.9	88	126	92	273
BR51–118–2	4.8	102	129	107	262
BM 248	4.8	98	125	120	225
FARO 15	4.7	113	137	116	232
NIGERSAIL	4.7	104	132	113	247
ITA 123	4.6	92	120	87	248
IR2034–380–5–6–3	4.5	104	111	101	273
FAROX 198 A	2.8	112	140	101	250
RG 375–1	4.3	94	122	102	227
R 2360–8–4–5	4.0	101	128	104	253
IR 12429–57–1	3.9	87	117	98	263
BH13–47–3	3.6	87	117	119	190
IR9787–144–3–3–3	3.3	80	112	87	286

TABLE 9: CVT–11, DEEP FLOODED TRIAL, 1981

DESIGNATION	YIELD (t/ha)	DT 50% F (Days)	MAT. (Days)	HT. (cm.)	PAN. /m^2
BKN 7022–6 ––4	3.6	114	141	131	256
DM 17	3.4	113	138	164	224
BKN 6986– 17	3.4	116	139	119	243
BKN 6986– 38–1	3.4	118	144	131	227
BKN 7022 10 – 1 – 4	3.3	111	139	126	215
1442–36	3.2	122	143	129	259
DA 29	3.2	110	135	150	212
IP2071–586–5–6–3	3.2	113	136	120	325
BKN 6323	3.2	110	141	157	225
DM 16	3.1	116	140	163	268
ANDY 301	3.0	126	152	157	202
DM 12	3.0	111	134	156	277
BH 2	2.8	119	139	146	260
BKN 6986–105–P	2.2	126	144	157	208

CVT-10, MANGROVE SWAMP TRIAL

In the 1981 wet season the trial was conducted at two places only. At Rokupr, Dhabon gave the highest yield of 4.64 t/ha and was significantly better than the location chech, ROK 10 (4.38 t/ha) and all other entries. At Caboxanque, Improved Mashuri gave the highest yield of 7.02 t/ha, followed by the local check ROK 5(6.65 t/ha).

CVT-11, 1981: DEEP FLOODED TRIAL

The deep flooded varietal trial in 1981 was conducted at six locations and the general performance was quite good.

The new entries exhibited good yield performance. For example, BKN 7022-6-4 gave the highest yield (2.1 to 7.0 t/ha) followed by DM 17 (1.9 to 6.8 t/ha). The old entry BKN 6986-17 ranked series were among the five top yielding varieties. BKN series such as BKN 7022-6-4, BKN 6986-17, BKN 7022-10-1-4 and BKN 6323, and DM 17 mentioned above deserve careful attention. Adaptability study indicated that BKN 7022-6-4 was the most widely adapted variety followed by DM 17 and BKN 6986-17.

The average grain yield and other major characters of the entries are shown in Table 9.

CVT-12, 1982: FLOATING CONDITION TRIAL

The floating condition variety trial in 1981 season was conducted at Mopti (Mali) only.

The yields of all entries were greater in 1981 than in 1980. The top yielders were from old entries with FRRS 43/4 as the highest vielder (4.10 t/ha) followed by CULA (3.60. t/ha). Indochin Blanc (3.48 t/ha) and Nang Kiew (3.26 t/ha).

Incidence of leaf blast was recorded low in all entries while insect pest infestation(viz. dead heart and white head) was moderate to low.

ON-FARM TRIALS

Each country was allowed ten trials to be funded by WARDA. Trials were conducted in Zones, I III, IV and V.

Zone I Gambia, Guinea-Bissau, Muritaina and Senegal.

Gambia Five out of ten on-farm trials conducted in Gambia were successful.

Variety

Zone I

Gambia, Guinea-Bissau, Muritania and Senegal

Gambia

Five out of ten on-farm trials conducted in Gambia were successful.

Variety

Of the six varieties tested at Sankule Kunda under irrigated condition, BG 90-2 gave the highest yield of of 4.97 t/ha and was superior to the local chech varieties such as IR 22, AIWU and I Kong pao.

Yield performance and grain quality of some selected varieties under mangrove swamp conditions at the Beretto project is presented in Table 10.

Table 10: Performance of some rice varieties at Bertto Manrove Swamp Project, Gambis, 1981*.

Variety	Yield (t/th)	Grain quality
1. ROK 5	4.20	Very Good
2. Phar Com En	2.47	50% unfilled, Good
3. BG 62-355	†.19	Fairly Good
4. Mbinchi Nandingo	1.35	Good
5. Mani Fingo	0.45	Good
6. N' Kumbandingo	0.80	Good

As in the past 4 years ROK 5 was superior to the rest of the varieties and is now being recommended for commercial production.

Agronomy

This is the first time that an on-farm weed control trial has been conducted under upland conditions in the Gambia. STAM F34 (at 10 L/ha) plus weeding at 30 days after herbicide application (DAHA) gave the highest yield of 1.9 t/ha followed by weeding at 35 and 55 days after sowing (1.7 t/ha) and weeding at 35 DAS (1.6 t/ha). All the weed control treatments gave greater yields than the no weeding treatment with STAM F34 at the rate of 10 L/ha plus one handweeding at 30 DAHA giving the highest yield increase of 192. 3% over control yield (0.65 t/ha).

Under mangrove swamp conditions grain yields using bunding (t0 manimize salt water intrusion during the dry season) were generally lower (2.2 t/ha) than no bunding (2.5 t/ha) indicating that bunding is not suitable for mangrove swamp rice at Janoi.

Guinea Bissau

Variety

On- farm varietal trials were not conducted in Guinea Bussau during the 1981 season. However, various trials in the country have shown that IRAT 10, 110 and 133 in upland; BG 90-2 BW 78 in irrigated, and ROK 5, Improved Mahsuri in mangrove swamp conditions have continued to exhibit good yield performance.

Agronomy

Fertilizer trials were conducted at four locations. In general there was a positive yield response of two varieties (BG 90-2 and BW 78) to fertilizer application. In a comparison of mean yield of the two varieties at four locations, the variety BG 90-2 gave higher grain yield increase (67%) than BW 78 (34.5%) due to fertilizer application.

For the first time, on-farm trials for weed control were conducted at Contuboned to compared various weed control methods under irrigated conditions without water control. Hand weeding twice gave the highest grain yields (Table II).

Table II: Effect of weed control methods on yield of BG 90-2 at Contuboel, Guinea Bissau - 9181*

Site	Treatment	YIELD	INCREASE	(%)
A	1. Hand Weeding 2X	4443	1617	57.2
	2. Ronster 4L/ha	4049	1223	43.2
	3. STAM F34 10 L/ha	3397	571	20.2
	4. Control (No weeding)	2826	0	0
B.	1. Hand Weeding 2X	5027	1685	50.4
	2. Roster 4L/ha	4022	680	20.3
	3. STAM F34 10 L/ha	4511	1169	34.3
	4. Control (No weeding)	3342	0	0

* Irrigation without water control.

Senegal

Variety

Varieties BR 51-46-5 and IR 1529-680-3 grown and IR 2823-399-6-6 under irrigated conditions exhibited good yield performance (Table 12) at Dagana.

Tab l e 12: Yield performance of varieties under irrigated on -farm trial at Dagna (Senegal) -1981*

Table: Yield performance of varieties under irrigated on-farm trial at Dagana (Senegal) - 1981*

VARIETY	YIELD (Kg/ha)	LODGING
IR 3941-86-2-2	5195	+
IR 2823-399-6-6	6634	+
BG 90-2	5317	0
Srymalaysia 2	5552	0
I Kong pao (Check)	6660	0

* * Unreplicated 0.5 ha plots.

Agronomy

One fertilizee on-farm trial, using three varieties, was conducted at Djibelor-Banchoule under lowland conditions. In comparision trial of three varieties using the recommended rate of fertilizer (N85 p36 K54), BR 51-46-5 gave the highest yield increase of 1.51 t/ha (119.9%) over the control of 1.26 t/ha. The yield response of this variety to fertilizer was much higher than DJ 634 (Check), and IR 1529-680-3 by 2.5 and 18.9% respectively.

However, without fertilizer, the two varieties DJ 634 (2.30 t/ha) and IR 1529-680-3 (2.33 t/ha) gave greater yields than BR 51-46-5 (1.26 t/han.

Selected weed control methods and cultural pratices were also compared at Dhibelor. In this on-farm trial, grain yields of transplanted rice was greater than those sown direct. Regardless of the method of planting , STAM F34 at the rate of 10L/ha plus hand weeding at 45 DAS gave the highest yields (2.6 t/ha) but yield increase over no weeding was greater in direct seeding (0.92 t/ha than in transplanted seedling (0.41 t/ha). This indicates that weed control is important when direct seeding is practised. Good land preparation and puddling needed before transplanting of seedlings led to the supression of weeds.

Zone III - upper Volta, Mali and Ivory Coast

Upper Volta

On-farm trials conducted in upper Volta were organized and monitored by the CERCI (EXperimental Centre for Rice and Irrigated Crops) and entrusted to development agencies: ORD and FRD - for implementation with the farmers: assistance. Ten (10) variety trials were conducted mainly under lowland conditions while four (4) herbicide trials were carried out in farmers' fields under flooded and irrigated conditions with proper water control (Kou Valley).

Varietv

The yield data of ten trials are presented in Table 13. The short duration variety IET 1996 exhibited good yield especially in undeveloped lowlands with poor water control. This variety also gave very good yields under favourable conditions. The yields at some sites were very good because of favourable rainfall distribution and good soil fertility. Diopsis and rice gall midge infestation was noted on IR 51-319-9 and IET 2885. Low yields at some sites could be attributed to insufficient water and poor plant population per unit area.

Table 13: Varietal Yield at various sites in Upper Volta

SITES \ VARIETIES	Yields (kg/ha) IR1529–680–3	IET 1996	IET 2885	BR 51–319–9	Local Variety (LV)	Av. site yield (kg/ha)
COMOE ORD						
Tanion Plain	1504	2860	2606	1392	(1) 1168	1906
DOUGOURIBA ORD						
Diebougou 1	470	452	722	364	1670	736
Diebougou 2	1652	3878	917	3176	1556	2236
Lokosso Loropeni	1274	1142	778	1974	(2) 3060	1646
BLACK VOLTA ORD						
Tcheriba Dedougou	4800	1200	400	0	–	1600
CENTRAL OUAGA ORD						
Kaibo	3455	3810	3149	1879	(3) 2970	3053
Jmiga (FDR)	947	5410	2944	3264	–	3141
Jmiga (BF FDR)	4118	5578	4298	4438	(4) 4064	4499
Tayende	3200	1920	1920	4266	(5) 1880	2637
CENTRAL NORTH KAYA ORD						
Amidin	3080	3000	1480	1680	(6) 2960	2440
Av. yield/variety (kg/ha)	2142	2925	1921	2243	–	

(1) LV = Mahiplango;
(2) LV = Gambiaka;
(3) LV = Sintane Diogor;
(4) LV = Vijaya
(5) LV = Gambiaka
(6) LV = Dourado precoce

Agronomy

For the first time an on-farm trial for weed control was conducted in Upper Volta. One out of four trials under irrigated conditions gave some reliable results (Table 14). The hebicide STAM F 34 gave the highest yield (4.6 t/ha) followed by Basagran, PL2 (4.5 t/ha) Rostar (4.2 t/ha) and hand weeding three times (Check) (2.8 t/ha). STAM F34 and Basagran PL2 were the most effective herbicides.

Table 14: Effect of weed control on yield of IR 1529-680-3 under irrigated conditions, Kou Valley, Upper Volta, 1981.

Treatment	Yield (Kg/ha)	Increase in Yield compared with Check (Kg/ha)	(%)
1. Check (hand weeding - three times)	2800	0	0
2. STAM F 34	4600	1800	64
3. Basagran PL2	4500	1700	61
4. Ronstar	4200	1400	50
5. Tamariz Ord.	3300	500	18

Mali

The Department of Agronomic Research in Mali assisted in conducting ten on-farm trials which were successful.

Variety

On-farm variety trials were conducted under strictly upland, flooded and floating conditions. One trials was conducted under most favourable ecological and strictly upland conditions in the south of the country near the Ivorian border. The grain yields of the varieties at Mahankro, Mali were:

VARIETIES	YIELD (Kg/ha)
IRAT 13	3220
IRAT 10	2860
IRAT 109	2120
IRAT 110	2060
IRAT 112	1840

IRAT 13 and IRAT 10 were the two top yielding varieties. The five varieties were resistant to leaf scald. Farmers preferred IRAT 112 because of its good grain quality.

The trial at Tien under flooded conditions with water control did not give expected yields of tested varieties:

VARIETIES	YIELD (Kg/ha)
H 15–23–DA	1728
GAMBIAKA K	1360
BH 2	1312
IET 2911	896
IET 2885	584

The results showed that IET 2911 and IET 2885 were better adapted under controlled irrigated conditions than under flooded conditions.

Three trials were conducted under irrigated conditions with partial water control. The grain yield data of varieties are presented in Table 15.

Table15: Yield of varieties under irrigated conditions with partial water control at three sites, Mali, 1981.

SITE	VARIETIES YIELD (kg/ha)	IET 2885 (kg/ha)	IET 2911 (kg/ha)	H15-23DA (kg/ha)	BH 2 (kg/ha)	GAMBIAKA (kg/ha)
Niono		3684	4381	4096	3888	3738
Kologo		3100	4544	3080	2624	2800
Kokry		1690	1590	1620	2360	2210
Average yield per variety (kg/ha)		2825	3505	2932	2957	2916

These yields confirm those of past years. The results of these trials showed that IET 2911 gave the highest mean yield and it may replace the two recommended varieties (D 52-87 and GH 2) in the near future.

Agronomy

For the first time three on-farm trials on weed control were conducted in Mali under irrigated conditions with partial water control.

The results in Table 16 showed that the effectiveness of herbicides in suppressing weeds and consequently resulting in higher grain yields varied with the trial sites. For example Tamariz and Ronstar 25 EC at Niono, Basagran PL2 at Molodo, and STAMP F34 and Basagran PL2 at Kokry had similar effect as manual weeding on grain yields.

Table 16: Effect of weed control on rice yield under irrigated conditions with partial water control at three sites, Mali, 1981.

TREATMENTS SITES	Manual weeding	STAM F34	Tamariz Ord.	Basa-gran PL2	Rons-tar 25EC	Unweeded Check	Av. yield site (kg/ha)
Niono	3133	3600	4200	3400	4133	1903	3395
Molodo	2900	1967	0*	2333	1900	667	1953
Kokry	2933	2963	2500	2900	2262	2433	2666
Average Treatment yield (kg/ha)	2933	2843	3350	2878	2767	1668	

*Plot flooded after sowing and prior to herbicide treatment.

During the vist of the trial sites it was observed that most of the herbicides provided satisfactory control of weeds, except at Kokry where the most prevalent weed was the rhizomatous wild rice (**Oryza longistaminata**).

Ivory Coast

The Savanna Institute (IDESSA) in Ivory Coast assisted in the condition of sixteen on-farm trials.

Variety

Grain yields of upland and irrigated varieties are presented in Table 17. IRAT 112 gave the highest yield (1.6 t/ha) followed by Dourado precoce (1.5 t/ha) and Iguape Cateto (1.49 t/ha).

IRAT 112 is preferred by the farmers because of its early maturing ability, production potential and good grain quality. In the northern region (Savannah), IRAT 112 is competing with the traditional varieties like Iguape Cateto and Dourado precoce.

No conclusion could be drawn from the irrigated on-farm variety trial (Table 17). The low yield of BG 90-2 could be attributed to heavy infestation of **Nymphula** and **Diopsis.** At the second site, insect damage was low, but leaf and neck blast infestation on IR 5 and BG 90-2 were severe.

Table 17: Grain yield of upland and irrigated varieties at various sites in Ivory Coast - 1981.

VARIETIES	Upland Rice (12 sites)	Irrigated Rice (2 sites)	Average Yield (Kg/ha)
IRAT 13			1161
IRAT 109			1325
IRAT 112			1642
IRAT 136			1427
IGUAPE CATETO			1491
DOURADO PRECOCE			1500
MOROBEREKAN			1050
BG 90-2			1800
IR 5			Not weighed +

\+ combine harvested.

Agronomy

Two herbicides on-farm trials were conducted at San pendro. There were two treatments: (i) Ronstar at the rate of 4 L/ha and (ii) untreated Check. The trial with IRAT 109, showed that there was no significant difference in grain yield between the Ronstar treated plot (1.76 t/ha grain yield) and untreated Check (1.50 t/ha grain yield). On the other hand, where Iguape Cateto was used there was a slight difference in grain yields (2.40 t/ha and 1.35 t/ha in Ronstar and untreated plots respectively).

Zone IV - Ghana and Nigeria

In cooperation with the technical officers of the Irrigation Development Authority, Grains Development Board and the Extension Unit of the Department of Agriculture, on-farm trials were conducted in Ghana.

In Nigeria, the National Accelerated Food Production Project (NAFPP) carries out extensive on-farm trials. As a rule nomination of varieties and technological packages for testing in the NAFPP programme come from the National Zonal trials coordinated by the National Cereals Research Institute, Moor Plantation, Ibadan. WARDA, by mutual agreement, lent support tol ten zonal trials and 4-5 of the promising varieties from WARDA CVT were nominated into these trials.

Ghana

Variety

Results of six out of ten on-farm variety trials are available for reporting.

Upland

Results of upland on-farm varietal trial conducted at four locations are presented in Table 18.

IR 1820-210-2 is the highest yielder at two locations, Kwame Danso and Atebubu in the forest savannah transitional zone. The variety has been released for commercial cultivation. However, plant height (72 to 75 cm) might be a limiting factor for its wider adoption.

The variety 4418 topped the yield at Zuo and Tamale Central in the interior savannah zone. In the 1978 CVT, 4418 ranked second at Nyankpala (2.45 t/ha), while in the 1979 CVT, it ranked second and third respectively at Ikenne (3.21 t/ha) and IITA (2.39 t/ha). In the 1980 on-farm trial, it ranked third at Zuo (2.10 t/ha), and first at Tamale Central.

Farmers at Atebubu and Kwame Danso selected IR 1820-210-2 and those at Zuo and Tamale Central selected 4418 as their first choice. Reasons variously given for their selection include high tillering ability, non-lodging and non-shattering characteristics, their early maturity, ability to compete effectively with weeds due to the development of thick canopy, their fair rsistance to pests and diseasses and good grain quality. However, recently IR 1820-210-2 is showing leaf blast infestation.

Irrigated

Irrigated on-farm variety trial results are presented in Table 19.

At Tono, the variety IET 2885 produced the highest yield of 7.12 t/ha, and per day yield of 61.91 kg/ha. In 1979, IET 2885 ranked first in the main season coordinated trial at IITA (6.73 t/ha) and Kpong (6.27 t/ha).

At Asutsuare, IR 2071-586-5-6-3 gave the highest yield of 7.88 t/ha, and a per day yield of 55.49 t/ha. However, ADNY 11 with a yield of 7.86 t/ha produced a higher per day yield of 72.77 kg/ha. The performance of IR 2071-586-5-6-3 had been known earlier. In 1978 main season coordinated trial, it ranked first at Badeggi (7.04 t/ha) and in 1979 coordinated trial, it ranked first at Kpong (7.09 t/ha). Also in the 1980 on-farm irrigated trial at Golinga, ADNY 11 was the highest yielder, producing 3.62 t/ha. Farmers in this locality selected ADNY 11 as their choice because of its high yield, long grains, non-shattering habit, and resistance to pests and diseases.

Table 19: Performance of entries in the Irrigated on-farm trials at Tono and Asutsuare in Ghana - 1981.

Location	Variety	Yield (t/ha)	Duration (days)	Per day Yield (Kg/ha)	Plant Height (cm)
TONO	IET 2885	7.12	115	61.91	95
	DAWHENYA 2(Check)	7.04	125	56.32	88
	BR 51-118-2	6.74	123	54.80	98
	ADNY 11	6.32	119	53.11	80
	IR 442 (Local Check)	5.98	124	48.23	81
ASUTSUARE	IR 2071-586-5-6-3	7.88	142	55.49	96
	ADNY 11	7.86	108	72.77	104
	BG 90-2	7.04	129	54.57	101
	CICA 4 (Local Check)	6.88	130	52.92	106
	IET 2885	5.54	129	42.95	99

TABLE 18: Performance of entries under the upland rainfed conditions at four sites in Ghana - 1981

Location	Variety	Yield (t/ha)	Duration (days)	Per day Yield (Kg/ha)	Plant Height (cm)
ZUO	4418	2.98	118	25.25	91
	IR 1820-210-2 s	2.58	105	24.57	72
	Besewar	2.42	103	23.49	85
	HBDA2 (Local Check)	1.51	115	13.13	94
	ADNY 8	1.32	114	11.58	88
KWAME DANSO	IR 1820-210-2	2.80			75
	Besewar	2.41			85
	4418	2.21			94
	M 55	1.40			115
	Gomba (Local Check)	1.20			125
ATEBUBU	IR 1820-210-2	2.61			73
	4418	2.41			90
	Besewar	2.21			87
	M 55	1.20			110
	Gomba (Local Check)	0.81			123
TAMALE CENTRAL	4418	3.93	119	33.3	98
	IR 1820-210-2	2.43	103	23.14	75
	Besewar	1.62	101	16.04	85
	IR 5 (Local Check)	1.50	140	10.71	90
	ADNY 8	0.74	115	6.43	109

Nigeria

Results of 14 on-farm variety trials are reported.

Upland

Table 20 shows the performance of upland short duration rice cultivars at three locations.

Yield was generally low at Ibadan and Ikenne, while reasonable yield was obtained at Akure. At Ibadan, the highest yielder was TOX 504-4-106-1 (1.44 t/ha). At Akure, a WARDA nominated entry, IR 1746-226-1-23 topped the yield figures (4.77 t/ha); while at Ikenne, the highest yielder is TOX 356-1-1-1 (3.00 t/ha).

For the overall yield performance, the highest yielding cultivar is TOX 502-46-4-1, which produced a yield of 2.70 t/ha.

Table 20: Performance of upland short duration cultivars at three sites in Nigeria - 1981.

NO.	VARIETIES	IBADAN YIELD (t/ha)	AKURE YIELD (t/ha)	IKENNE YIELD (t/ha)	MEAN YIELD (t/ha)	MEAN HEIGHT	LIFE PERIOD RANGE
1.	TOX 502-46-4-1	0.53	4.71	2.87	2.70	108-126	108-135
2.	TOX 515-22-107-1	1.20	4.11	2.33	2.55	90-127	111-136
3.	FARO 25 (Check)	0.67	4.40	2.20	2.42	133-152	118-131
4.	TOX 340-1-5-1	1.27	4.12	1.87	2.42	101-125	109-130
5.	TOX 86-1-3-1	0.93	4.13	2.13	2.40	114-140	111-121
6.	IR 1746-226-1-2-3*	0.87	4.77	1.47	2.37	102-134	112-133
7.	TOX 356-1-1-1	0.67	4.09	3.00	2.30	104-136	112-132
8.	TOX 504-4-106-1	1.44	3.95	1.07	2.15	116-132	106-129
9.	IR 30	0.73	4.00	1.53	2.09	86-102	107-134
10.	TOS 4090	1.07	2.67	2.33	2.02	133-161	112-132
11.	FARO 11 (Check)	1.00	3.59	1.20	1.93	153-156	119-132
12.	144B*	0.93	2.75	0.67	1.45	105-110	102-128

*Entries from WARDA CVT.

Performance of upland medium duration cultivars at the three sites is presented in Table 21.

As in the short duration trials, yields figures were very low at Ibadan and Ikenne. The yield at Akure was fairly good with IR 1746-226-1-1-2, a WARDA nominated entry producing the highest yield (4.89 t/ha) followed by IR 1529-430-3, another WARDA nominated entry (4.17 t/ha). TOX 718-2 produced a yield of 4.07 t/ha. The overall mean yield showed the highest yielder to be IR 1746-226-1-1-2 (2.22 t/ha), followed by TOX 40 Tox 4090-3-108-1-1 (2.10 t/ha).

Table 21: Performance of upland medium duration cultivars at three sites in Nigeria - 1981.

NO.	VARIETIES	IBADAN YIELD (t/ha)	AKURE YIELD (t/ha)	IKENNE YIELD (t/ha)	MEAN YIELD (t/ha)	MEAN HEIGHT (cm)	MATURITY RANGE
1.	IR 1746-226-1-1-2*	0.71	4.89	1.07	2.22	136-138	118-131
2.	TOX 4090-3-108-1-1	0.89	3.87	1.53	2.10	89-111	116-136
3.	TOX 95-8-1-3	0.67	3.57	1.47	1.90	142-153	114-131
4.	TOX 718-1	0.57	3.72	1.27	1.85	142-145	114-136
5.	TOX 718-2	0.71	4.07	0.67	1.82	138-145	116-136
6.	TOX 475-1-1-1	0.71	3.13	1.47	1.77	89-113	115-135
7.	IR 1746-226-1-1-3*	0.62	3.85	0.80	1.76	142-147	122-136
8.	FARO 25 (Check)	0.71	3.47	1.07	1.75	159-162	118-136
9.	IR 1529-430-3*	0.60	4.17	0.45	1.74	80-91	112-136
10.	FAR) 11(Check)	0.80	2.93	1.37	1.70	147-162	118-135
11.	TOX 494-10	1.13	2.67	0.93	1.58	143-149	127-133
12.	Ir 2035-108-2*	0.55	2.33	0.20	1.03	100-120	129-135

*Entries from WARDA CVT.

Irrigated

Performance of irrigated short duration cultivars is presented in Table 22.

It will be observed from the duration of the cultivars that only the following entries are truly of short duration: FARO 27 (Check), IR 790-35-5-3, IET 2938, IR 30 (Check) and IR 934-450-1; the remaining entries are of medium duration. Generally, the medium duration varieties gave greater yields. The highest yielders at the different sites are BR 51-46-5 (4.6 t/ha), ADNY 11 (6.9 t/ha), ITA 212 (6.s t/ha) and Ita 212 (5.5 t/ha) at Edozhigi, Badeggi, Abakaliki and Bende respectively.

The mean yield data shows the best three yielders to be ITA 212 (5.7 t/ha), BR 51-46-5 (5.4 t/ha) and ITA 121 (5.3 t/ha). In the 1980 main season, the same three cultivars were the highest yielders - ITA 212 (5.9 t/ha), ITA 121 (5.7 t/ha) and BR 51-46-5 (5.3 t/ha).

Four of the entires in this trial are currently being tasted extensively in the on-farm trials of the national Accelerated Food Production Programme. These are BR 51-46-5, ITA 212, ITA 123 and IET 2938.

TABLE 22: Performance of irrigated short duration cultivars at four sites in Nigeria – 1981

VARIETIES	EDOZHIGI			BADEGGI			ABAKALIKI			BENDE			Mean Duration (days)	Mean Yield (t/ha)	** Grain Type
	Grain Yield (t/ha)	Growth Duration (days)	Per day Yield (kg/ha)	Grain Yield (t/ha)	Growth Duration (days)	Per day Yield (kg/ha)	Grain Yield (t/ha)	Growth Duration (days)	Per day Yield (kg/ha)	Grain Yield (t/ha)	Growth Duration (days)	Per day Yield (kg/ha)			
1. ITA 212	4.5	117	38.5	6.5	129	50.4	6.2	127	48.8	5.5	135	40.7	127	5.7	B
2. BR 51–46–5*	4.6	103	44.7	6.5	133	48.9	5.8	132	43.9	4.8	146	32.9	128	5.4	B
3. ITA 121	4.5	116	38.8	5.4	128	48.2	6.1	132	46.2	5.4	139	38.8	129	5.3	A
4. ANDY 11*	3.8	119	31.9	6.9	127	54.3	5.2	127	40.9	4.4	133	33.1	126	5.1	A
5. ITA 123	4.2	106	39.6	6.2	126	49.2	5.2	124	41.9	4.1	134	30.6	122	4.9	A
6. BIPLAB	3.7	115	32.2	6.2	126	49.2	5.2	128	40.6	3.6	143	26.2	128	4.7	B
7. FARO 27 (CHECK)	4.2	103	40.8	4.9	121	40.5	4.8	118	40.7	3.9	123	31.7	116	4.4	A
8. BPI 76/9X DAWN*	3.8	106	35.8	4.0	129	31.0	4.5	131	34.4	5.1	133	38.8	125	4.3	B
9. IR 790–35–5–3	3.8	105	36.2	4.2	121	34.7	4.3	116	37.1	3.4	124	27.4	116	3.9	A
10. IET 2938*	3.6	102	35.3	3.7	121	30.6	3.9	114	34.2	3.6	114	31.6	113	3.7	B
11. IR 30 (CHECK)	3.7	103	35.9	3.1	117	26.5	4.2	117	35.9	2.9	136	21.3	118	3.5	A
12. IR 934–450–1	2.9	103	28.2	4.5	123	36.6	3.3	114	28.9	2.7	119	22.7	115	3.3	A

*Entries from WARDA CVT

**Length/Width Ratio: A = 2.8–3.8
B = 2.4–3.0

Table 23 shows the performance of irrigated medium duration entries at the four sites.

The mean duration of the entries varied from 119 days to 145 days. The highest yielders were BR 51-118-2 (4.4 6t/ha), BG 90-2 (6.6 t/ha), BG 90-2 (6.0 t/ha), and BR 5146-5 (3.7 t/ha) at Edozhigi, Bedeggi, Abakaliki and Bende respectively. The overall mean yield shows that BG 90-2 produced the highest yield (4.9 t/ha) followed by BR 51-46-5 (4.7 t/ha). BR 51-118-2 and M 50/2/2/2 came next (4.4 t/ha each).

Two cultivars, BG 90-2 and BR 51-46-5 showed good performance at all sites. In the 1980 medium duration zonal trials, GB 90-2 topped all other cultivars in its yielding ability.

Table 23: Performance of irrigated medium duration cultivars at four sites in Nigeria – 1981

No.	VARIETIES	EDOZHIGI			BADEGGI			ABAKALIKI			BENDE			Mean Duration (Days)	Mean Yield (t/ha)	** Grain Type
		Grain Yield (t/ha)	Growth Duration (Days)	Per day Yield (kg/ha)	Grain Yield (t/ha)	Growth Duration (Days)	Per day Yield (kg/ha)	Grain Yield (t/ha)	Growth Duration (Days)	Per day Yield (kg/ha)	Grain Yield (t/ha)	Growth Duration (Days)	Per day Yield (kg/ha)			
1.	BG 90–2*	4.0	122	32.8	6.6	126	52.4	6.0	125	48.0	3.2	136	23.5	127	4.9	B
2.	BR 51–46–5*	3.5	117	29.9	6.2	135	45.9	5.4	132	40.9	3.7	141	26.2	131	4.7	B
3.	BR 51–118–2*	4.4	125	35.2	6.5	131	49.6	3.7	129	28.7	2.7	144	18.8	132	4.4	B
4.	M 50/2/2/2	3.6	107	33.6	5.2	124	41.9	5.7	129	44.2	3.1	141	22.0	125	4.4	B
5.	BG 94–1	4.0	105	38.1	4.8	123	39.0	5.1	134	38.1	3.3	154	21.4	129	4.3	B
6.	FARO 15 (CHECK)	3.4	141	24.1	6.0	134	44.8	5.2	143	36.4	2.6	162	16.0	145	4.3	B
7..	FARO 13 (CHECK)	2.8	122	23.0	6.2	127	48.8	5.4	132	40.9	2.9	140	20.7	130	4.3	B
8.	BR 51–49–6*	3.7	137	27.0	6.3	134	47.0	3.9	114	34.2	1.6	127	12.6	128	3.9	B
9.	BR 51–319–9*	3.2	146	21.9	4.2	133	31.6	4.0	130	30.8	3.2	141	22.7	137	3.6	B
10.	IR 5496	2.7	115	23.5	5.3	126	42.1	4.6	120	38.3	1.6	128	12.5	122	3.5	A
11.	IR 944–102–2–2–2–2	2.7	114	23.7	3.9	123	31.7	4.2	121	34.7	1.4	130	10.8	122	3.0	A
12.	BG 94–2	3.2	107	29.9	3.2	120	26.7	3.5	114	30.7	1.5	134	11.2	119	2.8	B

*Entries from WARDA CVT

**LENGTH/WIDTH RATIO: A = 2.8–3.8
B = 2.4–3.0

9. BR 51–319–9*

Zone V - Niger. Benin and Togo

Niger

Variety

Eight irrigated on-farm varietal trials were conducted. Performance of the varieties is presented in Table 24.

The highest yielders at various sites were: BG 90-2 (7.6 t/ha and 7.1 t/ha at Kibkissory and N'Dounga respectively), IR 2061-22-8-3-9 (7.5 t/ha and 3.7 t/ha at Libore and Kolo respectively), BKN 6986-59-12 (4.6 t/ha and 3.8 t/ha at Saadia and Sebberi respectively). In general, BG 90-2 proved to be most productive with a mean yield of 4.3 t/ha in 1981 against 5.4 t/ha in 1980. Furthermore, IR 2061-22-8-3-9 and BKN 6986-59-12 also gave good yields.

Benin

Variety

Eight on-farm varietal trials were conducted. Six varieties were tested at four sites under upland conditions. Table 25 shows grain yields of these varieties. At some sites the rice crop was adversely affected by inadequate rainfall and bird and rodent damage. Nevertheless, COL 38 performed best (2.69 t/ha mean yield) followed by CR 1002 (2.57 t/ha mean yield). In 1980, the above two varieties also exhibited good yield performance in the on-farm trials (2.20 t/ha mean yield).

Irrigated on-farm varietal trial was conducted at four sites. Table 26 shows the grain yield data of tested varieties. The highest yielders at various sites were ADNY 11 (4.9 t/ha and 3.1 t/ha at Bagou and Mitro respectively) and IR 2042-178-1 (4.3 t/ha and 4.0 t/ha at Koussin and Ouedeme respectively. ADNY 11 gave good grain yields (3.7 t/ha mean yield of ten sites) in the 1980 on-farm trials in Benin. There is a possibility that ADNY 11 might be used in commercial production and also it might replace the local recommended irrigated varieties in the near future.

Togo

Variety

Ten on-farm varietal trials were conducted in the 1981 cropping season.

The only upland on-farm varietal trial conducted at Sotouboua gave very poor grain yields due to water stress on the rice crop caused by inadequate rainfall.

Results of irrigated on-farm variety trials at 12 sites are presented in Table 27. These trials covered south (Mission-Tove), north (Dapaon) and plateau region (Amou-oblo) of the country.

At Mission-Tove, all the selected entries outyielded the local Check Ainantchen 14 with a mean yield of 3.1 t/ha. In this respect, BR 51-319-9-3-3 deserves very close observation (mean yield of 11 sites - 4.2 t/ha). This variety at most sites except one gave yields between three and more than 5 t/ha and also performed well in the northern region.

In the northern region (Dapaon), IR 2042-178-1 gave the highest mean yield (4.7 t/ha) followed by BR 51-319-9-3-3 and BG 90-2.

Only one on-farm trial was conducted in the plateau region (Amou-oblo). All the four selected varieties outyielded the local Check significantly. In the trial ADNY 11 gave the highest yield (5.3 t/ha) followed by BG 90-2 (5.0 t/ha). These two varieties also did well in Niger and Benin.

Table 24: Performance of irrigated varieties at various sites in Niger – 1981.

VARIETIES	Grain yield (kg/ha) at various sites								
	N'DOUNGA I	N'DOUNGA II	KOLO	SEBERI	LIBORE	SAADIA	KIBKISSOY	SAGA	AV.YIELD
BG 90–2	3194	7083	2500	1125	6875	4500	7625	1375	4284
IR 2061–22–8–3–9	2444	5500	3750	3750	7500	3500	6550	625	4202
BKN 6986–59–12	1583	6083	3645	3854	4550	4625	5525	1000	3858
KUMRAGOIR	2972	3500	3541	3854	5000	3000	6000	1125	3624
KLG–6987– 50P	1250	5000	875	1916	7325	2750	7490	1375	3497
IR 1529–680–3	1777	5916	1229	116	–	–	–	–	2522

Table 25 Grain yields of upland varieties at various sites in Benin – 1981.

VARIETIES	Grain yield (Kg/Ha) at various sites				
	BAGOU	MOUSSOUROU	SAVE	MOKA	MEAN
COL 30	4714	1719	2286	2059	2695
CR 1002	4714	1458	1950	2160	2571
IR 937–55–3	3767	1563	2895	1284	2377
CAMBIAKA	1979	2094	–	1960	2011
IR 2035–250–3	–	1073	–	2450	1762
IR 442	–	–	1608	–	1608

Table 26 Grain yields of irrigated varieties at various sites in Benin – 1981.

VARIETIES	Grain yields (Kg/Ha) at various sites				
	KOUSSIN	MITRO	OUEDEME	BAGOU	AVERAGE
ANDY 11	3282	3130	3620	4927	3.740
IR 2042–178–1	4348	2196	4020	4000	3.641
IR 3273–P339–2	3869	2217	3990	4185	3.565
IR 8 (Check)	3934	–	–	2990	3.462
BW 196	4109	1565	3920	3832	3.357
IR 442 (Check)	–	2141	2520	–	2.230

SUPPORT TO NATIONAL RESEARCH

As in the past, assistance was given to national rice programmes. In addition to the construction of seed laboratories and providing equipment for these laboratories, member states also received some specific equipment for IET and coordinated trial programmes. Apart from the planning and execution of WARDA trials and participation in scientific meetings, the sub-regional offices provided assistance in the following areas:

1. The Sub-regional Coordinators in Zone I participated in the Jahali and Pacharr Swamp Project appraisal mission and in the USAID evaluation missions of WARDA's impact in the Gambia. A document prepared jointly by WARDA Headquarters' Staff and Coordinators entitled "Situation, Problems and Prospects of Increasing Rice Production in Gambia" was submitted to the Government of Gambia, while that for Guinea Bissau awaits translation into French. Preparation of similar documents for Senegal and Mauritania is in progress. The Sub-regional Office assisted in planning the annual rice research programme of Gambia.

2. In Zone IV, the Sub-regional Office was involved in the following:

   i) Assistance to WARDA Development Department in feasibility studies of rice production in Ghana.

   ii) Assistance to WARDA Training Department in the identification and selection of prospective trainees from Ghana and Nigeria.

   iii) Planning and conduct of a follow-up study of WARDA past trainees in Ghana, in collaboration with the Training Department.

   iv) Arrangement for, and assistance with the filming of rice research and production activities in Ghana and Nigeria.

   v) The Sub-regional Office was also involved with the preparation of a project document for the up-grading of staff and facilities of the Nyankpala Agricultural Experiment Station.

   vi) A document entitled "Rice Production in Ghana - Prospects and Problems" prepared by the Sub-regional Office is almost completed.

   vii) The Sub-regional Coordinator, as a member of the Research Committee of the University of Ghana Agricultural Research Station at Kpong, made modest contributions to programme planning and implementation at the Station.

The Sub-regional Office of Zone V was involved in the following:

Attending national research meetings organized by the National Institute of Agronomic Research of Niger (INRAN).

ii) Preparing notes on all the WARDA rice varieties, that have been used in CVTS since 1974 in Niger, Benin and Togo.

iii) Providing seeds of improved varieties to the National Office for Hydroagricultural Development (ONAHA).

In general, all the sub-regional offices spent some time in providing assistance to the activities of other departments (such as Development and Training) of the WARDA Headquarters. Thus all sub-regional officers are increasingly becoming responsible for various activities of WARDA in the member countries.

TECHNICAL SUPPORTING SERVICES (TSS)
SEED NURSERY FARM (SNF)

The Seed Nursery Farm continued to preform its vital role in varietal introduction, its improvement and seed production. The results and achievements are briefly presented here.

Results

During the year under review (1981), a total of 2226 varieties and stains were grown and tested at the SNF as shown below:

Upland materials

Screening and observation	704 entries
seed increase	20 entries

Irrigated materials

Screening and observation	1043 entries
Seed Increase	459 entries
Total =	2226 entries

In addition, 286 varieties were planted at Richard Toll for seed multiplication and observation. From these materials, most of the seeds for IETs and CVTs of 1982 were supplied. Two hundred and twelve varieties were nominated to the WARDA IETs of 1982 from the SNF programme.

SEED LABORATORY

Introduction:

The WARDA Seed Laboratory continued to supply high quality seed of newly introduced/developed varieties for the WARDA research and germplasm exchange activities.

ties for the WARDA research and germplasm exchange activities. In view of the general seed quality problems arising in the WARDA region, the seed laboratory activities are not oriented towards seed quality control and diagnosis of seed quality problems in member states. In this connection, seed health testing activities have started while some storage entomological work are being carried out.

Activities:

The activities of the laboratory included routine seed handling (processing, hot-water treatment and viability assessment), seed supplies for WARDA research activities and germplasm exchange, research and training in seed handling.

Seed handling

During the period under review 1,300 varieties/lines received mainly from WARDA special research projects were processed in the laboratory and from these 276 varieties have been selected as entries in the WARDA 1982/83 main season trial. Sources of these seed material are shown in Table 28.

Table 28: **SOURCES OF ENTRIES FOR THE 1982 MAIN SEASON TRIAL**

SOURCE		No. of Varieties	No. included in trials
Suakoko (WARDA Nursery Farm), Liberia		895	38
WARDA Special Research Project, R/Toll,	Senegal	193	92
WARDA Special Research Project, Rokupr,	Sierra Leone	82	52
WARDA Special Research Project, Bouake,	Ivory Coast	6	2
WARDA Special Research Project, Mopti,	Mali	17	10
IITA, Nigeria		107	82

Detailed analysis of the seed samples received from Bouake (Ivory Coast), Richard-Toll (Senegal), Rokupr (Sierra Leone), IITA (Nigeria) and Suakoko (Liberia) revealed the presence of storage insect pests spp such as **Sitophislus, Rhizopertha, Triboleum** and **Cryptolestes** Table 29. Also in colaboration with the Danish Institute of Pathology for developing countries, some samples of hot water treated and untreated seed materials used in the WARDA 1980 trials were tested for seed health status. The results obtained for the untreated samples are shown in Table 30. Further studies are to be carried out to investigated the relationship between the spore counts in laboratory and actual field infection.

Table 29: **ANALYSIS OF STORAGE INSECT PESTS FOUND IN RICE**

SAMPLES FROM FOUR ECOLOGICAL ZONES OF WEST AFRICA

Sources	Type of Ecology	Sitophilus oryzae	Sitotroga cereallela	Sitophilus	Rhizopertha dominica	Tribileum castaneum	Cryptolestes
1. Bouake (Ivory Coast)	Savanna	X		X			
2. R/Toll (Senegal)	Sahel	X			X	X	X
3. Rokupr (S/Leone)	Mangrove	X		X	X		
4. IITA (Nigeria)	Moist-Forest zone	X		X	X		
5. Suakoko (Liberia)	Moist-Forest zone	X	X	X	X		X

AGRONOMY

A. Upland

1. Yield constraints study

The treatments were so designed to develop a complete package (i.e. line sowing, fertilizer, weed and insect pest control and water conservation by bunding) and also an intermediate package (i.e. complete package minus bunding). The trial conducted in 1981 had eight treatments.

The results showed that the traditional method gave the lowest yield of 550 kg/ha. The highest yield of 1307 kg/ha was noted in the completed package (CP), although not significantly greater than the intermediate package, IP (125 kg/ha); IP minus insect pest control (1260 kg/ha) and IP minus line sowing (1264 kg/ha) Table 31.

It was also observed that line sowing is necessary for proper weeding. In IP minus line sowing treatment, the number of weeds at harvest was high when compared to IP. (Table 32).

The reduction in grain yield, compared to IP, was highest in the traditional method (56%), followed by IP minus fertilizer (49%) and IP minus weeding (48%). Thus fertilizer application and weed control had maximum contribution to the grain yield of upland rice. (Table 32).

As there was no significant effect of insecticide Furadan 3G on grain yield (no yield difference between IP minus insect pest control), observation on economic threshold of destructive insect pests population is necessary for beneficial effect of insecticide application.

It may be inferred from the above study that in the bush fallow-rice - rice systems, grain yield of traditional method (550 kg/ha) could be increased over 100% by adopting a package consisting of: line sowing + fertilizer application + weeding in area where the population of destructive insect pests has not reached the level of economic threshold.

2. YIELD RESPONSE OF RICE VARIETIES TO NITROGEN IN UPLAND BUSH FALLOW - RICE SYSTEMS

The trial was designed to evaluate the yield responses of some widely adapted upland rice varieties (120 days or less for short and over 120 days for medium duration) to various nitrogen levels (0, 20, 40 and 60 kg N/ha) in bush fallow-rice-rice cropping systems in high rainfall forest zone.

The trial was carried out for the first time in 1980 at a site after clearing a thick bush in the 1979 - 1980 dry season. At the same site the trial was repeated in the 1981 wet season.

The yield data showed that all varieties gave a significant yield increase with increasing N levels. However, and varieties (M18, IRAT 10 and IRAT 13 short duration and 4418, MRC 172-9 and IRAT 10 and and IR2035-108-2 medium duration varieties) were highly responsive to nitrogen (60 to more than 100% yield increase over no nitrogen). The local variety LAC 23 is moderately responsive to N (47 to 85% yield increase over N0) (Table 35 and 36).

In the first year (1980), after bush clearance, the three short duration and all the five medium duration varieties gave grain yield of more than 1.0 t/ha at no nitrogen level. However, even in the first year still high grain yields could be obtained by application of 20 kg N/ha (mean 59 and 100% respectively) and 40 kg N/ha (135 and 141% mean yield increase in short and medium duration varieties respectively). (Tables 33 and 34).

The grain yield levels in the second year (1980), regardless of N rates and varieties, declined sharply. In this respect reduction in yields in short duration varieties (6,24 and 41% reduction in 0, 20 and 40 kg N/ha respectively) were smaller than in medium duration varieties (37,59 and 58% in 0, 20 and 40 kg N/ha respectively0. Nevertheless in the second year, grain yield increased with increasing N levels in short and medium duration varieties. However, in various N levels, the short duration varities tended to give higher grain yields than the medium duration varieties. (Tables 33 and 34).

The above study also shows than in rice-rice systems high nitrogen levels (40 to 60 kg N/ha) were necessary to maintain reasonable yields (1.3 to 1.5 t/ha0 in successive years.

Table 30: FUNGAL FLORA OF SOME UNTREATED SEED RICE SAMPLES FROM WARDA REGION

COUNTRY	No. of samples tested	D. oryzae	D. rostrata	D. hawaiiensis	D. sorokiniama	D. bicolor	F. moniliforme	Fusarium semitectum	Fusarium equisitii	Fusarium dimerum	Rhyncosporium oryzae	Curvularia lunata	Other spp of curvularia	Trichochonis padwickii	Aspergillus congissima	Verticillum	Phoma sp.	P. oryzae
NIGERIA (IITA)	24	X	X				X	X			X	X		X		X	X	
IVORY COAST(Bouake)	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SENEGAL(Richard-Toll)	63	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
LIBERIA (Suakoko)	15	X	X				X	X			X			X		X	X	X

TABLE 31: EFFECTS OF VARIOUS AGRONOMIC PRACTICES ON YIELD AND WEEDS AT HARVEST IN LAC 23 UNDER UPLAND CONDITIONS (1981) WET SEASON, SUAKOKO, LIBERIA

Agronomic Practices	Yield (Kg/ha)	% over Control	No. of weeds (per m^2) at harvest			
			G	S	BL	TOTAL
1. Traditional method (control)	550c		206	9	59	274
2. Complete Package (CP)	1307a	138	100	2	56	158
3. CP- Bunding (IP)	1250a	126	116	2	44	162
4. IP - Insect Control	1260a	129	114	3	43	160
5. IP - Weed Control.	653b	19	220	10	101	331
6. IP - Fertilizer	638b	16	108	2	61	171
7. IP - Line Sowing	1264a	130	126	6	72	204
8. Traditional Method + Bunding	601bc	9	192	18	46	256

C.V. = 5.8%
LSD (0.05) = 80Kg.

G = Grass
S = Sedges
BL = Broad Leave.

TABLE 32: YIELD RESPONSE OF UPLAND RICE TO VARIOUS AGRONOMIC PRACTICES

Agronomic Practices	Yield (Kg/ha)	Reduction in yield	
		(Kg / ha)	%
1. Intermediate package (IP)	1250	-	-
2. Minus insect control	1260	-	-
3. Minus weeding	653	597	48
4. Minus fertilizer	638	612	49
5. Minus line sowing	1264	-	-
6. Traditional Method	550	700	56
7. Complete package (CP)	1307	-	-

L.S.D. (0.05) = 80
C.V. (%) = 5.8

Table 33; YIELD RESPONSE OF SHORT DURATION RICE VARIETIES TO NITROGEN UNDER UPLAND BUSH FALLOW–RICE–RICE CONDITIONS (1980–1981 WET SEASON AT SUAKOKO, LIBERIA

VARIETY	Days to 50% Flowering	Grain yield (Kg/ha) in various nitrogen (N) levels (Kg/ha)								
		1980				1981				
		NO	N20	N40	Mean	NO	N20	N40	N60	Mean
ANDY 7	83	552	862	1952	1122	–	–	–	–	–
ANDY 8	82	976	1476	1757	1403					
M 18	79	1357	2171	3238	2255	969	1256	1477	1591	1323
B9C–MD–3–5	80	524	1343	2424	1430	989	1223	1378	1552	1285
IRAT 10	66	1490	1976	2786	2084	–	–	–	–	–
IRAT 13	81	1319	2033	2438	1930	–	–	–	–	–
Mean		1036	1643	2432		979	1239	1427	1571	
C.V. (%) for N					12.2					10.2
C.V. (%) for N x V					9.8					7.1
L.S.D. (0.05) for N					157					150
L.S.D. (0.05) for V					161					–
L.S.D. (0.05) for N x V					278					–

Table 34: YIELD RESPONSE OF MEDIUM DURATION RICE VARIETIES TO NITROGEN UNDER BUSH FALLOR–RICE–RICE CONDITIONS (1980 AND 1981 WET SEASON AT SUAKOKO, LIBERIA)

VARIETY	Days to 50% Flowering	Grain yield (Kg/ha) in various nitrogen (N) levels (Kg/ha)								
		NO	N20	N40	Mean	NO	N20	N40	N60	Mean
ROK 3	88	1462	1809	2381	1884	–	–	–	–	–
4418	93	1019	2805	3567	2464	989	1260	1449	1685	1346
IR2035–1082	94	1128	2519	3024	2224	–	–	–	–	–
MRC 172–9	86	1090	3114	3257	2487	–	–	–	–	–
LAC 23	95	1648	2495	3081	2408	789	1127	1285	1458	1165
IRAT 132	92	–	–	–	–	732	802	1053	1337	981
C 22	99	–	–	–	–	706	944	1386	1698	1183
C.V. (%) for N					17.9					8.7
C.V. (%) for N x V					6.1					8.5

L.S.D. (0.05) for N	208	81
L.S.D. (0.05) for V	137	72
L.S.D. (0.05) for N x V	237	143

Table 35 EFFECT OF VARIOUS SOURCES OF NITROGEN ON GRAIN YIELD OF RICE (SUAKOKO 8), UNDER LOWLAND SWAMP CONDITIONS AT SUAKOKO, LIBERIA (1981 WET SEASON)

SOURCES OF NITROGEN	Yield (Kg/ha)	Yield increase over control	
		Kg/ha	%
1. Control (without N)	2161	–	–
2. SCU–14.8 DR* (36.7% N)	3805	1644	76
3. SCU–22.0 DR (36.7% N)	3847	1686	78
4. SCU–34.5 DR (37.8% N)	3420	1259	58
5. SCU–20.7 DR (38.6% N) Forestry Grade	3408	1247	58
6. SCU–35.5 DR (39.1% N) Forestry Grade	3387	1226	57
7. Urea Super Granule (46% N) l.g	3395	1234	57
8. Urea Super Granule (46% N) 2.g	3408	1247	58
9. Commercial Urea	3408	1247	58
10. Compound Fertilizer: 15–15–15	2778	617	28

C.V. (%) = 11.19

L.S.D. (0.05) = 536 Kg

*DR = Dissolution rate

Note: N, P_2O_5 and K_2O were applied each at the rate of 60 Kg/ha in Treatment 2 to 10, while in Treatment 1 (i.e. control) had 60 Kg/ha each of P_2O_5 and K_2O.

B. LOWLAND SWAMP

1. Evaluation of various sources of nitrogenous fertilizers

The experiment was conducted in the 1981 wet season with a view to evaluate the compound fertilizer (15-15-15) as against sulfur coated ure SCU) of various dissolution rates (14.8, 20.7, 22.0, 34.5 and 25.5%, UREA SUPERGRANULE (1g and 2g) and commercial urea as a source of nitrogen for lowland swamp affected by iron toxicity.

Suakoko 8 was used as test variety. In various N sources, 60 kg/ha each of N, P2 0 5 and K2 o and K2 0.

The grain yield data showed that all N sources gave significantly higher yield than the No treatment (28 to 78% yield increase over control yield of 2.16 t/ha). (Table 35).

Among the N sources, the lowest yield was given by 15-15-15 compound fertilizer (2.78 t/ha), and this was significantly lower than the vields obtained from other N sources. On the basis of grain yield therefore compound fertilizer (15-15-15) is the least efficient N source.

In other N sources (five SCU, two urea supergranules and commercial urea), the yield increase over control yield of 2.16/ha varied between 57% and 78%. However, the yield differences among these N sources were not significant. It is worth noting that SCU of lower dissolution rated (DR) (14.8 and 22.0 DR) gave about 20% more yield than the other N sources in this group (Table 35).

2. Evaluation of various sources of phosphours (P) fertilizers

The objective of this study was to evaluate phospate rocks such as Tunisia (30% P 2 O 5), HJordan (32% P 2O 5) and Togo (36.5 P2O5), and triple superphosphate for agronomic effectiveness in lowland swamp affected by iron toxicity. A control treatment was included in the trial. There were 16 treatments (i.e. five P sources each at 20,40 and 60 Kg P 2 O 5/ha hand N 60 P O K 400 in the trial, and IR 5 was used as test variety.

The results showed that regardless of sources of P, 20 Kg P 2O5 did not give significantly greater grain yield than the control However, grain yield increased signigicantly with P 2 O 5 level from 40 and 60 Kg/ha. In higher levels yield increase varied between 15 and 39% in 4o Kg, and 25 and 62% in 6o Kg level (Tables 36 and 37).

Tunisia phosphate rock gave the highest yield of 4.55 t/ha at 6o Kg P 2 O 5/ha and this was significantly superior to Jordan, Morocco, Togo ang triple super phosphate (Tables 36 and 37).

Togo phosphate rock gave the lowest mean yield in the group thus the least effective as source of phosphorus. (Tables 36 and 37). Considering the mean grain yield, the effectiveness of sources of P could be arranged in the following decending order:

i. Tunisia phosphate rock
ii. Jordan phosphate rock and triple superphosphate
iii. Morocco phosphate rock
iv. Togo phosphate rock

3. Yield response of rice varieties to various levels of nitrogen in lowland swamp

The objective of this study was to determine the yield response of widely adapted varieties with different duration (125 days or less for short and more than 125 days for medium duration) to various N levels (0, 40 and 80 kg N/ha) in iron toxic swamp.

Two separate trials, one with short duration and the other with medium duration varieties were carried out in th 1980 and 1981 wet seasons. In all the plots, P 2 O 5 and K2O at the rate of 80 kg/ha each were applied.

In both years and in all varieties, grain yield increased with increasing N level from O to 40 kg N/ha. Further increase in N from 40 to uo kjg/ha caused a decrease in yield of all but the two short duration varieties in 1980 and 1981 respectively with the increase in N level from 40 to 80 kg/ha. (Tables 39 and 40).

In short duration variety trial, LET 1444, 4414, BR 51-46-5 ADNY II, IET 1996 and BG 90-2 gave good yields (Table 39).

ENTOMOLOGY

rice insect pests at Suakoko

Constant surveillance of insect pests of rice was carried out at Suakoko throughout the season. There were no pests of economic importance on the upland crop. The ladybird beetle, **Apilachna similis,** termites and rodents were fount but in very low numbers.

In the lowland rice, **Diopsis thoracica** was the only insect pests at the early vegetative stage. But their incidence was also low. Generally, insect pests did not present major problem at the WARDA experimental plots at Suakoko during 1981 main cropping season.

Some seed multiplication plots were evaluated for stemborer attacks. Results (Table 41) showed that highest infestation by **Diopsis,** 45 days after sowing (DAS) was on the varieties, FARO 15 and BR 13-47-3 (9.3% and 8.9% respectively). FARO 188A was the least (1.1%). Infestation by Diopsis decreased as the crop matured, and at 75 days after sowing BR 13-47-3 still maintaining a high incidence recorded (4.2%.) FARO 188A is considered the least susceptible among the six varieties. Observations indicated considerable seasonal variation in insect pest severity at Saukoko

Table 41 **EVALUATION OF SELECTED RICE VARIETIES FOR STEMBORE ATTACKS**

Variety	% Deadhearts	
	45 DAS	75 DAS
BG 375-1	3.3	2.0
BR 13-47-3	8.9	4.2
BR 51-118-2	8.4	3.3
FARO 188A	1.1	0.9
FARO 15	9.3	2.8
BW 248-1	4.5	0.5.

Table 36 EFFECT OF SOURCES AND LEVELS OF PHOSPHORUS ON GRAIN YIELD OF RICE (IR 5) IN LOWLAND SWAMP (SUAKOKO, LIBERIA, 1981 WET SEASON)

TREATMENT	Grain Yield (Kg/ha)	Increase over control (Kg/ha)	%
1. Control (N60 PO K40)	2819	–	–
2. Tunisia Phosphate Rock: N60 P20 K40	3169	350	12.4
3. Tunisia Phosphate Rock: N60 P40 K40	3657	838	29.7
4. Tunisia Phosphate Rock: N60 P60 K40	4556	1737	61.6
5 Jordan Phosphate Rock: N60 P20 K40	3200	381	13.5
6. Jordan Phosphate Rock: N60 P40 K40	3550	731	25.9
7. Jordan Phosphate Rock: N60 P60 K40	3916	1097	38.9
8. Morocco Phosphate Rock: N60 P20 K40	3108	289	10.2
9. Morocco Phosphate Rock: N60 P40 K40	3489	670	23.8
10.Morocco Phosphate Rock: N60 P60 K40	3657	838	29.7
11.Togo Phosphate Rock: N60 P20 K40	3108	289	10.2
12.Togo Phosphate Rock: N60 P40 K40	3246	427	15.1
13.Togo Phosphate Rock: N60 P60 K40	3520	701	24.9
14.Triple Super Phosphate: N60 P20 K40	3124	305	10.8
15.Triple Super Phosphate: N60 P40 K40	3505	686	24.3
16.Triple Super Phosphate: N60 P60 K40	3912	1093	38.8

C.V. (%) = 8.7: L.S.D. (0.05) = 433

Table 37 YIELD RESPONSE OF IR 5 TO PHOSPHORUS

TREATMENT	Grain Yield (Kg/ha)	Increase over control Kg/ha	%
Control (N60 POK40)	2819		–
Mean of all phosphorus	3514	695**	25

** Significant (P = 0.01)

Table 38 DIRECT EFFECT OF VARIOUS SOURCES AND LEVELS OF PHOSPHORUS ON GRAIN YIELD OF IR5 (SUAKOKO, LIBERIA, 1981 WET SEASON)

SOURCES OF PHOSPHORUS	Grain yield (Kg/ha) in various levels of P_2O_5 (P) (Kg/ha)			
	P 20	P40	P60	Mean
1. Tunisia Phosphate Rock	3169	3657	4556	3794
2. Jordan Phosphate	3200	3550	3916	3555
3. Morocco Phosphate Rock	3108	3489	3657	3418
4.. Togo Phosphate Rock	3108	3246	3520	3291
5. Triple Super Phosphate	3124	3505	3912	3514

L . S. D. (0.05) for Sources = 250 Kg
L. S. D. (0.05) for Levels = 194 Kg

Table 39: YIELD RESPONSE OF SHORT DURATION RICE VARIETIES TO NITROGEN UNDE LOWLAND SWAMP CONDITIONS (1980 AND 1981 WET SEASONS AT SUAKOKO, LIBERIA)

VARIETY	Days to 50% flowering	Grain Yield (Kg/ha) in various nitrogen (N) levels (Kg/ha)							
		1980				1981			
		NO	N40	N80	Mean	NO	N40	N80	Mean
DJ 346 D	98	2905	4074	3492	3490	–	–	–	–
BR51–118–2	85	2100	2942	2735	2592	–	–	–	–
BR 51–46–5	97	3317	4360	3471	3716	3333	4474	4086	396
BG 90–2	96	3286	4503	4201	3997	–	–	–	–
ANDY 11	91	3222	4529	3243	3665	3359	4378	3843	386
IET 1444	95	3386	4339	3995	3907	3346	4247	3856	381
4414	94	2746	4656	4339	3914	2836	4336	3945	370
DJ 684 D	93	3280	3963	4233	3825	–	–	–	–
BR51–319–9	96	2905	3704	4037	3549	–	–	–	–
IET 1996	78	–	–	–	–	4163	4686	4112	432
BR168–2B–23	76	–	–	–	–	3022	3836	3343	340
Mean		3016	4119	3749	–	3343	4326	3864	–
C.V. (%) for N					3.0				8.5
C.V. (%) for N x V					7.4				4.5
L.S.D. (0.05) for N					54				231
L.S.D. (0.05) for V					180				142
L.S.D. (0.05) for N x V					311				246

Table 40 YIELD RESPONSE OF MEDIUM DURATION RICE VARIETIES TO NITROGEN UNDER LOWLAND SWAMP CONDITIONS (1980 AND 1981 WET SEASONS AT SUAKOKO, LIBERIA

VARIETY	Days to 50% flowering	Grain Yield (Kg/ha) in various nitrogen (N) levels (Kg/ha)							
		1980				1981			
		NO	N40	N80	Mean	NO	N40	N80	Mean
4448	105	2550	3333	3344	3076	–	–	–	–
IET 1996	82	3518	3206	3069	3264	–	–	–	–
IR 5		3074	4376	3397	3616	3554	4522	3974	4017
Vijaya	106	2772	3418	2053	2748	–	–	–	–
IR1529–680–2	101	1915	2873	2058	2282	–	–	–	–
BR51–49–6	94	2640	4497	3497	3545	3356	4244	3862	3821
BW 196	113	2301	3767	2820	2963	–	–	–	–
BR52–8–1	94	2857	3317	2831	3002	3420	4006	3910	3779
Suakoko 8	109	3079	4180	2878	3379	3391	4478	3554	3808
BG 90–2	93	–	–	–	–	3327	4324	3205	3619
Nigersail	105	–	–	–	–	3413	4221	4301	3978
Mean		2745	3663	2883	–	3410	4299	3801	–
C.V. (%) for N					6.3				3.9
C.V. (%) for N x V					6.4				3.8
L.S.D. (0.05) for N					148				108
L.S.D. (0.05) for N					187				121
L.S.D. (0.05) for N x V					324				209

Rice insect pests at Fendall

During the last growing season, the rice caseworm, **Nymphula depunctalis** was observed as a mojor pest of irrigated rice in Fendall, Liberia. The high epidemic was utilized to determine amout of damage caused by this pest and to evaluate effectiveness of an insecticidal application for its control The caseworm has become increasingly important in the last three years.

An experiment using two treatments, Furadan 3G applied at the rate of 1 kg a.i/ha 7 days after transplanting and an untreated chech was conducted, replicated four times on 12m2 plots. Observations onthe on the number of tillers infested were made at 3 weeks after transplanting was at the maximum tillering stage. The experiment was conducted in cooperation with the Training Department's entomologist trainer.

The results (Table 42 showed that Furadan -treated plots were virtually free of infestation 3 weeks after transplanting. Damage caused by the caseworm included complete destruction of rice hills resulting in missing hills, considerable reduction (about 86%) in the average number of tillers per hill at the maxium tillering stage and delayed maturity. Unprotected plots matured 20 days late. A yield loss of 97% was recorded.

Table 42: **EFFECT OF FURADAN 3G IN THE CONTROL OF RICE CASEWORM, NYMPHULA DEPUNCTALIS**

TREATMENT	% infested tillers	No. of tillers/ hill at max. tillering stage	% missing hills	Yield Kg/ha	% Yield loss
Furadan 3G at 1 Kg a.i./ha	0	21.6	0	3040	0
Control	97	3.1	33.8	92	97

PATHOLOGY

Pathological work in 1981/82 period involved mianly the monitoring of the reactions of the varieties in the coordinated trials to the major diseases in the region. The rice blast (**Pyricularia oryzae**) remains the major and prevalent disease in the region. Especially in the moist upland and moist irrigated trials. This is closely followed by the Brown Spot (**Helminthosporium oryzae**), the **Ustilaginoidea virens**). One of the rice cultivars C-22 was found to be particularly highly susceptible under the moist upland trials. This cultivar will be included in the fugicide control trial being planned for 1982/83.

The incidence of two bacterial diseases in the Sahelain zone of WARDA region is again recorded in the last season. They were found under irrigated rice in Richard-Toll, Senegal and deep-flooded rice in Mopti (Mali). The bacterial diseases include bacterial blight (**Xamthomonas oryzae**) and bacterial leaf streak **Xanthomonas tranluscens f.sp. oryzicola).**

WARDA ACTIVITIES ON GERMPLASM IN 1981

In 1981 WARDA received a total of 369 collections from IRAT for conservation under medium term storage. The collections were made up to cultivars from the Cameroon, Chad, Guinea, Ivory Coast and Mali.

Highlights of the field activities associated with germplasm are briefly presented below:

1. **Sativa** Collection received from IITA
Genetic Resources Unit (GRU)

The objectives of the screening Were:

To evaluate under Suakoko conditions the level of resistance to iron toxicity at different growth stages of the cultivars.

(b) To characterize the germplasm materials.

(c) To seed-increase the collection.

170 cultivars were planted under the iron toxic condition below the CARI dam with the cooperation of CARI rice breeders. pH of the soil was 4.8, iron content was 8,200 ppm and Manganese content was 59 ppm. The unreplicated plots had both resistant (Suakoko 8) and suceptible check.

There was a very high death rate due to iron toxicity. Before the first score was made only 88 cultivars survived. The information collected on fairly tolerant entries will be put on computer and made available to any one on request. Most of the survived test varieties were more susceptible to iron toxicity than the resistant variety (Suakoko 8) at both the vegetative and panicle initiation stages. Exceptions were TOS 7725, TOS 7726, TOS 7769 which were as resistant or more resistant to iron toxicity than Suakoko 8 at all the growth stages examined.

2. **Glaberrima Collections**

The objectives are the same as for the sativa screening.

Out of the 91 cultivars planted only 34 were not wiped out before maximum tillering stage. Therefore 63% of the collection screened highly susceptible. Characterizations of the survived 34 entries were made. None of the cultivars were as resistant as the resistant check (Suakoko 8f). Ther were all either just as susceptible as the susceptible check (IR5) or more susceptible than IR 5 at the tillering or panicle initiation stages. It could be that the collections were made under upland or iron iron toxicfree conditions. A few entries such a TOS 7454 will be rescreened and multiplied.

3. Screening of Collections made from Benue, Ghana and sokoto

In 1981 season we screened parts of this collections because they were collected from undeveloped swamp rice areas of Bunue, Ghana and Sokoto. The screening objectives were:

1. to characterize the collections under Suakoko conditions;
2. to multiply the seeds;
3. to see if any of them possess iron toxicity resistance.

There were four Benue collections, six from Ghana and six from Sokoto. The layout and observations were the same as for the first two trials discussed.

All the four collections from Benue survived till maturity while only three out of the six collections from Sokoto survived. Five of the six fromGhana survived till maturity. Some of the cultivars were moderately resistant (score 2-3. TOS 5532 and TOS 5354 from Sokoto were as resistant or more resistant than Suakoko 8, the resistant check. These will be rescreened and seed-increased.

Germplasm Bank

In 1981 the walk-in cold rooms were installed for the germplasm bank. The cooling systems were tested for a period of two months. The temperature varied between 1o-50c at 70% R.H.

INTERNATIONAL RICE TESTING PROGRAM (IRTP)

1981 International Rice Testing Programme (IRTP)

1981 International Rice Testing Programme IRTP)

Activities in West Africa

The 1981, activities in West Africa involved the procurement, quarantine, clearing and dispatch of IRTP nurseries; planting of nurseries; visiting of most of the nurseries, collection of results and request for 1982 and the special IRTP monitoring tour.

Most of the nurseries planted were the 1980 sets due to ligistics and quarantine reasons. However, few of the 1981 nurseries were planted at some of the locations. WARDA participated in the IRTP monitoring tour sponsored by IRRI in West Africa in 1981.

A. 1980 NURSERIES RESULTS

A total of 91 of 1980 sets of 15 different nurseries were received from IRRI. Nineteen of these nurseries were planted and their results were presented during the 1981 IRRC. Table 45 shows the countries and organizations that received the remaining nurseries which were planted in 1981. Only highlights of few of the received results are reported here. Detailed information will be in the final published report on IRTP in Africa.

1. 1980 IRYN-VE AT KOGNI, MALI

1. 1980 IRYN-VE AT KOGONI, MALI

Most of the promising entries in this trial produced over 3 t/ha with maturity of 109-113 days. But the control which out yielded other entries matured in 130 days. Five entries that have been selected for local yield testing were:

BG 276-5
BKNLR 75001-B3-CNT-B4-RST-47-
BKNLR 75091-CNT-B3-RST-40-2-2
IR 19762-2-3-3
IR 19819-31-2-3

2. 1980 IRYN-E IN IVORY COAST

The trial was conducted at a site near Bouake. Many of the entries produced more grains per plot than the local check, Bouake 189. The following promising entries will be used for national yield testing.

BAU 19-3
BKN 7033-13-1-1-3-2
BR 161-2B-58
Chiaung-Sen-Yul3
IR 9761-19-1
PAU41-8-31-1-PR407
PK 174-13-1-5
RASHT 507
INAU 8870

Table 43 1980 IRTP nurseries planted in some African countries in 1981

Cooperating countries and organizations	Nursery sets dispatched		Where planted
Benin	IRSATON	1	–
	IRLRON	1	
	IRBN	1	–
Ghana (CRI)	IURON	1	Nyankpala
	IRLRON	1	"
Ivory Coast IDESSA	IRYN–E	1	Bouake
	IRON	1	Man
	IURYN	1	Bouake
Liberia	IRYN–E	1	
	IRON	1	Suakoko
a) CARI	SCALD	1	
	IRBN	1	Suakoko
b) WARDA	IRBN	1	Suakoko
Mali			
a) (National station)	IURYN	1	Kogoni
	IURON	1	"
	IRYN–VE	1	"
	IRYN–M	1	"
	IRBN	1	"
b) WARDA	IRDWON	1	Mopti
Nigeria			
a) NCRI	IURON	1	Amakama
	IURYN		Badeggi
	IRYN–M	1	"
	IRON	1	"
	IRARON	1	"
	IRCTN	1	"
	IRSATON	1	"
	Fe–TOX	1	"
b) IITA	IRYN–VE	1	
	IRYN–E	1	
	IRYN–M	1	Ibadan
	IRYN–L	2	
	IURYN	1	Ikenne
	IRARON	1	

Table 43 (Cont'd)

Cooperating countries and organizations	Nursery sets dispatched		Where planted
b). IITA	IURON	3	Ibadan
	IRLRON	1	"
	IRCTN	1	
	IRSATON	1	
	IRSN	1	
	IRGMN	1	
	Fe–TOX	1	
Sierra Leone	IRSATON	1	Rokupr
	IRLRON	1	"
	IURON	1	"
	IRLRON	1	"
	IRYN–M	1	"
	IRYN–L	1	"
Senegal			
a). ISRA	IRLRON	2	Djibelor
	IRBN	2	"
	IRBN	2	"
	IRYN–VE	2	"
	IRYN–M	2	"
	IRSATON	2	"
b). WARDA	IRSATON	1	Fanaye
	IRCTN	1	"
	IRON	1	"
Upper Volta			
	IURON	1	Farakoba
	IRON	1	Banfora
	IRBN	1	Banfora

3. IRYN-M AT 3 LOCATIONS IN AFRICA

The 1980 IRYN-M were planted at 5 location in West Africa in 1981. Two results received were from Kogoni, Mali and Rokupr, Sireea Leone. Thetries chosen for local yield testing are shown in Table 44. In Kogni, many entries were better than local check; BIET 360 was the highest yielder among the entries. In Rokupr, BG400-1 was the highest yielder among the entries. The local check produce 4912 Kg/ha compared to BG 400-1 with a yield of 6309 Kg/ha.

Table 44: Grain yield of promising entries in the 1980 IRYN-M planted at Kogoni and Rokupr 1981

Kongoni, Mali		Rokupr, Sierra Leone	
Entries	Yield(Kg/ha)	Entries	Yield(Kg/ha)
BIET	4336	BG 4001	4309
IR 42(Int. Check)	4266	KMP 40	5764
BR 168-2B-23	3765	RP 825-24-7-1	5764
IR 4568-86-1-3-2	3093	IR 42 (Int. Check)	5671
D 52-37 (local Check)	2919	B 2850B-S1-2-2	5636
		IR 17488-2-3-2	5589
		MR 1	5385
		ROK 14 (local Check)	4912

4. 1980 IRYN-L IN ROKUPR, SIERRA LEONE

Nine of the entries in the nursery were selected for local yield testing. Table 45 shows the yield data on these entries and the local check. The hishest yielder was IR4625-132-1-2 which produced on average 33% more grain than the control.

Table 45: Mean yields of the most promising entries of 1980 IRYNL at Rokupr 1981

Entries	Yield Kg/ha	Days to flowering
IR 4625-132-1-2	6690	132
CR 1006	6369	132
CR 1005	5972	137
CR 210-1011	5896	132
CR 1009	5758	139
RP 975-109-2	5702	125
RP 1064-14-2-2	5582	128
MTU 7633	5370	117
BK 126	5252	141
ROK 14 (local check)	5019	115

5. 1980 IURYN

Results were received from the trials at Bouake, Ivory Coast and Amakama, Nigeria. The trial at Amakama was seriously affected by bird and rodent damage.

At Bouake soil problems, drought during booting and neck blast disease were the major streeses on the trial. Inspite of these problems some entries were impressive when compared to the control. Prominent among these was IR 3646-8-12 which outyielded IRAT 13, the control, by 64%. This entry has been selected for national yield testing.

6. 1980 IURON AT THREE SITES IN WEST AFRICA

Table 46 shows the promising entries in the 1980 IURON grown at Amakama, Nigeria; Rokupr, Sierra Leone and Nyankpala, Ghana. At Amakama, one set of the same nursery was planted in 1980.

Table 46: entries with best ratings for phenotypic acceptability from IURON 80 at 3 sites in West Africa.

Location	Best entries (pheno. accept.)
Amakama, Nigeria	IR 9266-124*, IR9761-19-1, IR6228-2-4*
	IR 5929-12-3, IR9171-60-2-2, IR8138-77-2-1,
	IR 10198-66-2, TOX 728-1, IR 35, IR 8103-72-2,
	M1 35-6-2, IR 3249-19-1-2, Marichbati,
	Tox 494-1-1-1, TOX 504-14-14-1, 2031,
Nyankpala, Ghana	IR 6228-2-4*, IR7805-22-3-2, B981K-1B-11
	UPL Ri-5, C424-2*, IR5440-1-1-3, IR6023-10-1-1
Rokupr, Sierra Leone	IR3880-29, IR 5853-118-5, IR 7473-118-2-2-3.
	IR 5783,111-2-1-2, IR 13240-10-1, IR6142-6-2,
	IR 7805-22-3-1, IR1564-149-3, C424-2*, C894-21,
	Sein-Ta-Lay, IR3646-8-1-2, LR 4818-90-1-2

* *Entries found promising at two locations.

7. 1980 IRON IN MAN, IVORY COAST

The trial had moderate attack of scald, blast and stemborer and water control was not complete. However, many of the entries were impressive under these conditions. The promising cultivars selected for national yield testing the following seasons were:

ECIA - S22204
IR 9828-91-2-3
IR 9852-12-2-13
IR 9852-12-2-13
IR 9852-22-3
IR 13240-39-3
IR 13415-46-2
IR 15396-219-2-3
P441-8-31-PR407
PAU41-306-2-1-PR405
PAU128-1191-PR303
PK174-13-15
1-5
KMP 38
NONG NGIEP 75-5.

Table 27: Grain yields of irrigated varieties at various sites in Togo – 1981.

VARIETIES	Grain Yields (kg/ha) at various sites												
	MISSION – TOVE								AMOU	DAPAON			AVERAGE
	1	2	3	4	5	6	7	8	OBLO	1	2	3	YIELD
ANDY 11									5350				5350
IR 2042–178–1										5100	5200	3750	4683
BR 51–118–2									4350				4350
BR 51–46–5									4350				4350
MRC 505	4638	5217	5360	–	–	–	–	–		3800	4100	2250	4227
BG 90–2									5050	4300	4400	3000	4187
BR 51–319–9–3–3	5166	5213	5458	4101	1836	4219	3984	3008		4800	4500	3600	4171
IR 20	5166	5264	5222	4258	1601	4078	3867	3437					4111
IR 841										4200	4000	2950	3716
IET 1444	3357	4430	4014	4336	1640	3867	3789	2383					3539
IET 3137	–	–	–	4726	1953	4375	4335	2304					3538
AINANTCHEN 14 (Check)	4222	4194	5445	2929	1797	2617	2062	2758					3130

8. 1980 IRLRON AT THREE SITES IN WEST AFRICA

Two 1980 IRLRON results were received from Rokupr, Sierra Leone. One from the natioanl programme and the other from the WARDA Programme. The third result was from Nyankpala, Ghana. Sevedral of the entries were selected for hybridization. Table 47 shows the promising entries at the three sites.

Table 47: **Promising entries selected from the 1980 IRLRON at 3 sites in West Africa, 1981.**

RES Rokupr	AWARDA Rokupr	CRI Nyankpala
2, 3, 4, 35, 4o, 41 43, 44, 53, 55, 58, 64, 67, 68, 69*, 129*, 134, 140, 143, 146, 151, 162 164, 178, 203, 205, 210, 211, 214.	6*, 50, 51*,67*, 69*, 83, 101, 103, 108, 118*, 119, 128, 129, 130, 131, 132, 141, 151, 154, 165, 166,169. 198.	6* 51*, 92, 166*, 103* 166*, 118*, 120,169, 174, 195,196, 213, 213, 215, 226, 228.

*Entries selected at two locations are as follows:

6 = IR8608-82-1-3-1-3
51 = BR 51-46-5
67 = CR1023
69 = INTAN
103 = IR9288-B-b-244-2
116 = IR10781-75-3-2-2
118 = IR10781-143-2-2
129 = IR13146-23-3
151 = IR13426-9-1
169 = IR14753-120-3

9. 1980 IRDWON

The deepwater nursery was grown at Mopti, Mali in 9181. Information was supplie only for ten of the entries. Five entries out of the ten with scores of 1 and 3 are shown in Table 48.

Table 48: Entries in the 1980 IRDWON with good acdeptability scores at Mopti, Mali

Cultivars	Scores
D WCT 37-2-B-B-	1
D WCT 134-1-2-B	3
D WCT 156-1-B-b	3
BROGER	3
FRRS43/3	1
DM 16/Check)	1

B. 1980IRTP NURSERIES

Only few of the 1981 nurseries were planted in 1981 due to the logistics and plant quarantine problems. Most of the nurseries will be planted in the appropriate 1982 corpping season. Table 49 shows the 1981 nurseries planted in 1981.

Table 49: **1981 IRTP nurseries planted in some West African countries in 1981**

Nurseries	Cooperating Institutions*	Where planted
IRYN-VE	IITA	IITA, Ibandan, Nigeria
IRYN-M	CARI	Suakoko, Liberia
IURYN	IITA	Ibandan, Nigeria
IRON	CARI	Ihenne, Ibadan
IRON	WARDA	Suakoko, Liberia
Flood. Tol.	WARDA	Suakoko, Liberia
Floating Screening	WARDA	Mopti, Mali
Medium Deepwater	WARDA	Mopti, Mali
Scald	CARI	Mopti, Mali
IRBN	CARI	Saukoko, Liberia
IRBN	WARDA	Suakoko, Liberia
Fe Toxi.	WARDA	Suakoko, Liberia
Fe Toxi.	CARI	Suakoko, Liberia

*CARI = Central Agricultural Research Institute
IITA = International Institute of Tropical Agriculture
WARDA = West Africa Rica Development Association.

1981 IRTP RESULTS

Highlights of some of the results received by March 30, 1982 are reported below.

1. **1981 IRYN-M AT IITA**

The trial was conducted at Ibandan, Nigeria. summary of yield, height and days to maturity are presented in Table 50. Four of the entries out-yielded the local check. CISADANE was the highest yielder. All the entries with the exception of Mr 1, matured between 105-135.

Table 50: Grain yield, height and growth duration of the top 10 entries in the 1981 IRYN-M trial, IITA Ibadan, Nigeria, 1981.

Entries	Grain yield (kg/ha)	Height (cm)	Growth duration in days
CISADANE	5411	125	130
IR 17488-2-3-2	5295	100	130
IR 42 (International check)	5263	115	135
B 3753-7-Pn-4-1	5043	115	130
ITA 212 (local check)	4995	100	130
PAU 143-B-4-2-PR 505	4971	100	120
R 22-2	4822	100	130
R 319-1	4819	120	120
ITA 123	4805	100	125
BR 109-74-2-2-1	4772	100	130

2. 1981 IURYN AT IITA-IKENNE, NIGERIA

The 1981 IURYN was planted by IITA at their upland research site at Ikenne. Some of the data collected for are summarised in table 51 for top 10 entries. IR 52, the top yielder outyielded the local control by 24%.

3. 1981 FLOATING RICE SCREENING TEST

This nursery was planted at the WARDA Special Research station Mopti, Mali. The entries having the best phenotypic acceptability score were:

HTA 7426-5-0-1-5
IR 11288-B-B-118—1
BH 2 (local check)
SPR 7410-0-256

4. FLOOD-TOLERANT RICE SCREENING TEST

This trial was conducted at WARDA Special Research Project, Mopti, Mali. The entries scored 1 or 3 are shown in Table 52.

Table 52: Flood-tolerant rice screening entries with phenotypic acceptability scores of 1 or 3.

ENTRIES	SCORES
BH 2	1
BKNFR 76106-16-0-1-0	3
BKNFR 76109-1-2-1	3
BR 118-3B-17	3
CR 1030	3
IR 7064-OT-42-0-1-1	1
KAU 2039	3

Table 51: Some data on the best 10 entries in IURYN 1981, Ikenne, Nigeria

Varieties	Grain Yield (Kg/ha)	Height (cm)	Growth duration in days
IR 52	4268	90	115
IR 5931 - 110 - 1	3467	95	115
IR 9101-124-1	3461	75	130
ITA 141 (local check)	3436	115	125
ITA 118	3432	100	110
CR 156-5021-207	3336	85	120
IR 43 (Int. check)	3254	80	125
IR 6115 - 1-1-1	3253	75	120
ITA235	3111	125	115
ITA 225	3110	115	110

5. 1981 MEDIUM DEEP WATER RICE SCREENING SET

This trial was also conducted at the WARDA Special Research Project at Mopti in Mali. Phenotypic acceptability score ranged from 1-9. DA 29, a local check was rated 1, while SPR 7292-0-0-0-0-1 was rated 9. The following entries had scores of 3:

BKN 76033-3RGA-8
Leb Mue Nahng 111
DWCT 156-1-2-0
GEU 77057-1-1-0
HTA 7403-110-1-1-3-0
BH 2
IR 7691-OT-2-2-1
RD 19
SPR 7292-0-0-0-0-2
SPR 7292-151-2-1-3-3

6. 1981 IRON AT SUAKOKO-LIBERIA

Both WARDA and Central Agricultural Research Intitute (CARI) conducted thie trial at Suakoko at different sites. At the WARDA site the selected 20 entries are presented in Table 53. These will be used for further yield testing in the country and in West Africa through the WARDA trials. The promising entries were tolerant to iron toxicity, scald, neck blast and brown spot.

Table 53: Selected entries from the 1981 IRON conducted by WARDA at Suakoko.

Entries	Grain yield per plot (gm)	Acceptability score
AD9246	1,395	2
BAU50-3-32	1,150	2
BRI61-2B-53	1,280	3
IR13535-21-2-3-3-2	1,050	3
IR13539-100-2-2-2-3	725	2
IR15529-256-1	1,050	2
IR15529-253-3-2-2-2	1,200	3
343 D.T	1,400	3
IR13540-65-3-2-1	1,560	2
BR51-315-4	1,000	2
IR19660-274-3-3-1-3	955	3
IR19660-109-3-2-3-2	1,000	3
IR19660-131-3-3-3-3-3	1,000	3
BR51-74-6/J1	860	2
IR54	1,000	4
TAICHUNG SEN 10	1,240	2
MUTANT 842	980	4
IR19657-84-3-2-2-2	1,100	4
IR13538-48-2-3-2	1,320	2
IR17525-278-1-1-2	1,250	3
Suakoko 8 (local check)	440	3

7. 1981 IRBN AT SUAKOKO, LIBERIA

The blast screening nursery set was planted by CARI and WARDA at Suakoko at different sites. At the WARDA site, blast incidence was relatively low when compared to CARI site (Table 54).

Table 54: Leaf blast scores taken 3 times on some of the entries in 1981 IRBN at two sites in Suakoko 1981.

	Leaf blast score at					
	WARDA Site			CARI Site		
ENTRIES	1st	2nd Score	3rd	1st	2nd Score	3rd
Caloro	2	2	3	3	5	6
Chokoto	1	1	1	3	3	5
IR 42	1	3	3	3	3	5
WAGWAG	2	2	4	5	3	4
SHIN 2	1	1	3	7	7	9
BG94-1	0	0	1	7	9	9
Colombia II	0	1	1	5	6	7
IAC 47	0	1	1	5	5	6
IRAT 104	1	1	2	6	5	6
IRAT 13	1	2	2	3	3	3
TETEP (R-check)	1	1	3	3	3	5
B-40 (S-check)	5	7	7	9	7	8
IR 26	1	1	2	3	3	3
K2	0	1	3	5	5	5
TRE MARIAS	1	1	2	9	7	8
MILYANG 56	5	5	5	5	3	4
PAU143-B-4-2-PR 505	3	3	5	9	7	8

8. 1981 IRON TOXICITY SCREENING NURSERY AT SUAKOKO

CARI and WARDA conducted this trial at two different sites at Suakoko, Liberia. Iron toxicity was more pronounced at the WARDA sites than at CARI site. Table 55 shows the scores obtained on the nurseries for ten of the entries. The first 6 entries have been nominated by WARDA for yield testing.

Table 55: IRON toxicity tolerance scores for 10 entries at WARDA and CARI sites in Suakoko 1981

Cultivars	Tolerance scores			
	WARDA site		CARI site	
	4 WAT*	8 WAT	4 WAT	8 WAT
BW 78-7	3	3	3	3
IR4227-109-1-3-3	4	3	3	3
IR4422-480-2-3-3	5	3	3	3
IR4432-52-6-4	3	2	–	–
IR4625-269-4-2	1	2	–	–
IR4683-54-2-2-3	1	2	5	5
IR 52	3	2	5	5
IR 54	7	8	5	9
IR13168-143-1	6	6	5	5
IR9129-136-2	6	7	5	5

*WAT = Weeks After Transplanting

9. 1981 IRYN-VE AT CARI-SUAKOKO

The very early yield nursery was conducted by the Central Agricultural Research Institute at Suakoko, Liberia in 1981. The mean grain yields and days to flower of the top ten entries are show in Table 56.

Table 56: Means of grain yields and days to flower of top entries in the 1981 IRYN-VE, Suakoko, Liberia.

Entries	Grian yield (Kg/ha)	Days to flower
Ir19735-5-2-3-2-1	3,278	85
IR19774-23-2-2-1-3	2,996	82
IR19746-28-2-2	2,926	80
IR19791-12-1-2-2-2	2,886	82
RNR 7306	2,876	89
IR15429-268-1-2-1	2,704	85
BKNLR 75001-B3-CNT-B4-RST-47-1	2,664	82
IR19743-46-2-3-3-2	2,520	84
IR19743-25-2-2	2,350	85
IR19762-2-3-3	2,120	81

C. 1982 TRIAL REQUEST

Table 57 shows the details of the 1982 trial request. A total of 147 sets of 23 nurseries and screening sets have been requested in West Africa.

D. NOMINATIONS INTO MEDIUM-DEEP SCREENING

WARDA Special Research Project at Mopti, Mali has nominated the following cultivars for the medium-deep screening. They will survive below 140 cm depth of water.

1. D.W.C.T. 37-2-B-B
2. Baroger
3. FRRS 43/3
4. DM16

E. MONITORING TOUR

In 1981 there was an IRTP monitoring tour organized by IRRI in cooperation with WARDA and other Institutions in the region. Senior national and international scientists within and outside of the region participated. IRRI was represented by three scientists. The tour visited Senegal, Liberia, Ivory Coast and Nigeria. The detailed report of this monitoring tour has been published under separate heading by IRRI and IRTP Coordinator.

Table 57: 1982 IRTP trial requests for West Africa

TRIALS	Dept.Agron.Ros. Benin	M.O.A8 Sapu-Gambia	CRI–Nyankpala Ghana	Bissau	Guinea	IDESSA Ivory Coast	CARI Liberia	WARDA Liberia	MOA Mali	WARDA Mopti–Mali	IRAT Nigeria	IITA Nigeria	NCRII Nigeria	ISRA Senegal	WARDA Senegal	Rokupr Sierra Leone	WARDA Sierra Leone	IRAT Togo	Others	TRIAL TOTAL
	Institute/Country Requesting																			
IRYN–VE		1				1	1	1	1			1	1	1	1					9
IRYN–M	1					1		1	1			1	1	1	1	1		1		10
IRLYN		1				1	1		1		1	1	1	1		1				9
IRON						1	1	1				1	1			1				6
IURON–T	1		1				1	1	1		1	2	2	2						12
IRLRON–E	1	1	1					1			1	1	1	1			1	1		10
IRLRON–L	1	1	1					1			1	1	1	1			1	1		10
(Flood Tol.)								10		1			1							12
(Medium Deep)								10		1			1							12
(Floating)								10		1			1							12
(Tidal)								3					1							4
IRCTN		1						1					1		1			1		5
(Salinity)		1		1				1					1	1	1		1			7
(Fe Tox.)				1			1	1					1							4
(Acid Sulfate)													1				1			2
(Acid Upland)								1					1							2
(Peat)	1													1						2
IRBN	1						1		1		1		1	2				1		8
(LeafScald)							1													1
(Sheath rot)								1					1	1						3
(Brown Spot)								1					1							2
(Gall midge)								3												3
(Yellow stem borer)								2												2
Country Total	6	6	3	2	4	6	51	5	3	5	8	20	42	4	3	4	5			147

ACTIVITY REPORT OF THE SPECIAL SUPPORT TO THE VARIETAL IMPROVEMENT PROGRAMME AT IDESSA, BOUAKE, 1981

Introduction

The assistance WARDA gives to the upland rice research programme conducted by the Food Crops Department of the Savanna Institute (IDESSA/DCV) at Bouake is mainly in form of a breeder who is wholly integrated into the rice research team and who participates in the joint implementation of the programme that is examined and approved every year by the programmes committee of the Ivorian Ministry of Scientific Research.

The activities of the WARDA breeder in 1981 were in three areas:

1. General selection in the 1980-1981 off-season
2. Varietal evaluation
3. Study of the criteria for special selection.

    Evaluation of the importance of the problem of grain discolouration.
    Study of milling yields.
    Weevil infestation in relation to the number of open glumes.

I. SELECTIONS FROM SEGREGATING POPULATIONS

A total of 543 F4-F6 lines were selected from different F3—F5 populations in 1980—81 off-season.

II. VARIETAL EVALUATION

Medium duration cultivars used in several trials in Ivory Coast were analysed by comparing their average yields with a composite yield of IRAT 13 and IRAT 104. These two varieties are outstanding in many places in and outside of Ivory Coast.

Table 58 illustrates the results obtained in this study for the top twenty cultivars. Considering the number of sites and yields, the best cultivars were IRAT 13, IRAT 104, IRAT 120 and IRAT 156. An analysis of variance different.

Cultivar 949M came top of the list but it is however not acceptable under traditional upland cultivation because it is too short and shatters. The shattering is however the same as that of IRAT 13. The variety might be recommended in future for intensive cultivation in the western zone of Ivory Coast.

A detailed study was carried out to determine where IRAT 13 and IRAT 104 are best suited in Ivory Coast. The adaptability study revealed that IRAT 104 is best suited to the central zone and IRAT 13 western zone. Although IRAT 13 is not significantly superior to IRAT 104 in the west, it has an advantage of blast resistance over IRAT 104 which is susceptible to blast under the abudant rainfall in the western zone.

Table: 58: Yield indices of medium duration varieties from multi-location trials in West Africa.

Number of trials	Variety	Index
12	949 M	107
1	TOX515-11-SLR	104
19	IRAT 104	102
19	IRAT 13	98
12	IRAT 170	97
3	IRAT 164	95
11	IRAT 156	94
3	IRAT 166	94
11	IRAT 132	94
2	SEL IRAT 194	92
5	IRAT 138	91
3	IRAT 162	91
2	TOX 516-19-SIR	88
3	IRAT 168	87
3	IRAT 165	87
3	IRAT 161	87
3	IRAT 160	87
6	IGUAPE CATETO	86
16	IRAT 136	84
3	IRAT 167	84

Similar varietal evaluations were conducted for early duration cultivars. The composite check was made up of IRAT 110, IRAT 112 and IRAT 133. Table 59 shows the grain yields indices of the top 20 cultivars. IRAT 144 and IRAT 109 were to top two cultivars with 17 and 14% yield increase respectively over the composite check.

Table 59. Grain yield mean Indices of 20 early maturing varieties in multi-location trials in West Africa.

Number of trials	Variety	Index
14	IRAT 144	117
30	IRAT 109	114
41	IRAT 110	104
41	IRAT 133	104
4	IRAT 142	99
3	ITA 117	98
17	DJ 8-341	95
14	M 55	94
13	IRAT 146	92
41	IRAT 112	91
10	TOX 475-1-1-1	88
4	M 18	83
17	IRAT 147	80
4	TOX 86-1-3-1	79
12	ROK 16	78
2	TOX 516-19-SLR	70
3	62-155-Cl	76
10	TOX 475-NIBI-SLR	74
13	TOX 502-13-SLR	71
25	DOURADO PRECOCE	71

*Index 100 = Yield of composite check IRAT 110 + IRAT 112 + IRAT 113.

III. STUDY OF SOME SELECTION CRITERIA

The effect of stained grain or grain discolouration

The problem of grain discolouration and staining is usually given as the more important reason why varieties are rejected in the wet forest zone. During the seminar on WARD'S UPLAND RICE RESEARCH POLICY HELD IN May, 1981 in Monrovia, the main constraints against upland rice varietal improvement in the zone were indentified as:

1. blast
2. stained grains
3. others.

The purpose of this study is to undertake a preliminary investigation of the seriousness of yield lost resulting from stained grains.

Seven varieties harvested under the same conditions at Bouake in October, 1981 were analysed as follows:

25 grains of each variety were taken, and each grain assigned to one of the following classess:

- spotless grains
- averagely stained grains
- very stained grains
- unfilled grains.

Each class was then counted and weighed. The empty grain were then eliminated from the calculations. The results are therefore only for the filled grains. After this, each class of the grains was dehusked manually, and the same calculations done using the dehusked grains.

spotless grain weight

The ratio: number of spotless grains makes it possible to determine the average weight of the "normal" grain, that is, of the spotless grain. This then makes it possible to calculate the difference between the weights of the "normal" and "stained,, grains and then the theoretical weight that the class of grains would have had if none of them had been stained. (Table 60)

It appears that the grain loss resulting from the stained grains is, in certain cases, high. This is the case for 4 out of 7 varieties. The is a great correlation between the frequency of stained grains and weight loss per grains. Put differently, there is a great correlation between the incidence and seriousness of an attack.

It also appears that there is a clear difference between West African upland rice types which are less seriously attacked and have a moderate frequency of stained grains, and the Asian semi dwarf indica types in which all the grains are almost attacked. The difference here is minimal because the calculations were only based on filled grains since the unfilled grains (below 10 mg) were eliminated. However, it is likely that certain grains were classified as "unfilled" precisely because they were stained since "unfilled" grains are often stained. It was important to aviod the interference of factors such as physiological scalding sp., borers, etc., with fungal attacks on grains.

From the practical point of view, it seems that the relationship between weight loss and the frequency of grain attack is exponential in nature. This would facilitate screening for this character. In fact, only high incidence have a notable effect on yields. Any form of screening could threrefore be effective.

Table 60 CHARACTERISTICS OF STAINED GRAINS OF 7 RICE VARIETIES

	Weight of one healthy grain (mg)	Weight loss of one stained grain (mg)	Weight loss of a stained grain (%)	% of stained grains	% weight loss due to stained grains	% grain weight due to stained grains
IR9671–1–4–6–8	21.8	5.1	23	92	22	32
TOX 516–19–SLR	25.9	4.18	16	94	15	18
IR 5853–118–5	26.2	3.82	15	96	14	10
DJ 11–307030105	29.8	3.76	13	93	12	17
TOX 502–13––SLR	36.2	0.5	2	39	1	2
TOX 86––1–2–1	30.3	1.39	5	14	1	1
ROK 16	27.6	0.1	0	12	0	0

Milling yield is one of criteria that the breeder has to consider. It was therefore necessary to find out if the varietal effect, no matter how little, was sufficient enough to be used in which case it was necessary to identify a satisfactory adequate method. If it is confirmed that the effect is too little to be used, it would therefore be unnecessary to continue with this approach.

Since the environmental factor is important, the varieties for the experiment were sown on different dates according to the duration, beginning with the most late-maturing variety and ending with the most early-maturing one. Thus all the varieties matured at the same time and were havested on the same day with same degree of maturity and having grown under the same climatic conditions. This is the physiological maturity stage, that is, grains 3-5cm from the tips down the panicle axis have yellow-straw colour on at least 80% of the panicles and the moisture content is between. 22 and 25%. Over mature or immature panicles were not used.

Three sites representing ecological conditions of the Ivory Coast were selected for the trial. These sites were:

- Ferkessedougou, Northern zone, with a short rainy season where cleavage is excessive (havesting after rains)
- Bouake, Central zone
- Man, Western zone, wet.

A total of sixteen varieties were used in experiments. Three samples of 100 grains at 12% moisture contents were used for each variety from each location for milling purposes. The milling, grading etc., were done at controlled temperature and humidity by the IDESSA/DCU Seed Control and Technology Laboratory.

The results of the experiments (Figures 1, 2 and 3) show that the varieties have different milling recoveries and their total milled yields and total head rice are influenced by the environmental conditions at various locations. The analyses of variances showed highly significant differences for varieties, location and variety as in multiplication location interactions.

Some general conclusions from the experiments are: Iguape Cateto had the best total milled rice yield, IRAT 109 had the best head rice yield. IRAT 13 and Dourado Precoce produced the least head rice (Fig 1).

These experiments revealed little or no coorelation between total milled yield and head rice yield.

FIG. 1. PERCENTAGE TOTAL MILLED RICE YIELD PER VARIETY AT THREE SITES IN IVORY COAST, 1981

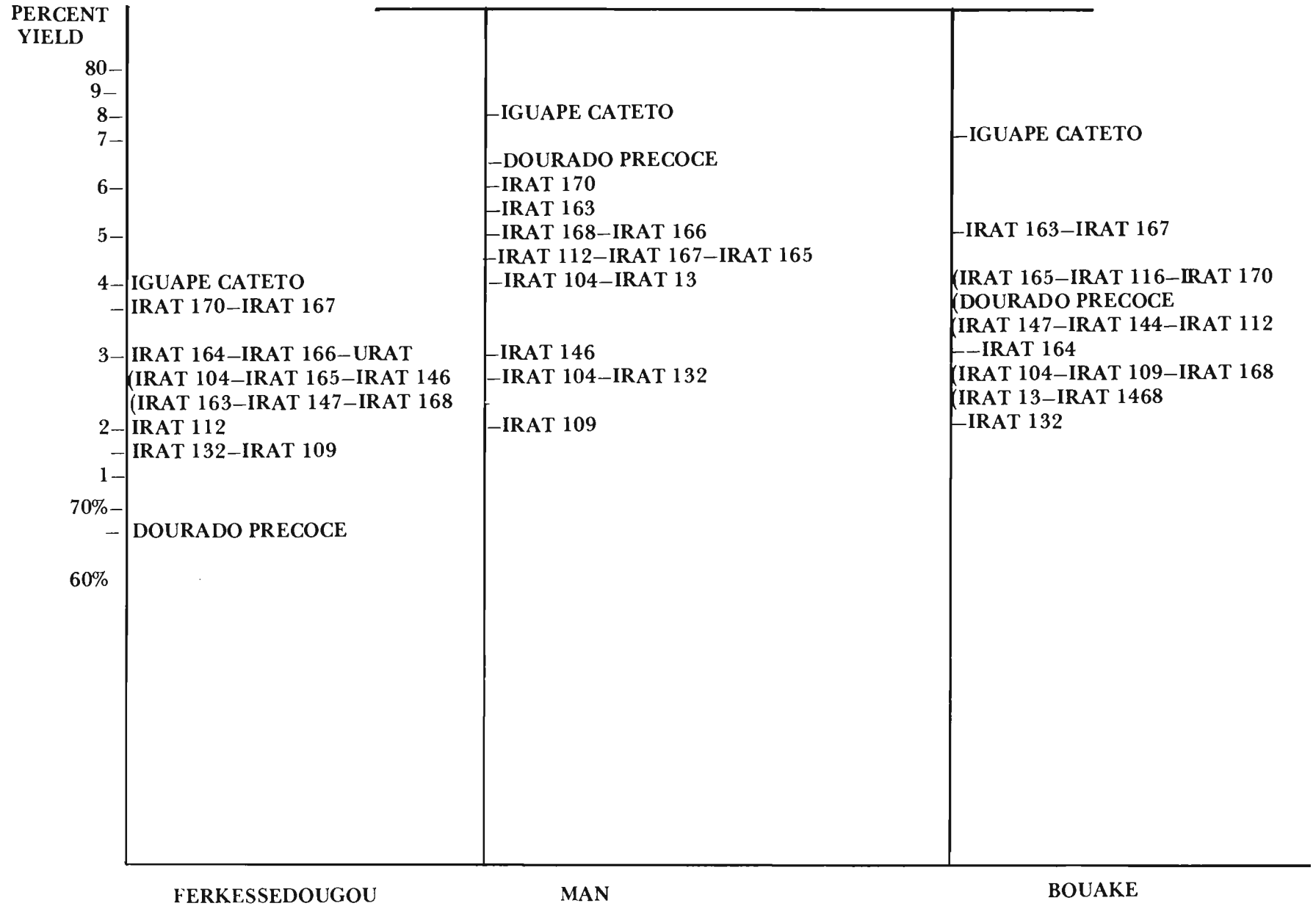
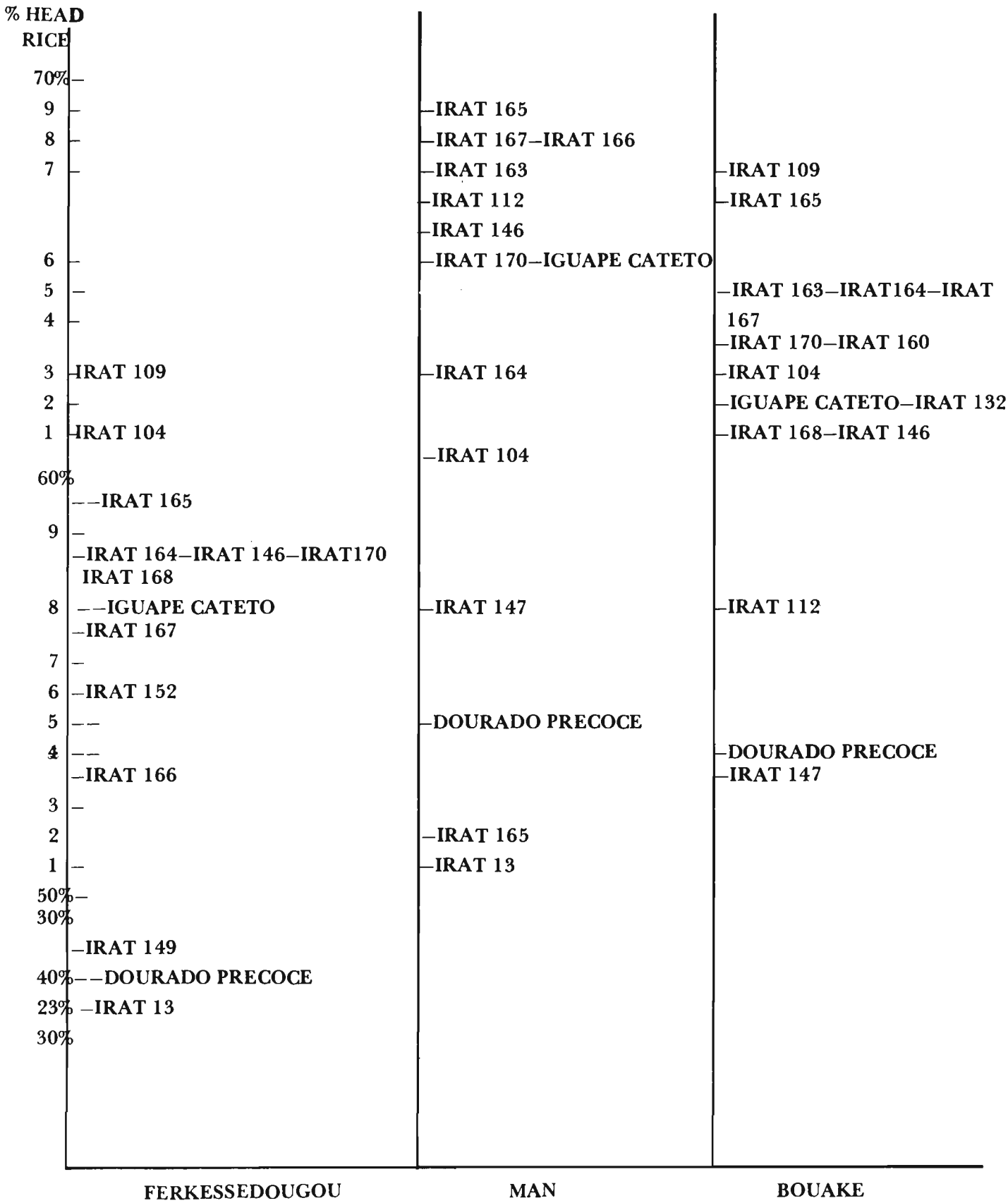


FIG. 2. PERCENTAGE OF HEAD RICE YIELD PER VARIETY AT THREE SITES IN IVORY COAST, 1981



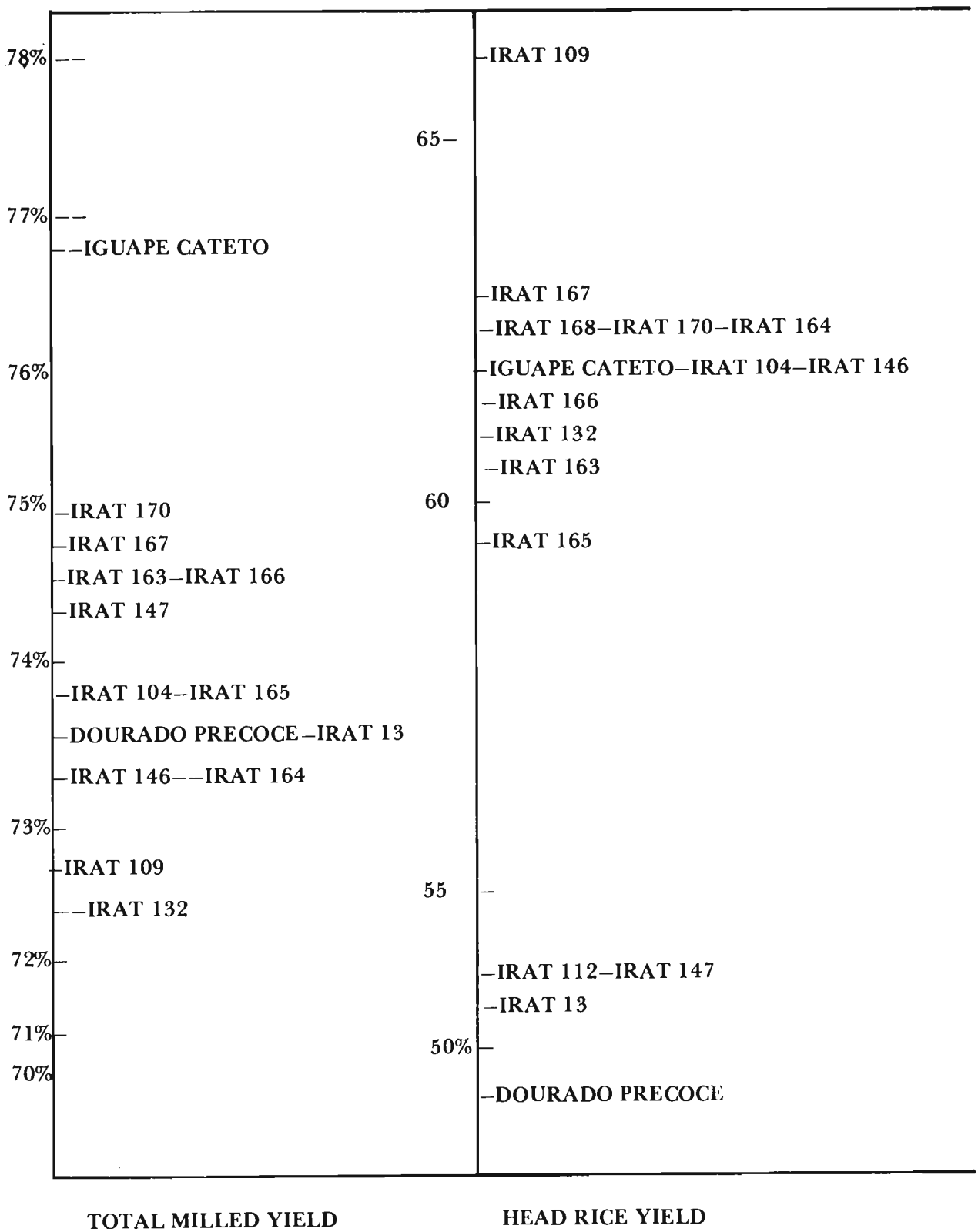


FIG. 3 PERCENTAGE TOTAL MILLED AND HEAD RICE OF THREE LOCATIONS IN IVORY COAST 1981

Study of weevil infestation (Sitophilus oryzae)

in relation to the percentage of open glumes

The study was started in 1980. In 1981 two approaches were used:

(a) Evaluation of the correlation between the percentage of open glumes of 12 varieties and the infestation rate of weevils in a given time.

(b) Selection, within one variety, of grains with open and closed glumes and changes in the number of number of weevils in the two lots.

After harvesting samples of 200 grams were taken. From December, the weevil were counted every 15 days. Then the correlation coefficient between the following was calculated:

a. The percentage of open glumes of each variety and the cumulative number of weevils from the first counting date.

Table 61: Value of the coefficient of correlation between the percentage of open glumes and the number of weevils

Date	"r" value for the number of weevils on each count /date	"r" value for the number of cumulative weevils
8/12/81	0.91	0.91
24/12/81	0.31	0.82
8/01/82	0.65	0.86
22/01/82	0.61	0.76
6/12/82	0.57	o.75
22/o2/82	0.16	0.73

It can be seen from Table 61 than in general, the correlation has a high value of the first counting date and then subsequently decreased. The percentage of open glumes must certainly have an effect especially on the initial infestation.

Study on the lots initially classified as "grains with open glumes" and "grains with closed lemmas".

In order to make this study more precise, grains were selected from within two varieties. Lots of 67 grams were obtained as well as grains of 100% open or 100% closed lemmas from the same varieties 9IRAT 160 and IRAT 169), with two lots per treatment. Counting was done four times (onece a week).

Figure 4. illustrates the effects of open glumes on the populations of weevils. There was a significantly higher infestation on open glumse than on closed ones as confirmed by analyses of variance. It is important to note that rate of increase in weevil population over a period of time varies depending on the varies used. The rate is lower for IRAT 160 tha IRAT 269 and 30-35 days after harvest there was a decrease in weevil population (Fig. 4).

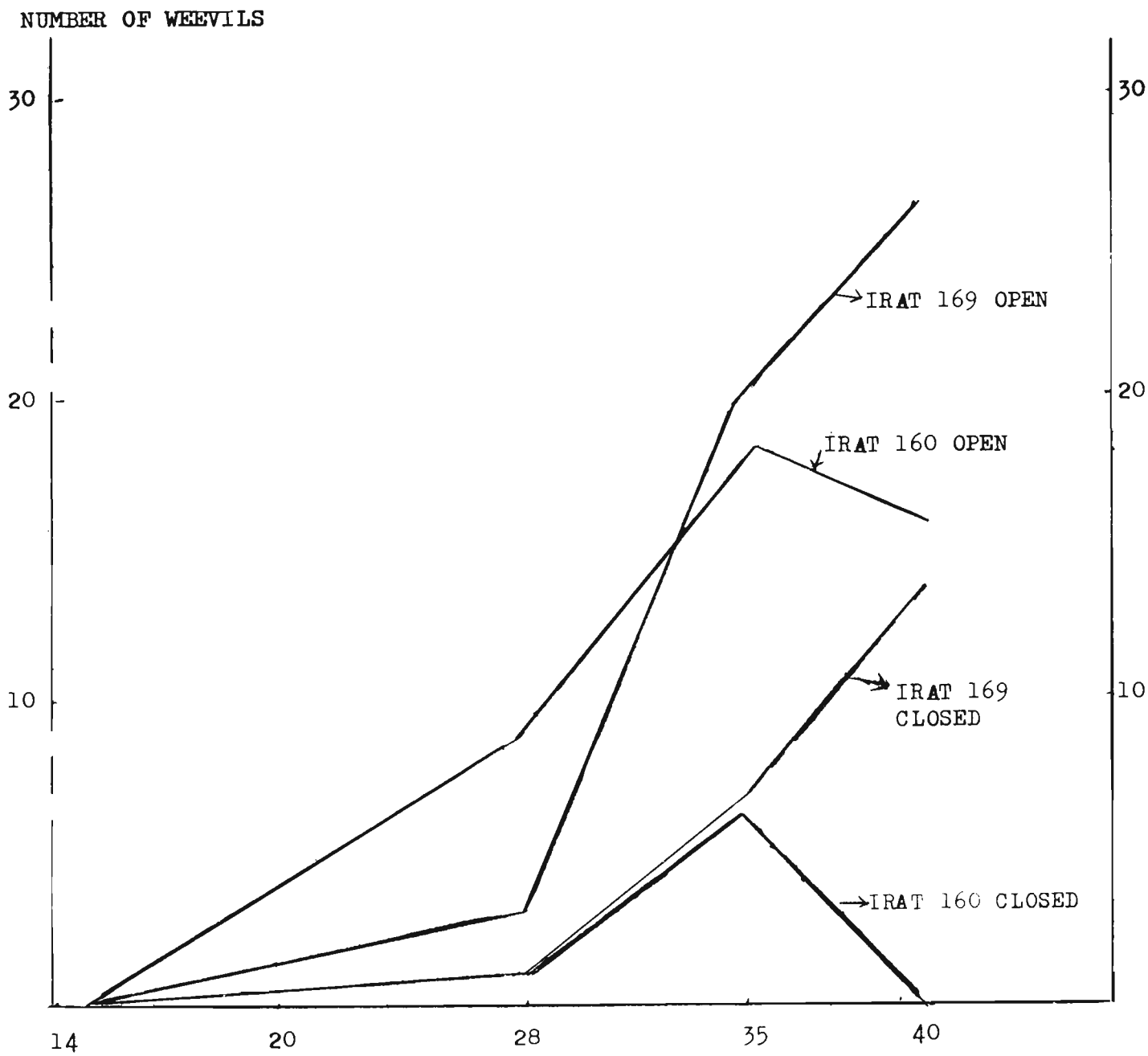


FIG. 4. CHANGES IN WEEVILS POPULATIONS IN 67 gms of RICE SAMPLES

SPECIAL RESEARCH PROJECT FOR DEEP-WATER AND FLOATING RICE, MOPTI, MALI

OBJECTIVE

The broad objective of deep water and floating rice research at Mp½ti is to develop improved varieties and cultural practices in the form of production packages which are adapted to the West African environment and can profitably enhance farmers yields.

The emphasis has been on adaptive research comparising programmes in varietal improvement, agronomy, weed control, entomology and research extension on farmers fields.

This report is on the research activities during the 1981 corpping season.

RAINFALL AND FLOOD

Rainfall of 376.7 mm was recorded during the year as against 460.8 mm the average for the previous eleven years. The month of June, a time for land preparation saw very little rain, 71% less than the 11-year average. Consequently land preparation was delayed. Soon after sowing, severe moisture deficit set in during the month of August. In many cases, sowing had to be reported.

When flood water arrived in mid-September, the young seedlings were drowned as they could not keep up with the rising water.

Many experimental yields, when compared to the previous season, fell by 27% to 35% depending on the site.

VARIETAL IMPROVEMENT

Efforts in this were concentrated on screening tests and varietal trials at varying water levels.

I. SCREENING TESTS

Objectives was to identify phynotypically new varieties with broad spectrum resistance to major environmental stresses including drought, submergence, insects and diseases, and varieties whose growing cycles are adapted to deep water and floating conditions.

Two tests, international rice deep-water observational nursery (IRDWON) (53 entries) and initial evaluation tests (IET) (153 entries) were conducted in the tank.

In IRDWON test, three varieties, DWCT 37-2-B-B, Baroger, FRRS 43/3 were selected. Their flowering dates, 19th, 18th and 20th November respectively were optimum for Mopti conditions. Twenty three varieties have been retained from the IET (Table 62). It would be observed that all but two of these varieties flowered in the third to the last week of November.

Table 62: List of best introductions from the IET (1980)

Varieties	Varieties
1. GH2 (check)	13. DA 29 (check)
2. HTA T42b-S-O-1-S	14. BKN FR 76050-10-1-1
3. IR 11288-BB-118-1	15. BR 314-B-4-6
4. BKN FR 76109-1-2-1	16. HTA FR 77043-2
5. BKN FR 76106-16-0-1-0	17. HTA 7426-5-0-2-5
6. BR 118-BB-17	18. IR 4935-K103-0-2-0
7. CR 1030	19. SPR BR 7411-7-2-1
8. KAU 2039	20. SPR 7233-1-22-3-2
9. DWCT 156-1-2-0	21. SPR 7233-1-40-1-2-1-2
10. RD 19 (check)	22. SPR 7410-0-147
11. SPR 7292-0-0-0-2	23. SPR 7410-0-256
12. SPR 7292-151-2-1-B-B	

Date sown: 5/8/81
Max. water level 88 cm.

II. YIELD POTENTIALS OF VARIETIES UNDER DIFFERENT WATER LEVELS

1. Deep and medium water levels

These trials were carried out in order to identify high yield varieties for deep and medium water levels. This is the third year for the experiment.

Seven new varieties were compared with Khao Caew, Mali Sawn and Nang Kiew, currently grown by farmers. The maximum water levels were 122 cm for the deep zone and 118 cm in the medium zone.

The seeds were drilled at the rate of 70 kg/ha. Fertilizer of ammonium phosphate and of urea at 100 kg/ha were applied at sowing and two days before flood respectively. Weedings were done as necessary.

The highest yield was obtained from Cula in the medium zone and in the deep zone. DM 16 and BKN 6323 produced top significant yields (Table 63).

In terms of yield stability over the last three years and regardless of water level, DM 16, BKN 6323 and Cula invariably gave best yields.

2. Medium and shallow water levels

The objective was to identify new varieties which yield better than the recommended ones in the above water levels.

Eight new varieties and two recommended varieties were sown in the medium and shallow zones. The maximum water levels were 118 cm in the medium and shallow zones respectively. All other treatment were same as was in the preceeding trial.

The variety, T442-36 produced significantly better yield than the control D52-37 (Table 63). The other control BH2 produced second highest yield and was significantly better than most of the new introduction.

Again, in terms of yield stability over the last three growing seasons, varieties BKN 6986-105-P, T442-36 and BH2 produced at least 3 t/ha regardless of the water level.

TABLE 63: Yield performance of new varieties in deep and medium water levels.

Varieties	GRAIN YIELD KG/HA				
	1979	1980		1981	
	Medium zone	Deep zone	Medium zone	Deep zone	Medium zone
1. Mali Sawn	1548	1934	3208	2060	2875
2. Nang Kiew	1933	2664	2836	2162	3407
3. Khao Gaew	2122	2921	3250	2320	3227
4. BKN 6323	2585	2998	3302	2900	3024
5. BKN 6986–81–5	1396	1814	2169	1624	2602
6. BKN 6986–167	1937	2476	2858	1725	2879
7. BKN 6986–108–3	1877	2632	2874	1793	2669
8. Cu la	–	2981	3301	2646	4218
9. DM 16	3263	3052	3290	3044	3285
10. MSP 11	1914	2449	2868	1877	2708
C.V. (%)	39.9	18.2	17.8	32	19.7
L.S.D. 5%	792	550	684	839	707
Sowing Date	25/7	16/7	25/7	23/7	21/7

TABLE 64 Yield performance of new varieties in medium and shallow water levels.

Varieties	GRAIN YIELD KG/HA				
	1979	1980		1981	
	Shallow zone	Medium zone	Shallow zone	Medium zone	Shallow zone
1. T442–36	3626	3778	4070	3299	2371
2. DM 16	3756	3522	3894	2325	3504
3. DM 17	3770	3137	4265	2572	2379
4. D52–37	4059	2777	3339	2098	2301
5. BH2	3677	3286	3954	2952	2476
6. BKN 6986–105–P	3633	4396	4774	2568	2931
7. BKN 6986–38–1	4217	3494	4524	1855	2215
8. BKN 7022–6–4	3756	3687	4373	2571	2099
9. BKN 7022–10–1–4	3025	3548	4298	2024	2203
10. DA 29	3859	3668	3591	2481	2232
C.V. (%)	16.7	13.6	14.6	24.2	24.3
L.S.D. 5%	724	559	701	696	670
Max. Water level	60 cm	85 cm	50 cm	118 cm	68 cm
Date sown	11/8	27/7	7/8	27/7	8/8

III. MULTIPLICATION YIELD TRIALS

The aim of these experiments was to work in collaboration with national agricultural extension services in Mali and Niger and to compare promising new varieties with localty recommended varieties on farmers' fields.

In Mali four varieties were compared with BH2 at two sites.

In Niger four varieties were compared with D52-37 at Kolo.

In Mali at Bougoula where the trial was successful, the varieties DM 16, DM 17 and BKN 6986-38-1 produced 16 to 28% higher yields than the local variety BH2 (Table 64).

In Niger the new introductions BKN 6986-38-1, DM 17 and BH2 produced from 15 to 26% higher yields than the local control D52-237.

IV. HYBRIDIZATION PROGRAMME

The number of selected plants in the previous crosses were as follows:

AA8A x Khao Yai 14-22-108 ..... 16 plants in F4

The 16 progeny lines of the F4 were sown but only five survived in F5.

2. BR3 x Son Lon A ..... 1 plant in F3.

IR 790-28-6 x Son Lon A ..... 1 plant in F3.

IR 790-28-6 x Mali Sawn ..... 1 plant in F3.

3. In addition, the following crosses were made during the growing season:

IET 2885 x Khao Gawe
IET 2885 x Mali Sawn
H15-23 DA x KahKhao Gaew
H15-23 DA x Mali Sawn
IR 442 Khao Gaew
IR 442 x Mali Sawn.

Only the two crosses made with H15-23 DA were successful.

AGRONOMY

The trials in Agronomy consisted of land preparation, cultural practices and fertilizer management.

I. LAND PREPARATION

The aim was to compare at two nitrogen levels, the performance of three tillage implements used in deep water rice growing areas.

Three tillage implements, the native hand hoe, animal drawn plough and the reversible plough drawn by a tractor were tested and the respective depths of ploughing for each implement were 8, 15, and 25 cm. A split-plot design was used with treatment replicated four times. The effective plot size was 10 m2.

The variety, Khao Gaew was sown at 70 kg/ha nd all plots received 40 kg P O 25/ha at beginning of tillering. The nitrogen treated plots received the dose one week before flooding. The treatment were same as for the previous years.

Like last year, ploughing with the native hand hoe gave the lowest significant yield. Differences in the other treatment neither were not significant (Table 65).

TABLE: 65 Influence of tillage implement and nitrogen on grain yield Kg/ha of floating rice.

Tillage implement	No Nitrogen	with Nitrogen	Mean
Hand hoe	736	864	800
Oxen plough B2 + Harrow	1141	1148	1144
Tractor plough + Harrow	1236	1035	1136

C.V. % (Implement)..... 54%
LSD 5% (Implement)..... 204
Maximum water level..... 135 cm.

II. CULTURAL PRACTICES

1. Influence of seeding date on deep water rice

The objective was to find the influence of seeding date on the performance and yield of deep water rice.

Three varieties, Khao Gaew, Nang Kiew and Mali Sawn were seeded at 10 day intervals. A split-plot design was used. The maximum water level was 175 cm.

The last two seeding dates suffered from drought and were inundated when floods arrived.

As in previous years, Nang Kiew (Table 63) appeared to be a table and relatively high yielder, followed by Khao Gaew. It has been observed over the years that sowing in the first week of July necessitated more weedings due to heavy infestation from annual wild rice, **Oryza barthii.**

TABLE 66: Influence of seeding date on grain yield (kg/ha)

	VARIETIES			
Seeding Date	Mali Sawn	Nang Kiew	Khao Gaew	Mean
1/7	1345	2010	1080	1478
10/7	898.	1703	2092	1564
20/7	902.	1880	1100	1294
31/7	—	—	—	—
10/8	—	—	—	—
Mean	1049	1864	1424	

2. Effect of variety and spacing on yield of deep water rice

The objective was to determine if spacing has any effect on yields when different varieties are used and sown at varying water levels.

Two varieties, GH2 erect/variety and DM 16, a variety which lies prostate at maturity were sown at three different sites (deep, medium and shallow zones) using 20, 30 and 40 cm spacings.

In deep and medium zones the experiment failed due to drought and mice infestation.

Statistically, no significant differences were noted in the grain yields between the two varieties, but DM 16 produced about 6.7% higher than BH than BH2 (Table 67). It also produced significantly higher number of tillers and panciles (Table 67).

The 20 cm spacing produced the highest yield and was 35% higher than the 40 cm spacing and 22.7% than the 30 cm one.

TABLE 67: Effect of variety and spacing on grain yield (Kg/ha)

Variety	Spacing (CM)			Mean
	20	30	40	
BH2	3118	3038	2158	2772
DM 16	3618	2451	2805	2958
Mean	3368	2745	2481	

C.V. % (Variety) 13.1
C.V. % Variety x spacing = 28.1

TABLE 68:

Variety	Spacing (cm)						Mean	
	20		30		40		Tillers	Panicles
BH2	41.75	35.5	45.5	41.0	52.5	46.25	46.6	40.9
DM 16	59.5	51.25	66.0	58.25	55.0	46.75	60.3	52.1
MEAN	50.6	43.4	55.7	49.25	54	46.5		

	Tillers	Panicles
C.V. % Variety.....	13.7	7.46
L.S.D. 5%.....	7.5	4.51

III. FERTILIZER MANAGEMENT

Studies included the followings:
(1) Nitrogen and phosphorus placement effectives on grain yield.
(2) Rate and time of fertilizer application.
(3) Response of floating rice to different sources of nitrogen
(4) International trial on nitrogen fertilizer effeciency in rainfall wet land rice.

None of these studies produced significant results but the details of the experiments and results obtained can be found in Mopti station 1981 Annual Report.

weed control

I. EFFECT OF SOME MECHANICAL AND CULTURAL PRACTICES IN REDUCING YIELD LOSSES DUE TO WEEDS

The aim was to determine weeds, especially wild rice of yield of rice variety Nang Kiew.

Seeds of this variety were drilled at the rate of 70 kg/ha. Fertilizer rate of 100 kg/ha of ammonium phosphate was broadcast as basal application and 100 kg/ha urea top dressed a few days before the flood.

Table 69 shows the extent of weed infestation for the various cultural treatments. Ploughing at the end of the season gave better result than at the beginning of the season the former practice giving a more effective weed control than the latter.

TABLE 69: Effect of mechanical and cultural practices on weed population/m2 on sandy soil.

Treatments	28 days after sowing		97 days after sowing		Grain yield Kg/ha
	No. of Melochia sp	No. of O. longistaminata	No. of Melochia sp	No. of O. longistaminate	
ES Plough - 35 cm	5	5	0	4	2 663*
ES Plough - 15 cm - Tractor	3	4	0	1	2 487
ES Plough - 15 cm - Cattle	4	3	0	1	2 921
BS Plough - 15 cm - Tractor	5	33	0	45	1 982
BS Plough - 15 cm - Cattle	2	28	0	46	2 097
BS Plough by cattle	3	40	0	49	1 866

ES = end of Season
BS = Beginning of Season

C.V. % 20.3
LSD % 713
Max. water level = 105 cm.

II. COMPARISON OF CHEMICAL AND CULTURAL CONTROL METHODS FOR ORYZA LONGISTAMINATA

The objective was to compare four herbicides with other cultural methods in controlling perennial wild rice in a heavily infested field.

Six treatments were tested as shown in Table 70.

Table 70 shows the weed counts and the effectiveness of the treatment. For the immediate effects, glyphosate and dalapon were the most efficacious in controlling the wild rice but the residual effects are to be evaluated in 1982 cropping season.

TABLE 70 Weed count/m2 and effectiveness of chemical and cultural control **Oryza logistaminata**

Treatments	No. of **O. longista-minata** before treament	30 days after treatment		107 days after treatment	
		No. of **O. longista-minata**	Effective-ness	No. of **O. longista-minata**	Effective-ness
1. Glyphosate 2.88 kg a.1/ha	240	20	8	1	10
2. Glyphosate 3.6 " "	245	37	7	1	10
3. Dalapon 10 " "	220	39	7	2	10
4. Diuron 4 " "	206	124	5	119	4
5. Slashing under water twice	223	258	0	92	5

ENTOMOLOGY

The entomology programme consisted of identification of insects, studies on population dynamics of stemborers, rice varietal infestation by stemborers and chemical control of insect pests.

I. IDENTIFICATION OF INSECTS

The Commonweath Institute of Entomology (CIE) indentified some insects for the station:

1. **Segatella nigeriensis** (Muir) Homoptera
2. **Toya tuberculosa** (Dist.) family: Delhpacidae
3. **Balelutha eremica** (Lindberg) Homoptera
4. Sterellus sp.

II. POPULATION DYNAMICS OF RICE STEMBORERS

Light trap with ultraviolet bulb was used at the station starting from August. Figure 5 shows the results of weekly traps which is similar to those obtained in the previous two years. The peaks of the three major stemborers were obtained at the same period namely September, October and November and **Scrpophaga subumbrosa.** Meyr was found in the greatest number. The curves observed for **Maliarpha separatella,** Ragonot and **Chilo zacconius,** Blez were similar.

III. INFESTATION OF VARIETIES BY STEMBORERS

Weekly dissections of three rice varieties, Mali Sawn, Nang Kiew and Khao Gaew growing on the seed multiplication farm and also at the WARDA station were made to ascertain the degree of infestation. The percentage of infested stems is presented in Figure 6. On the whole Mali Sawn was more infected than other varieties and in the former variety infestation increased with age. Peak infestation was reached in Nang Kiew, Khao Gaew a week before full maturity resulting in about 48% infestation.

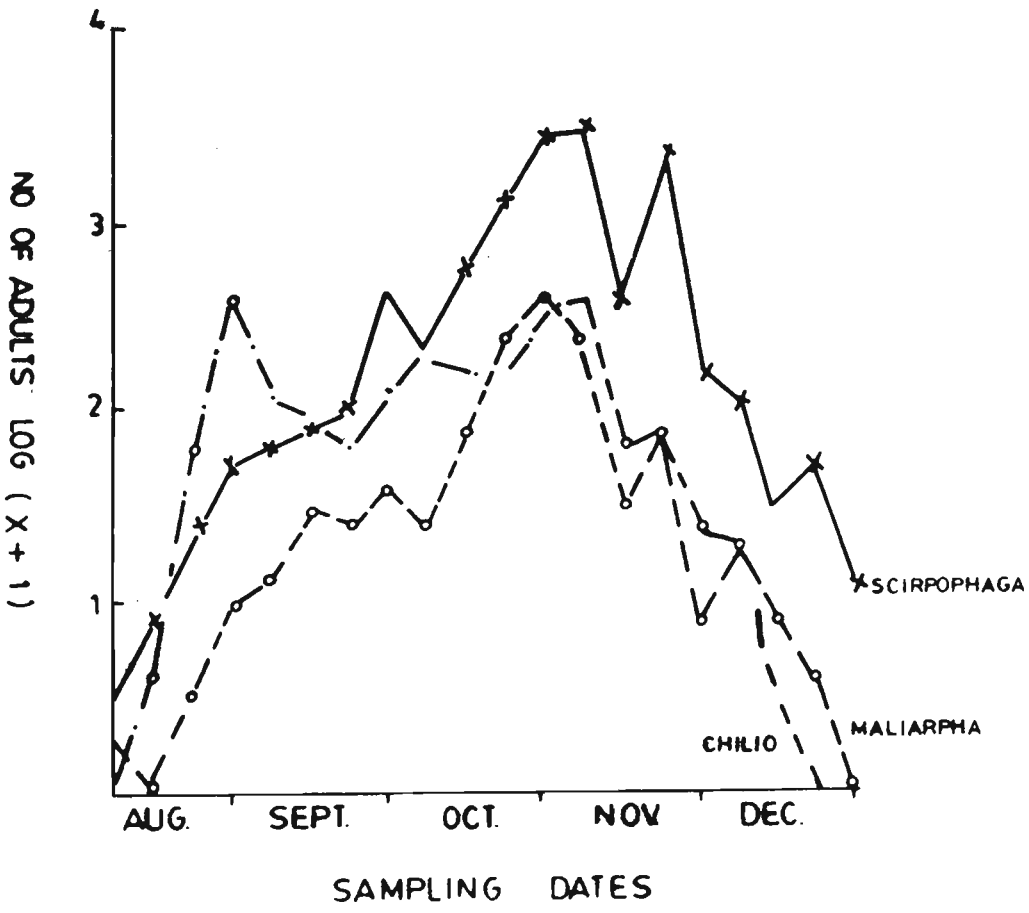


FIG. 5. POPULATION DYNAMICS OF ADULTS STEMBORERS

IV. CHEMICAL control

The objective was to evaluate the dosage and time of application of insecticide.

Three granular insecticides were applied at 10, 30 and 60 days after rice emergence. The variety, Khao Gaew, was sown at a seed rate of 70 kg/ha on July 15th. Fertilizer application and weeding were effected according to the local practice.

Furadan 3G at the rate of 900 gm.ai./ha applied 30 days after rice mergence produced significantly higher grain yields than the control (Table 71). The increase in yield was 72.4%.

TABLE 71: Effect of granular insecticides on grain yield

Treatment	Rates Kg a.i/ha	No. Tillers/m2 186 DAS**	No. panicles/m2 186 DAE	Grain Yield (Kg/ha)
Furadan 3G 10 DAE*	0.9	138	136	2315
Furadan 3G 30 DAF*	0.9	150	144	3139
Furadan 3G 60 DAE	0.9	126	126	2070
Miral 10G 10 DAE	1.0	129	121	1879
Miral 10G 30 DAE	1.0	117	114	2084
Miral 10G 60 DAE	1.0	133	123	2223
Birlan 10G 10 DAE	1.0	118	118	2624
Birlan 10G 30 DAE	1.0	132	131	2500
Birlan 10G 60 DAE	1.0	121	121	2814
Control	—	105	105	1821
C.V. %	—	8.6	8.9	30.3
L.S.D. 5%	—	NS	NS	1031

* DAE = Days after emergence
** DAS = Days after sowing.

b) Effect of some liquid insecticides in controlling insect pests

The objective was to compare the efficacies of four liquid insecticides in controlling insect pests.

Four liquid insecticides were applied 10 and 45 days after rice emergence. The variety Khao Gaew was sown on July 20.

Azodrin and Sumithion appeared to have produced significantly higher yields than the control (Table 72).

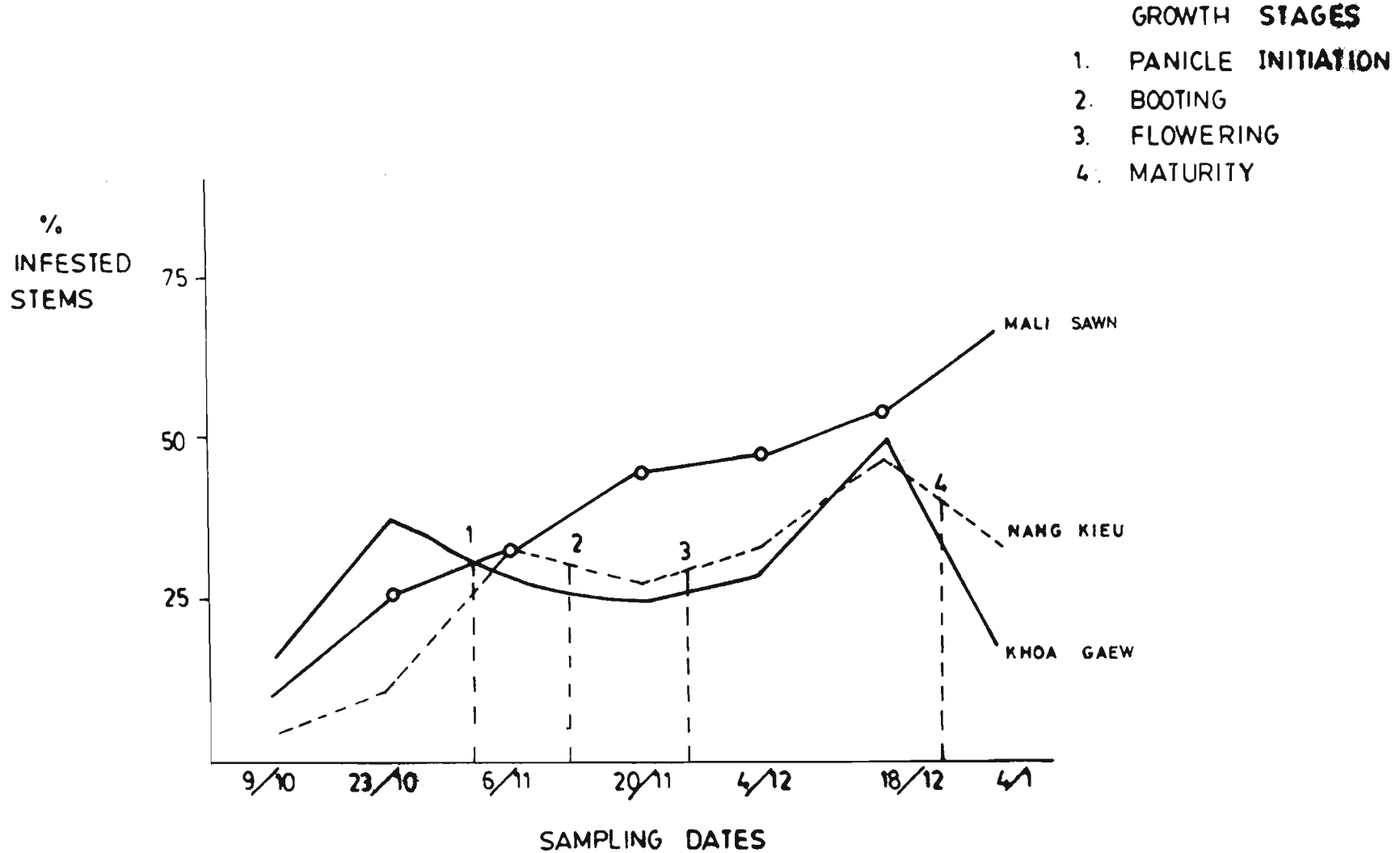


FIG. 6. STEMBORER INFESTATION OF RICE STEMS.

Table 72: Effect of some liquid insecticides on insect pests in floating rice.

Treatment 1/	Rate Kg a.i/ha	% Damaged leaves		% Dead hearts		% Infested	% White head		Yield (Kg/ha)
		DAS* 82	121	82	121	178	137	178	
Azodrin 25 EC	1.104	4.8	0.8	3.4	4.2	10.3	2.9	5.9	2039
Dimecron 50 SCW	1.0	5.3	0.5	3.4	3.5	15.8	2.9	4.9	1200
Sumithion 50 EC	0.5	5.9	0.1	3.7	2.3	11.0	4.6	4.7	1996
Basudin 25 EC	1.0	4.9	1.2	3.8	1.5	17.8	7.6	7.9	1696
Control		7.3	0.1	4.9	3.0	11.4	5.6	3.6	1159
C.V. %		7.3	49.9	16.5	37.2	16.1	35.2	30	19.0
L.S.D. 5%		1.5	3.0	NS	NS	NS	NS	NS	557

1/ All treatments applied at 10 and 45 days after emergence.
* DAS = Days after sowing.

c) **Method and time of insecticide application**

The objective was to evaluate the performance of some insecticides in controlling insect pests when applied at different doses and times.

Generally, Furadan 3G applied at 1.8 kg a.i just before arrival of flood gave highest yield (Table 72. This was followed by Furadan 3G applied at 10 and 30 days rice emergence. The control plot gave lowest yields.

d) **Yield loss assessment**

The objective was to ascertain the degree of grain loss that could be ascribed to insect pests.

Furadan 3G and 10G at 2 kg a.i/ha were applied each at 10 and 60 days following rice emergence. A third treatment plot was not protected. All other control practices were followed as normally recommended.

Incidence of insect pests was very low in all treatment (Table 74). Furadan 10G produced the highest yields and when the unprotected plot was compared against this yield, the crop loss was 33.9%, about 1.2 tons/ha. It was 24% when compared with Furadan 3G treated plot.

TABLE 74: Yield loss assessment due to insects

Treatments	% Damaged leaves		% Dead hearts		% Infested Tillers at maturity	% White heads		Yield Kg/ha
	DAS 64	106	64	106		122	163	
control	1.0	1.0	3.2a	0.9	33.2	8.4	3.2	2336
Furadan 3G	0.3	0.7	0.3b	0.8	30.1	7.7	1.5	3076
Furadan 10G	0.5	0.4	1.0b	1.8	29.0	9.6	3.0	3535
C.V.		33	30	83	32.4	20	58	41
		NS	*	NS	NS	NS	NS	NS

1/ = Days after sowing.

TABLE 73 Effect of insecticides treatments applied at various doses and times

Treatments	% Damaged leaves		% Dead hearts		White heads		% stems infested	Yield
	86	127	87	127	144	163	183	
Furadan 3G 1.8 Kg/ha at sowing	3.1	0.7	1.3	6.0	3.6	5.7	25.7	1859.2
Furadan 3G 0.9 " 10+30 DAE	3.1	1.2	0.7	3.7	5.2	6.8	27.1	2354.1
Furadan 3G 1.8 " before floods	3.1	0.8	1.0	5.0	4.2	6.2	29.9	2567.3
Diazinon 25 EC 1 Kg a.i/ha 10+30 DAE	3.3	0.7	0.2	3.1	4.1	6.2	26.3	1912.1
Diazinon 25 EC 2 Kg a.i/ha 30 DAE	3.2	0.7	0.9	3.1	4.0	6.9	32.0	1927.3
Diazinon 25 EC 2 Kg a.i/ha before floods	3.2	1.2	0.4	4.6	2.6	6.6	23.7	2058.2
Control	3.9	1.3	3.5	6.1	4.5	5.8	27.5	1478.8
C.V. %	12.3	34.1	70	27.1	24.7	22.1	22.9	30.8
F Test	NS	NS	NS	NS	NS	NS	NS	NS

RESEARCH EXTENSION

The aim was to demonstrate to farmers the usefulness of new, shorter growing varieties in areas where water recedes too early.

Two promising shorter growing varieties, DM 16 and DM 17 were tested against two old recommended varieties, Khao Gaew and Gambiaka Kokum, in four zones where there was frequent crop failure because of water problem. The flood water usually flows too forcefully and drowns the plants or it recedes too early and crops fail to reach maturity. In 1980, only 48 out of 1014 hectares were havested.

One or two farmers were selected in each zone and the four rice varieties were sown by each farmer 4th week of July on a plot size of 225 m2 (15 x 15m) replicated twice and all was harvested for grain yield.

One or two farmers were selected in each zone and the four rice varieties were sown by each farmer 4th week of July on a plot size of 225 m2 (15 x 15m) replicated twice and all was harvested for grain yield.

The DM 16 and DM 17 varieties with a growing cycle of about 137 days matured in the last week of November and were harvested gave the highest yield (Table 76). On the contrary, Khao Gaew the variety normally grown and with about 156 days growing cycle failed in most locations as in Gambiaka.

The yield potential of the new varieties is higher than that recorded in this trial so it is possible that if the water is properly controlled, farmers could set better result.

TABLE 75: Varietal yield (Kg/ha) on farmers fields.

	Treatments			
Sites and Farmers	DM 16	Khao Gaew	Gambiaka	DM 17
Konodimini				178
Mr. Massake Couliba	378	0		
Sorobasso				
Mr. Traore	1150	0	—	950
Mr. Drissa Dembele	1089	0	—	800
Souniana				
Mr. Brehima Goita	978	556	—	689
BOUGOULA				
Mr. Mamadou Traore	1267	—	755	1178
Mr. Moussa Diallo	1133	—	—	1667
Average.....	999	130	755	910

PROBLEM IDENTIFICATION

Tour in the Gao Region

A study tour was organized by WARDA, Mopti, in collaboration with "Action Riz Shorgho Gao" to observe some yet unidentified symptoms on rice fields.

Visits were made to Moudakane, a plain of Ilifi 75 km from GAO towards Timbouctou and to the plans of Golomgolom, Almata and Duchare. From Gao towards Niamy the plans visited were: Gagouna and Ansongo, about 100 km from Gao.

Observations

The incidence of the disease symptoms was high in the plains of Ilifi, golomgolom and Almata towards Timbouctou. It was characterized by drying of leaf tips which later turned into brownish, necrotic tissue. In severe cases, the entire stem turned brown and rotted away. In occured in restricted areas, especially in desions, and it appeared localized. For example, in the village of Moudakane, the plain of Ilifi comprising of

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The incidence of the disease symptoms was high in the plains of Ilifi, Golomgolom and Almata towards Timbouctou. It was characterized by drying of leaf tips which later turned into brownish, necrotic tissue. In severe cases, the entire stem turned brown and rotted away. It occured in restricted areas, especially in depressions, and it appreared localized. For example, in the village of Moudakane, the plain of Ilifi comprising of 144 hectares, only about 5-6 hectares suffered from the symptoms.

It seemed also that some varieties especially the **O. sativa** like Khao Gaew and Mali Sawn were more suceptible than the **O. glaberrima** varieties, Moberi, Louby and Kossa. The later ones mature early in about 130 days. Among these, Kossa appeared to be least effected.

In teh fertile plains towards Niamey, the major problem was drought and entire sorghum, millet and rice fields were found dead.

SPECIAL RESEARCH PROJECT FOR IRRIGATED RICE RICHARD TOLL FANAYE SENEGAL

VARIETAL IMPROVEMENT

Screening for cold tolerant rice varieties

Performance and yield of 5 long duration rice varieties in the cold season.

This study which started in 1980 entered its second season in 1981. In each of the experiments, the design was a complete randomized Fisher blocks with six replications. Basal application of Super phosphate (60 Kg/ha/P2 05) and Potassium chloride (60 Kg/ha K20) was carried out before transplanting. The nitrogen dose (120 Kg N/ha) was applied in split application as follows: 49% 10 days after transplanting (DAT) 30% at the tillering stage and 30#% at panicle initiation.

The results are shown in Table 76. The result of 1981 confirmed the good performance of KON-CHOU-CHAN compared with the other four varieties (KONTSI-CHAN, AS774, TONGLI 917, SAI-GHA and IR 8). KON-CHOU-CHAN matured 30 days earlier than IR 8 for yields that were similar.

Table 76: Yield and agronomic characteristics of 5 cold-tolerant long duration rice varieties.

Variety	1980 Yield (kg/ha)	1980 Height (cm)	1980 Duration Maturity (days)	1981 Yield (kg/ha)	1981 Duration Maturity (days)
KON-CHOU-CHAN	5730a*	71	159	6332a	170
KONTSI-CHAN	5700a	65	150	4918 bc	172
AS 774	5044 b	74	157	5160 bc	175
TONGLI 917	4150 b	63	162	5734 b	178
SIANG SAI-CHA	3593 c	66	149	4710 c	176
IR 8	—	—	—	5988ab	202
C.V. (%)	15,8			13.18	

*The figures followed by the same latter are not significantly different.

The variety AS 774 which performed quite well during the vegetative phase revealed that it has some yield stability.

The two varieties, KON-CHOU-CHAN and As 774 will be considered for cold tolerance coordinated trials.

Similarly, another set of 14 rice varieties was assessed for their yield and other desirable agronomic characters. The results obtained showed that Varieties IR 5467-2-2-2, KN-1B-361-8-6-9-2-6, KN-1B-361-179, NAENGDO and IR 1846-296-3 gave yields comparable to those of the check, Fujisaka 5. Furthermore, the duration of the four varieties is less than that of the check. The varieties KN-1B-361-8-6-9-4-4 and KN-1B-361-BLK-13-9 have long duration.

Performance and yield of medium duration cold-tolerant rice varieties

Eight cold tolerant medium duration varieties introduced from Japan were also studied for two consecutive cold seasons. (Table 77).

The procedure of the experimentation is a described before.

Table 77: Yield and agronomic characteristices of cold tolerant medium duration rice varieties.

Variety	1979-1980 Season sowing 25-1-80			1980-1981 Season Sowing 30-10-80		
	Yield (Kg/ha)	Height (cm)	Duration Maturity (days)	Yield (Kg/ha)	Height (cm)	Duration maturity (days)
SORACHI	4912a	71	116	3453ab	71.5	130
TATSUMI-MOCHI	4278 b	72	116	4007a	72.5	137
YONESHIRO	3937 bc	65	117	3222 c	65.5	134
KACHIHONAMIA	3832 c	66	116	3422 b	66.5	131
ISHIKARI	3822 c	61	117	3296 c	60.8	131
HOKU SETSU	3003 d	66	117	3717ab	66.5	137
OIRASE	2572 d	79	115	3366 bc	79.0	134
KAYAYUKI	2524 d	74	116	3244 c	74.5	131
C.V. (%)	25.31			12.77		

II. Evaluation of varieties less susceptible to bird attack

Bird damage iA the Shael region is very serious. Rice varieties with erect panicle leaves are, in general, less attacked by birds. For the past few years attempts were made to select and test varieties that are least susceptible to bird attacks. The yield potential of a few of the selected varieties was evaluated. The results obtained are shown in Table 78.

TABLE 78: Yield of rice varieties less susceptible to bird attack compared with JAYA

Variety	Yield Duration Yield (Kg/ha)	Duration (days)
Kn 144	9000 a	149
Jaya (check)	8500 ab	121
IET 1785	8500 ab	123
IET 2775	7700 bc	116
BW 170	7625 cd	142
IR 2823-399-5-6	7000 cd	144
BR 51-91-6	6700 d	164
Improved Mashuri	5100 e	155
C.V. (%)	12.0	

It appears from this Table that there is no significant difference between the check, JAYA and the two varieties, KN 144 and IET 1785.

III. Yield potential of some short duration rice varieties selected from the International Nurseries:

The results of one of the trials are show in Table 79

As far as the short duration varieties are concerned, 16 varieties gave good yields compared with the check, JAYA.

TABLE 79

Yield and duration of rice varieties selected from the International Nurseries.

Variety	Yield (kg/ha)	Duration (days)
19 MRC 603–303	8433 a	117
28 JAYA	8167 ab	109
9 IR 36	8066 ab	117
5 BR 161–2B–25	7900 abc	120
16 IR 13429–196–1	7000 abc	125
24 RASHT 507	7900 abc	134
23 R7–2–3–1	7567 abc	120
12 IR 50	7500 abc	120
13 IR 9761–19–1	7566 abc	119
4 BR 109–74–2–2–2	7433 abc	120
6 BR 161–2B–58	7467 abc	137
14 IR 9828–91–2–3	7567 abc	117
2 BAU 19–3	7300 abc	134
3 BKN 7033–13–1–1–3–2	7300 abc	125
20 MTU 3419	7300 abc	119
8 CHIANUNG SEN YU 13	7067 abc	124
25 TNAU 1756	7100 abc	120
10 IR 9129–209–2–2–2–1	6833 abc	124
1 BAW 2–3–43	6667 bcd	124
21 PAU 41–8–31–1 PR 407	6667 bcd	136
22 PK 174–13–1–5	6660 bcd	137
18 MR 355 (22)	6600 bcd	116
11 IR 9209–48–3–2 (23)	6567 bcd	116
15 IR 13427–40–2–3–3 (24)	6433 cd	116
7 BR 169–1–1 (25)	6200 d	124
27 UPR 251–101–2 (26)	5800 d	116
26 TNAU 8870	3060 e	104

WEED SCIENCE

I: Study of the effect of different spary liquid volumes on the efficacy of Basagran PL

A trial was conducted at Fanaye to study the eficacy of using low spray liquid volume rates for controlling weeds with a post emergent herbicide.

Experimental design was randomized block with 8 replications. The trial was conducted on Hollalde soil with a clay content of between 50 and 70%. The previous crop was rice. The variety used was IR 8. Fertilizer application was based on recommended doses used under varietal improvement.

The herbicide treatment were applied at the following rates: PL applied in a volume of water of 100, 300, 500 and 25L ha-1.

Basagran (Bentazon + propanil) was applied at the dose of 10L ha-1 with an Oxford precision sprayer for the first three treatment (volume rates of 100, 200, 500 1/ha). The last treatment was made using a "Micron Herbi" sprayer (with a volume rate of 25 1/h). The first three treatment were applied 20 days after transplanting whereas the last treatment was applied 29 days after transplanting.

No significant difference was observed between treatments as far as grain straw, yield, and number of panicles per square metre (Table 80) are concerned. The statistical analysis shows as significant difference in weed density between a volume rate of 25 1/ha and volume rates of 100 and 500 1/ha.

Table 80: Effect of Basargran PL applied under different volume rates on the weed density, grain and straw yield, the number of panicles of the rice crop.

Volume rate (1ha-1)	Yield (grain) yield	(Kg/ha-1) (straw) yield	No. of Panicles (m-2)	Weed counts (log. m-2)
100	9118 a*	6412 a*	298.3a	1.33 b
300	9482 a	7418 a	317.3a	1.69ab
500	9288 a	6445 a	301.8a	1.51 b
25	8956 a	6754 a	304.8a	2.20a
CV(%)	8.7	11.0	11.8	28.3

*The figures followed by the same letter are not significantly different.

The most prevalent weed species were:

Aesopynomene indica Linu; **Ammania auriculata** Wild; **Cyperus difformis** Linn; **Echinochloa zeylanica, Gaertn.** This trial will be repeated next season where there is a great weed denisty and also under different climatic conditions using not only Basagram PL but also other herbicides before a conclusion can be drawn.

II. Effect of crop density on weed control

The laborious and expensive task of hand weeding a rice crop and the prohibitive costs of herbicides calls for a need to search for other less expensive weed control methods. One of these techniques which has received very little attention in the region, is high crop density. In this trial, the effect of different spacings on weed control was studied.

The trial was conducted on Hollalde soil using a factorial design. The variety used was IR 8. Fertilizer application treatment was carried out once a week.

Manual weeding was undertaken 21 days after transplanting for the "Manual weeding treatment". Propanil (Stam F34) was applied at the dose of 3.6 a.i. 1/ha (10 1/ha of the commercial product) with an Oxford precision sprayer in a spray liquid volume of 200 1/ha 16 days after transplanting.

Table 81: Effect of crop density under different weed control methods on grain and straw yield, density and dry weight of weeds.

Treatment		Yield Kg/ha-1		Weed count (log m-2)	Dry weight (g/m-2)
Methods	Spacing	(kg/ha) (grain)	straw yield		
Weed free	15 × 15	9752	8238	—	—
Unweeded check	15 × 15	8679	7594	2.42	21.7
Manual weeding	15 × 15	9971	8659	1.72	8.3
Propanil	15 × 15	8625	8271	1.93	6.0
Weed free	20 × 20	8346	6732	—	—
Weed check	20 × 20	7421	6282	2.70	97.3
Manual weeding	20 × 20	9106	7499	2.02	14.3
Propanil	20 × 20	9050	6978	1.87	20.0
Weed free	25 × 25	8833	6813	—	—
Weed check	25 × 25	6350	5213	2.78	14.5
Manual weeding	25 × 25	8292	6015	2.06	10.3
Propanil	25 × 25	7606	6405	2.42	43.3
S.E. of difference		716	1848	0.21	24.0
CV (S)		10.5	15.5	11.4	71.5

Spacing did not affect the control methods used in Table 81.

Grain and straw yields from spacings of 15 × 15 cm were signigicantly higher than those from spacings 20 = × 20 cm there is a significant decrease in the number and dry weight of weeds.

Table 82: Effect of spacing on grain and straw yield, density and dry weight of weeds

Spacing	Yield (Kg ha-1)		Weed counts (log. m-2)	Dry weight (g.m-2)
	Grain	Straw		
15 × 15	9257 a	8190 a	2.02 b	13.1 b
20 × 20	8481 b	6972 b	2.20ab	43.9ab
25 × 25	7771 b	6111 b	2.42a	66.2a

The figures followed by the same letter are not significantly different (P × 0.05).

The control gave the lowest grain yield compared with the other treatments (Table 83). Even though the difference is not significant, the result of the herbicide treatment appears to be better than that of the "single manual weeding" treatment.

The weed counts and weed dry weights (Table 83) of the control were significantly different from those of the herbicide and manual weeding treatment.

Table 83: Effective of weed control methods on grain yield and straw yields density and dry weight of weeds

Control method	Yield (Kg ha-1)		Weed density (log. m-2)	Dry weight (g.m-2)
	Grain	Straw		
Weed free	8977a*	7260a	2.63 a	
Unweeded check	7483 b	6362a	1.93 b	89.1
Manual weeding	9130a	7390a	2.07 b	11.0
Propanil	8427a	7217a		23.1
			0.12	
SE of difference	411	515	11.42	13.9
CV (%)	10.5	15.47		71.5

*The figures followed by the same letter are not significantly different.

There was no interaction between the crop density and other weed control methods. Nevertheless, the crop density could contribute to an increase in yields and to a reduction in thke weed population.

III. Study of the effect of a few herbicides with or without supplementary manual weeding

The purpose of this trial was the avaluate the efficacy of a few hebicides and manual weeding on weed control and rice yield.

The trial was conducted at Guide on Fonde soil with clay content of between 35 and 50%. IR 8 was used as test variety. Experimental design was a complete randomized block with 5 replicates. The recommended fertilizer dosage was used.

Hand weeding of the weed free treatment was done once a week, 21 days after transplanting for the "1 hand weeding" treatment, 21 and 45 days after transplanting for the "2 hand weeding treatments," and herbicide treatments were applied 21 days after transplanting. Benthiocarb + Propanil, Bentazon + Propanil and Piperophos + 2, 4D were applied using an Oxford Precision Sprayer in a spray liquid volume of 200 l/ha 17 days after transplanting. Oxadiazon was applied 5 days after transplanting.

The appreance of weeds in the trial was slow and the number of weeds observed was very small with the result that the trial failed to show any significant difference between the treatment (Table 84).

The major weed species observed were:

Ammania auriculata Willd; **Cyperus iria** Linn; **Echniochloa colona** Linn) Link; **Eclipta prostrata** (Linn.) Linn; **Eragrostis namaquensis** var. **diplachinoides** (Stend.) W.D. **clayton: Jussica erecta** Linn.**Jussiaca percnnis** (Linn; **Brenan Sphenoclea; Zeylanica Gaertn.**

Table 84: Effect of different weed control methods with or without hand weeding on rice grain and straw yield.

Treatment	Rate applied t/ha	Yield (Kg/ha)	
		Grain yield	Straw yield
Weed free	—	7668a	6000a
Unweeded check	—	6935a	6076a
1 Handweeding	—	6958a	5939a
2 Hand weedings	—	6933a	5789a
Oxadiazon	60	8168a	6549a
Oxadiazon + 1 hand weeding	60	7870a	5367a
Benthiocarb + Propanil	10	6744a	
Benthiocarb + Propanil + 1 hand weeding	10	7547a	6113a
Bentazon + Propanil	8	8047a	6260a
Bentazon + Propanil + 1 hand weeding	8	7353a	6590a
zpiprtophod z = 2, 4 D	21	7282a	5775a
Piperophos + 2, 4 D + 1 hand weeding	21	7325a	6199a
CV (%)		11.78	9.8

ENTOMOLOGY

Study of varietal resistance to insects and mites

Among the rice insect pests in the region are borers and aleurodids whose economic impact on yield suggests that resistant varieties be used minimize production costs. Mites pose a serious problem today and greatly affect rice yields in the dry season.

The experimental design used was the Fisher Block with 10 varieties. The varieties are shown on Table 85. The ferti lizer doses applied were those recommended in the region: 120-60-60 Kg/ha of NPK respectively.

The results showed that certain varieties such as IR 1529-280-3, IET 1996 and BR 15-118-2 had low infestation by borers and mites (Table 85).

Table 85: Reaction of a few varieties to stemborer and mite attacks at Fanaye in 1981 dry season

Varieties	Yield (Kg/ha)	Percentage Dead hearts	White Panicles.	% of hills attacked (mites)	No. of caterpillar on 12 hills
					Maliarpha separatella
TN1		5	6	35	20
B 51-282-8		2	7	52	19
IR 1529-680-3		3	6	27	23
IET 1996		8	6	20	11
Jaya		6	5	37	6
BG 90-2		8	6	30	12
BR 15-118-2		5	4	20	40
IR 1820-52-2		8	6	67	21
IR 1820		6	6	60	11
DJ 3-106-4		6	11	23	25

II.(a) **Screening of a few granulated insecticides**

The objective was to selected the best chemical for mite and aleurodids control.

The experimental design was the Fisher Block. The variety was IKP. The chemicals (Table 87) were applied by the broadcast method at the rate of 1 kg a.i./ha in water at 30, 50, 70 and 90 days after transplanting.

The granulated insecticides tested significantly reduced the damage caused by **Aleurocybotus indicus** (David) and **Olygonychus** sp. (Table 86) Ekalux and Azodrin proved to be particularly efficients in controlling both **Aleurocybotus indicus** (David) and **Olygonychus sp.** Furadan 3G which is the reference chemical currently recommended for use confirmed its superiority in controlling **Aleurocybotus indicus** (David). On the hand, its efficacy against **Olygonychus sp.** was average.

According to the results, it would be better to use Ekalux and Azodrin in the dry season on rice which is more effective to the above mentioned pest and Furadan in the wet season what borers are predominant.

Table 86: Effects of a few granulated insecticides in controlling some rice insect pests on I Kong Pao

Treatment	Yield (Kg ha-1)	Difference with check	No. of plants attacked by Aleurocybotus per plot	No. of plants attacked by Olygonychus sp. per plot
Diazinon	8500	247 ns	18	27
Furadan	8422	168 ns	3	43
Chlorpyrifos	8689	436 ns	57	19
Ekalux	9618	1365 **	7	17
Birlare	8761	508 ns	9	57
Sam 155	8078	-175 ns	10	85
Lindane	8533	790 ns	19	69
Azodrin	9043	—	14	13
Control	8253		32	80
CV (%)	8,47		49,03	74,31
LSD (5%)	856		10	39

(b) **Efficacy of a few phytosanitary chemicals (Table 87) on the control of the mite (Olygonychus sp.) on irrigated rice:**

This study was conducted at Guede using the same experimental design as that used previously. The insecticide dose used was 750 g of active ingredient per hectare applied as a mixture at the rate of 500 l/ha at 30, 44, 58 and 72 days after transplanting. The IRRI score system (Scale of 0-9) was used.

All the products tested significantly reduced damage caused by **Olygonychus** sp to irrigated rice. Azodrin (Monocrotophos) and Dicofol (Keltane) were very effective compared with other products (Hortathion, Nuvacron and Ambox). Their use resulted in clearly higher yields compared with yields from the check plots (Table 87).

TABLE 87 **Effects of a few phytosanitary products on the control of the mite, Olygonychus sp., on irrigated rice (Guede, 1980 Wet Season).**

Treatment	Yield (kg/ha)	Difference with check	No. of plants attacked per plot
Ambox	10542	612 ns	1
Nuvacron	10926	996* ns	4
Dicofol	11261	1331**	1
Azodrin	11189	1259**	2
Hostathion	10660	730 ns	2
Control	9930		50
C.V. (%)	6.83		108.71
LSD (5%)	874		12.86

* Significant at 5%

** Highly significant at 1%

ns Not significant.

III. Entomological survey in three WARDA Member countries, (Mauritania, Senegal, The Gambia).

Mites and aleurodids posed serious problems in the Sahelian countries. Aleurodids have been identified in several West African countries. They cause important yield losses on dry season rice in Senegal, Mauritania and the Gambia (Tables 88 & 89 on the type of rice variety cultivated (Table 90).

Mites attacked thousands of hectares of rice in Senegal (SAED plots) and The Gambia. In the Senegal River Valley, most rice plots in the dry season are infested with mites (Table 91). At the Mindiao Kaedi (Mauritania) Agronomic Station, it was noted that infestation is more severe on short duration than on medium duration varieties (Table 92).

TABLE 88 Degree of Olygonychus sp and Aleurocybotus indicus David infestation in Mauritania, The Gambia and Senegal.

Country	Location	Date of observation	Degree of infestation	
			Olygonychus sp.	Aleurocybotus indicus
Mauritania	Kaedi	28/05/80	+++	+++
	Lamin	07/06/80	+	+
	Sapir	08/06/80	++	+
	Sankuli Kunda	08/06/80	++	+
The Gambia	Georgetown	08/06/80	+	+
	Basse	09/06/80	++	+
	Kolikunda	09/06/80	+++	+
Senegal	Guede	04/06/80	+++	+++
	Fanaye	04/06/80	+++	+++
	Nianga	02/07/80	+++	++
	Richard-Toll	03/07/80	+++	++

(–) = No infestation; (+) degree of infestation.

TABLE 89 Annual variation in Aleurocubotus indicus David infestations in two locations in Senegal.

Location	1978	1979	1980
Guede	+	+++	+
Fanaye	++	+	+++
Richard-Toll	+++	+	+++

TABLE 90: Reaction of different varieties to Olygonychus sp and Aleurocybotus indicus David attacks in Mauritania, The Gambia and Senegal

Country	Varieties	Degree of varietal susceptibility	
		Olygonychus sp.	Aleurocybotus
The Gambia	1 Kong Pao	high	very low
	IR 22	high	very low
	Iwon	very high	very high
Mauritania	ASM 74	high	very high
	Taichung native (B)	high	very high
	Taichung native (A)	high	high
Senegal	TN_2 (I Kong Pao)	high	very high
	Jaya	high	high
	IR 8	high	high
	Cun Chu Aye	very high	high
	Khuna She Shung	High	high
	Miao - jie	very hihg	high
	Taichung native No. 1	high	high

Table 91 Varietal resistance of 14 medium duration varieties (MDV) and short duration varieties (SDV) to Olygonychus sp. (Kaedi, 1980)

MDV	*Damage	SDV	*Damage
Jaya	4	Taichung Native (A)	4
ANDY 11	6	Konchou Chan	2
BG 90–2	3	IR 1561–228–3	5
NET 2775	6	IET 1444	2
N T U–770–7–2	2	KS_2	2
CHIANNUNG No. 8	4	ASM 74	4
N T U 1009–11	3	IR 934–450	6
BG 374 – 1	3	Taichung Native (B)	3
IR 1529–680–3	3	Tongli –917	4
BW 196	3	NTU 770 –7–2	5
IET 1996	3	BG 34 – 8	–
IR 934 – 450	5	978116	7
ANDY 2	3	BKN 7073–3–3–2–2–3	7
Taichung No. 5	2	–	

*IRRI Scoring System 0 – 9

Average of four replications

AZOLLA PROJECT

I. Assessment of the impact of one or several azolla crops ploughed in or not, on rice yields in the presence of various nitrogen doses.

Ex perimental design was the Fisher Block with 5 replications. The rice variety used is I Kong Pao. **Azolla pinata** (UCL - G strain from India) was used. The fertilizer was made of 60 kg of P2O5 per ha, 60 kg of K2O per ha applied as basal dressing for all the treatments. The nitrogen doses were the following: 0, 30, 60 and 120 Kg of N per hectare. The doses were applied in the 10 treatments as shown in (Table 98). The Azolla was sown at the rate of 200 g per square metre.

The results presented in Table 93 show that there is an azolla effect. In fact, the higher the plough in organic matter, the higher too is the effect. The ploughing in of two azolla crops could lead to the saving of 50% of the urea dose to be applied to a paddy field (Treatments 7, 8 and 10).

Table 92 Effect of one or several Azolla crops, ploughed in or not, on irrigated rice yield (1981 wet season. Fanaye (Senegal) (Variety: I Kong Pao

Treatments	Paddy yield (kg/ha)	Straw yield (kg/ha)	No. of Panicles (m^{-2})	Height (m)
1 = Check	2898 e*	1930	157 s	73
2 = 120 kg N/ha	5345 a	3980	226	81
3 = Azolla I(1)	3721 d	2570	175	74
4 = Azolla II(2)	4213 cd	3080	195	78
5 = Azolla II + Azolla III(3)	4447 c	3010	214	80
6 = 60(4) + Azolla III	3832 d	2640	165	75
7 = Azolla II + 30A + 30B(4)	5437 a	3940	226	79
8 = Azolla II + 30A	5186 ab	4170	225	82
9 = Azolla H + 30B	4736 bc	3170	233	76
10 = Azolla II + Azolla III + 30A	5030 ab	3510	224	83

* The figures followed by the same letter are not significantly different at 5%

(1) Azolla I = 1 Azolla crop ploughed in before transplanting
(2) Azolla II = 2 Azolla crops ploughed in
(3) Azolla III = Azolla as a cover crop after transplanting
(4) 60 = 60 kg of N/ha before transplanting
(5) 30A = 30 kg of N at tillering
30B = 30 kg of N at panicle initiation

II: Comparative study of the effect of nitrogen and chemical fertilizer on rice yield and study of the effect of crop plant spacing on the growth of Azolla.

The purpose of this trial was tow-fold: (1) to compare the effects of Azolla with those obtained with chemical fertilizers and (2) to compare the influence of crop plant spacing on the growth of the rice plant.

Experimental design was the Fisher Block with five replications. The vareity was I Kong Pao and Azolla pinnata was used as green fertilizer.

The fertilizer was made up of nitrogen: Urea and/or Azolla (for method of application see the treatments below). Phosphorus: 60 kg of P2)5/ha applied as basal application for treatments without Azolla, and 45 kg of P2O5/ha as basal dressing in addition to 15 kg of P2O5/ha applied on the surface in water for each treatment involving Azolla III. Potassium: 25 Kg of K2O per hectare applied as basal dressing.

Furadan was applied at the dose of 1 kg of a.i. per hectare as basal treatment. The spacings were 20 ÷ 10 cm.

Number of treatments:

1. Check without urea, without azolla, spacing: 20 × 20 cm.
2. 60 kg of N/ha in 3 applications (⅓ + ⅓ + ⅓: 20 × cm
3. Same as treatment No. 2 except that that the spacing was 40 × 10 cm
4. 1 Azolla crop (17 - 20 t of fresh water hectare) ploughed in before transplating + 30 kg of N/ha ⅓ + ⅓): 20 × cm.
5. Same as treatment No. 4 except that the spacing was 40 ÷ 10 cm.
6. One Azolla crop ploughed in before transplanting + one inoculted plant after transplanting and ploughed in after the entire plot had been covered: 20 × 20 cm.
7. Same as treatment No. 6, but only 2 crops ploughed in after transplanting.
8. Same as treatment No. 6, but only 2 crops ploughed in after transplanting.
9. 120 kg of N/ha (½ + ¼ + ¼: 20 × 20 cm.
10. Same as treatment No. 9, but spacing was 40 ÷ 40 cm.

The Azolla were sown at the rate of 200 g/m2. Three azolla crops were grown between the transplanting and harvesting of rice. Only the first two crops were ploughed in during the growth of the rice crop. The last one was ploughed in after harvesting. It took an average of 20 days to grow each azolla crop from the initial inoculum. Just before ploughing in, the density per square metre was 3880 g (average of the first two crops of treatments 6, 7 and 8).

The results obtained are shown in Table 93.

Table 93 Effect of one or several azolla crops on rice yields compared with yields obtained when chemical fertilizers are used (INSFFER trial, Fanaye, 1981.

Treatment	Spacing (cm)	Yield (kg/ha) paddy	Straw	No. of panicle (m^2)	Height (cm)
1 = Check	20 x 20	3300 c	3050	236	74
2 = 60 kg N/ha	20 x 20	5456 ab	3630	260	79
3 = 60 kg N/ha	40 x 10	5016 b	3270	282	81
4 = 30 kg N + Azolla I(1)	20 x 20	5236 b	4200	321	80
5 = 30 kg N + Azolla I	40 x 10	4983b	3600	303	813
6 = Azolla(1) + Azolla III(2)	20 x 20	5038 b	3730	254	77
7 = Azolla + Azolla III	40 x 10	5159 b	3830	323	80
8 = Azolla I + Azolla III	40 x 10	5104 b	3720	319	80
9 = 120 kg N/ha	20 x 20	6062 a	4460	307	81
10 = 120 kg N/ha	40 x 10	5214 b	3720	307	81
SE	201				
	8.9				

The averages followed by the same letter are not significantly different at 5%

(1) Azolla I = 1 Azolla crop ploughed in before transplanting
(2) Azolla III = Mixed cropping with rice.

This is the first INSFFER trial on the uses of Azolla conducted under our conditions.

The best yield was obtained with treatment that included the rate and application of urae recommended in the region. However, it was noted that the use of Azolla alone also caused the rice plant to respond in yield. The yields obtained when Azolla was ploughed in several times before and after transplanting were very satisfactory (53 - 56% increase compared with check). The yields obtained through the combination of 30 Kg of N/ha dnd an Azolla crop ploughed in before transplanting, gave increased yields of between 51 and 59% as compared with the check. However, this trial did not show any effect of spacing on the growth of Azolla.

III. Colmp;arative study of the effect ofAzolla and chemical fertilizer on rice yield (Rokupr Station)

Experimental design was the Fisher Block with 5 replications. The organic matter, Azolla pinnata, strain, SL 2, harvested in May 1981 from the Mange rice farm in Sierra Leone, was produced and used. An application of 21 Kg of P2)5/ha in the form of triple superphoshate was made and 40 Kg of N/ha applied in the form of urea injection at 15 - 20 cm in the soil. There were four tretments:

1. Check
1. Check
2. 40 kg of N/ha (50% at tillering and 50% at panicle initiation).
3. One Azolla crop (17-21 t/ha) ploughed in two panicle before transplanting.
4. One Azolla crop ploughed in two weeks before transplating, in addition to a second crop ploughed in two weeks after transplanting.

The results obtained are presented in Table 94. It follows from these results that the ploughing in of two Azolla crops before and after transplanting guaranteed the same yields as those obtained from the application of 40 Kg of N/ha in form of urea injection.

The ploughing in of one Azolla crop before transplanting increases yields by 25% as compared with the check.

Table 94: Comparative effect of Azolla and urea on ROK 5 yield in the tidal limit of cleared mangrove swamps (Rokupr Station, 1981 Main Season)

Treatment	Yield (Kg ha-1)	Difference as compared with the check	Fertile tillers (m2)	Height (cm)
40 N	3652	112**	141	105
1 Azolla crop	3164	633*	137	104
2 Azolla crops	3581	1050**	149	110
Check	2531	—	—	—
CV (%)	10,5	LSD(5%)	473	LSD(1%) 668

* Significant at 5%
** highly significant at 1%

ON-FARM TRIALS

These on-farm trials will help to determine the most economical doses and establish whether or not phosphorous and potassium applications are justified in the present conditions of SAED plots as well as test the farmer's reaction the use of the developed technologies.

The scattered trials method devised by FAO, was used. With this method, each farmer constitutes a block or a replication in the statistical sense.

For NPK trials, the followint doses were tested.
N⅔0.60, 120 Kg/ha
P2 05 = 0.48,96 "
K20 = 0.40,80

Check (NPK applied to farmer' fields) 120-96-80 (Appendices I and II) (Middle Valley) and 120-96-0 (Data). Thirteen sites were chosen.

npk trials in the middle valley
NPK TRIALS IN THE MIDDLE VALLEY

The results of the NPK trials in the middle valley (maere-Lao Sector) are summerized in Table 95 which shows that all the treatments with a double does of N gave the best yields regardless of the doses of P and K applies.

TABLE 95 Paddy yield (kg/ha) – N P K trial 1981 hot dry season – Hacro–Lao sector, Middle Valley (average of 13 sites)

*Treatment	Paddy yield kg/ha
222	5624 a
SAED	
(222)	5393 ab
211	5278 abc
221	5115 abcd
202	5112 abcde
212	4977 abcdef
220	4862 abcdef
112	4232 bcdefg
122	4071 cdefgh
121	3878 defghi
101	3831 efghi
111	3708 fghi
110	3512 ghij
011	2823 hij
022	2694 ij
000	2127 j

*FAO designation of fertilizer combination
See Appendix VI.

All figures followed by the same letter do not differ significantly (LSD = 0.05).

Table 96 Paddy yield (Kg/ha) NPK trial
1981 Hot wet season Delta – (Average of 10 sites)

Treatment	Paddy yield (Kg/ha)
212	7264 a
202	7221 a
221	7080 a
SAED (220)	7048 a
222	6983 a
211	6983 a
122	6780 a
111	6713 a
112	6705 a
110	6603 a
220	6576 a
101	6475 ab
121	6461 ab
011	5582 bc
022	5524 c
000	5095 c
C.V. (%)	13.0

All figures followed by the same letter do not differ significantly (LSD = 0.05).

NPK TRIALS IN THE DELTA

The results summarized in Table 96 shows that nitrogen is essential to obtain good yields in this region. If the results are analyzed from the economic view point taking the case of the farmer who has bought his fertilizer at a subsidized price and that of the farmer who has boutht his at cost price, a clear difference in income will be observed (Table 97) between the single and double doses in the case of subsidized fertilizers. At subsidised price, 120 Kg/ha of nitrogenous fertilizer gave a marginal profit between 19.7 and 19.9 francs while at cost price it is between 3.22 and 3.25 francs.

Table 97 **Balance of income derived from various treatments after purchase of fertilizers (Hacro–Lao Trial)**

Treatment	Balance of income with subsidy (F.CFA)	Treatment	Balance of income without subsidy (F.CFA)
222	218 221	202	160 229
SAED	210 909	211	159 904
211	208 162	222	155 172
202	202 298	SAED	149 713
221	198 747	212	141 412
212	194 020	221	140 048
220	189 923	220	135 639
112	166 378	101	133 058
122	157 046	112	130 486
101	154 061	111	114 740
121	150 687	110	112 696
111	146 202	120	110 713
110	139 825	121	108 704
011	112 804	011	97 850
022	103 151	000	88 720
000	88 270	022	73 406

1. Paddy is sold at the official price of CFA F 41.50 per kg.
2. All forms of fertilizers cost CFA F 25 per kg at the subsidized rate.
3. Cost of fertilizers at non-subsidized rates (including transport from Dakar to the River) Granulated urea = CFA F 152.60 per kg; triple superphosphate (TSP) CFA F 123.50; ammonium phosphate = CFA F 170/kg; potassium chloride = CFA F 90.90 per kg.

The results obtained from the NPK trials in the middle valley and the Delta showed that (1) there is leaner responses to nitrogen until well beyond 120 Kg N/ha in irrigated rice; (2) phosphorous and potasium applications do not modify yields during the first year of cultivation. The NPK long term trials now conducted all along the river will show when corrective P and K fertilizers can be applied. As far as nitrogen is concerned, the dosage of 120 Kg N/ha currently recommended for small plots where transplanting is done, can be increased to 160 Kg N/ha (if the policy of subsidies is maintained). In the case of the Delta where direct sowing is practised during the rain season, the does of 120 Kg/ha should be maintained.

UREA SUPERGRANULE TRIALS

The aim of this trial was to verify the results obtained at the station and test the reaction of the farmers to the of urea supergranules. They were conducted during the wet and dry seasons. The dosage of nitrogen applied was :0, 60 and 120 Kg/ha.

The yields obtained (Table 98) showed that applications of 120 Kg/ha of urea supergranules gave better yields. Furthermore, there was no significant difference in the yield obtained from 120 Kg N/ha of urea and 60 Kg N/ha of urea supergranules.

Table 98 Paddy yield (Kg/ha USG Trial 1981 Dry season Haere–Lao sector)

Treatment	Yield (Kg/ha)
2'22(1)	6639 a*
222	5994 b
SAED Check	5440 b
1'22(2)	5090 bc
122	4201 c
022	2866 d

* All figures followed by the same letter do not differ significantly.

1. (2') represents a double dose of USG (120 kg N/ha)
2. (1') represents a single dose of USG (60 kg N/ha)

Another trial was conducted at Fanaye during the dry season, the yield results are shown in Table 99.

Table 99 Paddy yield in USG trial – 1981 dry season at Fanaye, Senegal

Treatment	Yield (Kg/ha) Farmer 1	Farmer 2
2'22	7331 a*	7718 a
222	6812 ab	7579 a
SAED Check	6236 ab	5832 ab
1'22	5160 ab	5324 ab
122	4882 b	3645 bc
022	2320 c	1933 c

* Figures followed by the same letter do not differ significantly (LSD = 0.05).

This result does not show any significant difference between the treatments with double and signigle does of urea supergranules. As far as the urea supergranule trials conducted in the Delta are concered, the results obtained by 14 farmers (Table 100 showed that there was no significant difference between treatments with double doses of urea (120 Kg/ha N) and single doses (60 Kg/ha N) of urea supergranules.

TABLE 100 Paddy yield (Kg/ha) of USG trials – 1981 wet season in the (Delta average of 14 sites).

Treatment	Yield
220	6374 a*
SAED Dose (220)	6019 ab
1'20	5807 ab
220	5738 ab
12'0	5610 b
020	4678 c

* Figures followed by the same letter do not differ significantly. (LSD = 0.05)

The second trial conducted in the delta compared 5 doses of urea and urea supergranules: o, 29, 58, 116, 174 Kg N/ha. The results obtained are presented in Table 101 No significant differences was observed between urea and urea supergranule treatments which were applied in equal doses.

The trials of urea supergranules conducted during this season showed that the results obtained at the station were only true on small plot experiments. In the Delta, however, urea supergranules did not prove superior to urea under the present conditions of applicaion. Irrigation which is often faulty in small farmers' fields probably increases the relative effectiveness of the supergranules and greatly reduces the availability of nitrogenderved from urea applied as top dressing. Furthermore, the application of supergranules should be studied in greater dept in case of direct sowing since tillering and nitrogen response apparently differ from what has been observed on transplanted rice.

TABLE 101 Paddy yield and yield components of the USG trials (Delta 1981 Wet Season).

Nitrogen source	Treatment	Yield (kg/ha)	Height (cm)	Fertile tillers (m^2)
Urea	174	7870 a*	91 a	20.1 a
	116	7025 a	82 b	15.9 abc
	58	5068 c	79 b	11.8 cd
	29	4345 c	73 c	10.8 cd
USG	174	7688 a	88 a	18.1 ab
	116	7440 a	87 a	87 abc
	58	5815 b	81 b	12.4 bcd
	29	4917 bc	77 c	11.3 cd
	0	2797 d	66 d	8.7 d
	C.V. (%)	12.0	3.38	28.3

* The figures followed by the same letter do not differ significantly. (LSD = 0.05).

VARIETAL TRIALS

During the previous wet season, eleven rice varieties were tested by seven farmers in the Delta. The seed were sown about the time same day in farmers' fields' on an area of 100 m2 each. Table 102 shows the yield results.

When sown relatively early, some varieties appear to be equivalent to the KSS check variety, particularly: IR 3941-86-22, BG 90-2 and Sri Malaysia.

The results showed that in the case of late sowing the apanese varieties, Totumi mochi and Yoneshiro and the KN-1h-350 variety outyielded the check variety. This trial will be repeated during the next season so that a xonclusion can be reached on varietal behaviour under delta farmers conditions.

TABLE 102 Paddy yield (kg/ha) of varietal trial in the Delta – 1981 Wet Season

Variety	Date of sowing / Sites	Farmer's Field 1	2	3	4	5	6	7
		22 Aug.	26 Aug.	28 Aug.	29 Aug.	ler Sept.	ler Sept.	13 Sept.
		N.	THIL'	NDIAYE	NDELLE	NDIAYE	NDIAYE	MBODIENE
IR 3941–86–22		*	5029	5631	*	7737	5579	5308
BG–90–2		6608	6600	5242	7390	*	*	*
Tatsumi–mechi		*	3499	3764	*	5642	4374	6297
IR 1820–210–3		6192	* *	*	*	*	*	*
KN–1 50		4684	4383	4221	*	4601	3742	5567
FH–109		5567	6234	*	*	*	*	*
Sri–Malaysia		6244	6810	4587	7441	*	*	*
BR 2323–399–6		5880	5452	4148	6452	6282	*	*
KSS		*	6357	5151	7658	7470	6434	5151
Yonoshire		*	3499	2847	*	5138	4302	5203
KH–998		5203	5291	7002	6771	5214	5716	*
Farmer's fields IKP or KSS		*	4977	3950	*	5000	4171	7024

*Harvested by farmer without weighing or damaged by birds or not ripe before irrigation stopped.

MONGROVE SWAMP RICE -ROKUPR, SIERRA LEONE

VARIETY IMPROVEMENT

Nominations for WARDA trils

In 1981, five new varieties were nominated for inclusion in the 1982 coordinated trial for mangrove swamps. The varieties were of short and intermediate height and are likely to be suitable for use only in iron-tidal mangrove swamps. They were selected fo their yield potential with and with fertilizer.

Varieties were also nominated for the moist zone irrigated medium duration trial, the deep-flooded coordinated trial, the Initial Evaluation Test for irrigated and deep flooded conditions, and for salinity tolerance tests.

Farmers Field Trials

One bushel lots of rice variety ROK 5 were made available to a number of co-operating farmers in 17 sites along the Great Scarcies River during 1981. The variety was well received in areas such as Kibanka and Morobaia where salinity problem was served. Around villages such as Kyohom and Balancer, where salinity problem was less acute, farmers were less receptive of ROK 5 because the shorter duration mean that bird scaring activities were needd. Whereas the longer duration local varieties avoided bird damage. It was also known, from farmers' fields that the currently available long duration varieties, ROK 10 and CP 4, have too long duration (190 days) to avoid salt damage when grown around Balancera and Kyohom. Activities to indentify improved intermediate duration varieties of between 165 and 170 days for this area are going on. A number of varieties of suitable duration are already at an advanced state of testing.

HYBRIDIZATION

During the year ten crosses were carried out, mainly with the aim of producing varieties with improved salt tolerance. Two crosses between four local varieties selected for their tolerance of iron toxic conditions were also carried out.

Rapid Generation Advance: Following initial tests to modify the IRRI RGA technique for use at Rokupr, the F2 generations of a series of crosses were grown by this method in the latter half of the year. The most advanced cross has now been taken to the F5 stage in less than two years by RGA and will be screened in the field in the coming season.

Pedigree Breeding: The F3 and F4 generations of the earliest crosses were grown in the field and several =) and the F3 lines range from about 140-180 daus so these materials are mainly intended for the long duration mangrove areas of Sierra Leone.

Germplasm Conservation and Characterization: The cold store was finally completed with the installation of the cooling units in the second half of 1981. The store has maintained temperatures and humidities well below ambient conditions and it is hope that it will now be possible to maintain vailbility of seed for three or four seasons without rejuvenation.

Seventeen new varieties were obtained from Guinea during 1981. Four failed to germinate but the remaining 13 were purified and added to the collection which now atands at 584 accessions. Characterization of previously collected varieties continued with further 64 accessions being scored for morphological and agronomic characters to bring the nuber so characterized to 571 accessions.Three hundred and forty accessions in the germplasm collection, originating from Sierra Leone, were sent to IRRI in 1981 for long term storage.

Screening of the collection for tolerance to iron toxicity was also started, using iron toxic conditions generated by waterlogging upland soil in conerete beds. This method was successful and gave good discrimination among the 250 varieties screened.

Comparsion in unfertilized observational yield trials of the most commonly grown long duration local varieties with CP 4, and improved variety of similar duration, confirmed results obtained in previous seasons: namely, that the best improved varieties as represented by CP 4 are only marginally better on average than traditional varieties and are no better than the best of them (Table 103).

Table 103 Comparisnn of improved varieties and most commonly grown local varieties

	No. of plots	Mean Yield (kg/ha)	Range
Long duration varieties (Grown at Rokupr)			
CP 4	8	2727	2181–3650
Local varieties	16	2399	1641–3815
Medium duration varieties (Grown at Mapo.tolon			
ROK 5	3	2440	2291–2526
Local varieties	4	1256	709–1723

Similar exercise to compare medium duration local varieties with ROK 5, a medium duration improved variety, showed ROK5 to be superior in yield to the best local varieties by a margin of about 25 per cent.

ENTOMOLOGY

PEST MANAGEMENT

Promising rice varieties, ROK 5 Djbon, Bali Gredak and CP 4 were tested at Rokupr to determine their fertilizer responsiveness and insect-tolerance. The rice was grown at O and 6o Kg N per heetare. As it was observed in the previous years, fertilizer tended to induce higher incidence of stembore infestation. The long duration variety CP 4 suffered the highest stemborer infestation. Dhabon and Bali Grodak were mor responsive to fertilizer than ROK 5 and CP 4; and again tolerant to stember infestation when fertilezer is applied. The insect tolerant nature of Djabon and Bali Grodak had also been observed in the previous year.

ECOLOGICAL &BIOLOGICAL STUDIES

The biology of caseworm **Nymphula depunctalis** was studied in a loboratory with average maximum and minimum temperatures of 90of and 75of. Adult mated immediately after emergence and the female lays eggs on the underside of leaf margins of floating leaves. The average of 220 eggs were laid by each of 25 females. Individual variation in oviposition periods was from 1 to 5 days with a mean of three days, and the peak rate of egg-laying was about as high as 126 per day. The highest number of eggs is laid on the first day of egg laying period which is often the second day after emergence. The duration of the developmental stages of the caseworm is shown in Table 104

Table 104 Duration of the developmental stages of Nymphula depunctalis

Stages	Duration in days (+ SD) Average	Range
Egg incubation	3.5 + 0.5	3 – 4
Larva	22.5 + 2.8	15 – 28
Pupa	6.6 + 1.9	3 – 12
Egg to Adult	32.6 + 1.9	26 – 60
Male life span	2.9 + 1.4	1 – 6
Female life span	2.8 + 1.8	1 – 7
Oviposition	2.8 + 1.3	1 – 5

Larva parasite, **Vadonina Sp.**, an **Ichneunoid** was reared for the first tim from caseworm larvae collected durin g field survey around Rokupr.

Population Studies in Rice Fields: Continued progress has been made in detailed studies of bictic and aboitic factors affecting pest population changes during the season in rice fields around Rokupr, as basic elements of integrated pest management studies. In 1981 corpping season similar studies was made to compare fields aroudn Rokupr with farmesr' FIELDS.

T he population trend of **Maliarpha** larvae in both fields planted to CP 4 were similar. It increased as the season progressed, but the intensity of infestation and larva numbers were higher in the farmer's field. There were to two population peaks which indicated possible two generation during the cropping season.

Diopsis throacica started to infest the crop two weeks after transplating in the experimental field and progressively increased ever the next six weeks. **diopsis** attack in the farmer's field came later and was comparatively lower.

Mortality Factors: The rate of maliarpha larval parasitization was higher in the experimental (39.1% in the farmer's field (18.8%). Spiders. **Tetragnatha** sp. and **Araneus** spp. predators are known to be general feeders en defoliatiors, stemborers, and leaf-hoppers in rice field. The experimental field contained slightly higher numbers of each of the two spiders than in the famer's field. Although there was no definite evidence to suggest that spiders were significant predators of any particular rice pests their present along side with other natural enemis in the field might be of some importance in suppressing some pests. Generally the various mortality factors appeared to be density dependant - theior effects on the whole increased with the populations of the host.

From the farmer's field, two common larval **maliarpha** parasites reared are **phanerotoma major,** THE DOMINANT, (60.2%) and **Rhaconotus** sp (38.%), while in the experimental field **Venturia crassicaput** the most common parasite (48.0%) followed by **Phanerotoma major,** (26%), **Menaforia** sp. (18.0%) **Phaconotus** sp. (*%) **phanerotoma major** was noted to undergo hibernation to greater extend than the rest of the parasites. The aults **P. major** emerged from hibernation and lived for an average 1.5 days (range 1-5). **V. crassicaput,** male and female lived for 4.0 (range 1-9) (range 1-7) days respectively.

The numbers of **Borbo fante/ pelopidas mathias,** rice leaf defoliators eggs collected during the intensive sampling were low in both rice fields, 30 and 17 respectivel,y in the experimental and farmer's field. However, the eggs were parasitised/ by egg parasites/of **Tolonomus** sp and **Pediobius telonomi** to the extent of 83.3% in farmer's field and 90.0% in the experimental fields. A tachinid, **Thecocarcelia** sp. a larva parasite was reared from **Borbo fanta/ Polopidas mathlas.**

CRABS

At four sites along the Scarcies river experiments were conducted to determine the effect of crab damage on seedling rated (3, 6, 10/hill), age (*40, 60 days) and seedling conditions (freshly uprooted and seedling uprooted and left in heap for eight days before transplanting).

Table 105 Crab damage on rice and yield in kg per ha as related to seedling condition and age CP 4.

	ROBOMP *Crab damage	ROBOMP Yield	ROKUPR *Crab damage	ROKUPR Yield	KAGBANGA *Crab damage	KAGBANGA Yield	KASSIRIE *Crab damage	KASSIRIE Yield
B (Withered seedlings	34.7	2342.0	45.0	2514.5	47.9	1690.6	42.2	2764.9
B (Fresh seedling	22.8	2604.8	30.3	2579.6	42.2	2355.5	44.6	3285.5
C (40 day old seedling	33.6	2518.3	40.6	2410.8	50.1	1892.0	46.6	2850.6
C (60 " " "	23.8	2428.5	54.7	2683.2	40.0	2154.1	40.4	3199.8
B. Seedling condition (LSD 5%)	3.6	N.S.	2.4	N.S.	4.2	479.1	N.S.	338.1
C. Seedling age (LSD 5%)	3.6	N.S.	2.4	198.3	4.2	N.S.	3.2	338.1
B x C (LSD 5%)	5.1		3.4					

*ARCSIN $\sqrt{\text{Percentage}}$

Table 105 showed that at the higher number of seedlings per/hill more seedlings were lost at the lower rate but this was compensated for by tillering and the large number of hills per sq.m. At the usual farmers rate of 16 hills per sq.m. it is expected thay yield reduction would have occurred.

Withered seedlings tended to attract more crab damage than fresh seedlings /(Table 105) possibly because of their softness or tenderness. Again, more of the withered young seedlings were attacked than the old but for fresh seedlings; age is not an important factor particularly at Rokupr. The young seedlings were more proned to damage especially at high seedling per hill rates.

Significant differences in yield due to age of seedling, codition of seedling and interaction of both factors were noted at Rokupr, Kagbanga and Kassirie (Table 105 Thus under the prevailing condition of crab infested field, older seedlings may be perforred to young ones. Transplanting of newly uprooted seedlings can reduce crab damage and result in higher yields compared with transplanting withered seedlings.

Varietal Reseistance: In preliminary studies in the two previous seasons it was noted that some rice varieties were more susceptible to crab damage than others. In 1981, mass screening of the Project's 580 accessions under of the varieties. The results indicated high significant difference among varieties in susceptibility to crab damage. Some plant characters shown to be correlated with crab damage are shown:

Plant Character	Correlation with Crab damage
Leaf	— o.33* *
Plant height	— 0.35**
Seedling base thinkness	— 0.33**
Sheath length	— 0.15NS

Generally, tall seedlings with long leaves and thick base are most tolerant to crab damage. However, some varieties for example Nachin II and KKamo Solo have tall seedlings with thick base but were susceptible to attack whild thing base varieties like Pa Bathurst, 32B and Rok 9 were less severly attacked.

The basis of varietal resistance appears to be morphological, (hphsical) interfering physically with feeding mechanism and possible ingestion. The thickness of cell walls and increased toughness i.e., silication of sheat form a physical barrier or deterrent to tearing action by crab thereby retarding the feeding rates.

PATHOLOGY

The pathologist returned tp pest in November, 1981 after sucessfully completing a two year M.Sc. research training in plant pathology at Aberdeen University in the United Kingdom. A reduced programme of work was carriet out by the Junior staff under the daily supervision of the breeder.

Screening for horizontal resistance to the major fungal diseases of rice continues both in the nursery and field. A collection of varieties (145) including local checks were tested under field conditions. In addition the breeders' materials at all stages of testing were monitored for blast and other diseases.

Several lines showed a high level of resistance to seedling blast (**Pyricularia oryzea**); blast (including neck rot) was virtually absent in the swamp except on very sensitive materials. Most verieties were highly resistant to brown leaf spot (**Cohlionolus miyabeanus - Helminthosporium**) in the field. Moderate resistance to leaf scald (**Rhynchosporium oryzae**) was also shown by serval lines.

Narrow brown leaf spot (**Cercospora oryzae**) occurred in only a few varieties to any damaning level. Generally, leaf smut (**Entyloma oryzae**) incidence seemed to be increasing. The factors responsible for this increase in incidence and severity were not known but were probably due to a combination of favourable environmental conditions and susceptible germplasm.

Udbatta (**Ephelis pallida**) continued to occur sporadically as in the past. Pa Sorro 125 and B441B-126-3-2-1 were notable for severed discoloration of glumes in the field, a disorder partly due to the effect of grain discolouring moulde (**O. miyabeanus**, for example).

WEED SCIENCE

TIME AND METHOD OF WEED CONTROL

A long term trial has been initiated since 1979 to evalute the effects of different cultivation methods on the growth of Kire Kire (**Paspalum vaginatum**) and yield of rice. The results of this third season presented in Fig. 7 show that in mangrove swamps with soft mud and heavy kire kire growth, June is the best time to do land preparation. March cultivation results in regeneration of the weed before the time of transplanting. Irrespective of the cultivation method used, all cultivations done in June had highly significant lower weed infestation than the cultivations done in March. Mechanical cultivation had the lowest weed weights and highest rice yields of all the other cultivation methods used in both March and June, showing the great potential that machnical cultivation has in mangrove swamp rice cultivation. Time of cultivation had no significant effect on rice yields.

EFFECT OF DURATION OF WEED CONTROL

In the associated grass swamps weed infestation by grasses and sedges is a very serious problem. Farmers realize the importance of weeding in order to obtain reasonable yields and usually do one handweeding, but this is rarely enough. From the results of experiment initiated this season it appears that the critical period to keep the rice crop free from weed competition in order to obtain reasonable yields is the first four weeks after transplanting, during which frequent handweeding should be done (Table 106).

Table 106 Effect of Duration of Weed Control on Rice Yield and Weeds in the Associated Swamp

TREATMENT	Yield (kg/ha)	Weed weight (gm/sq. m)
Weed free by Hand weeding for 2 weeks after transplanting	995	16.5
" " " " " " 4 " " "	1.657	4.5
" " " " " " 6 " " "	1.795	6.3
" " " " " " 8 " " "	2.021	1.0
" " " " " " 10 " " "	2.190	2.1
weeding (Control)	690	24.4
L.S.D. (0.05) for comparison of two treatments	539	8

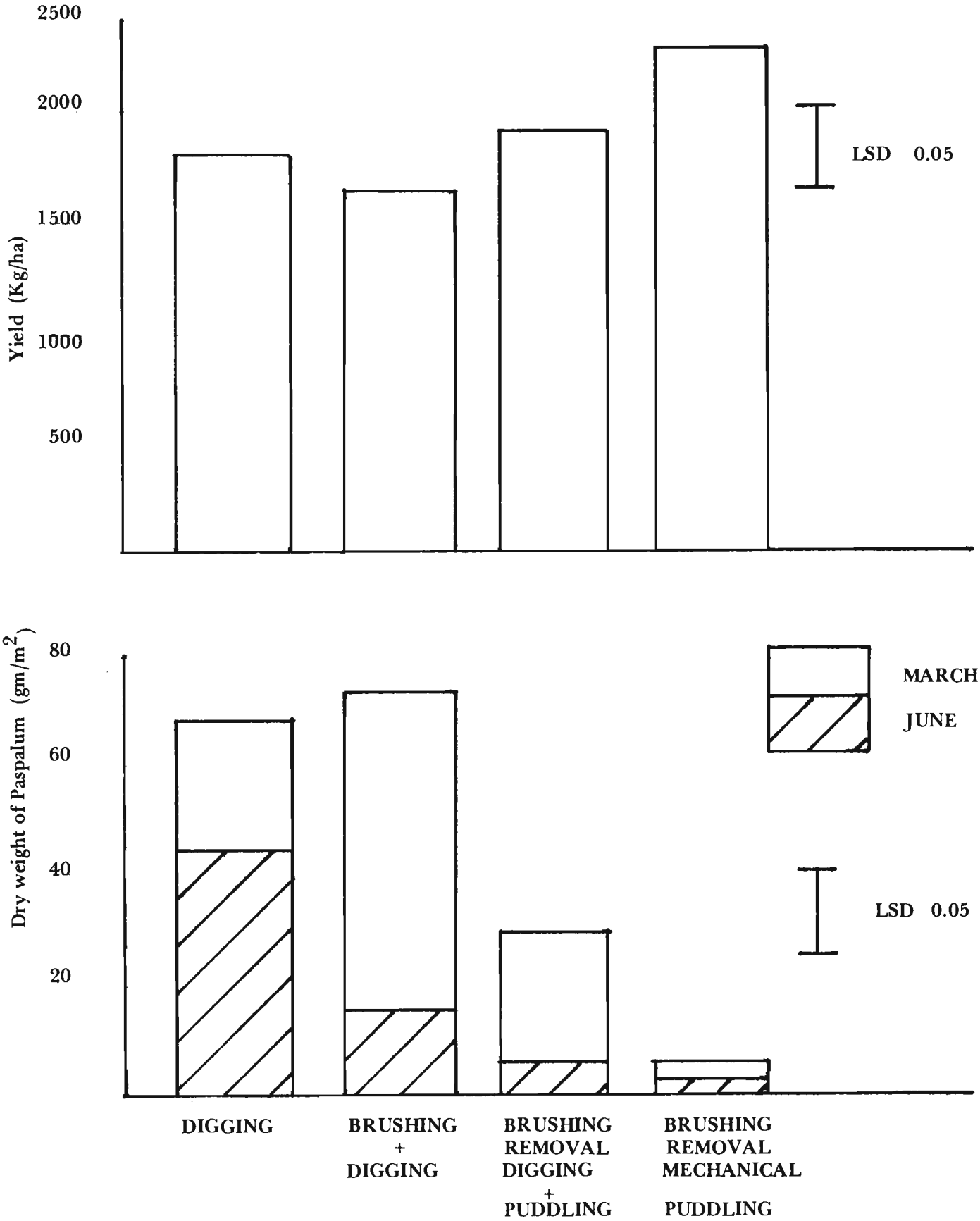


Fig. 7: Effect of time and cultivation methods - Mangrove Swamp.

EFFECT OF CULTIVATION AND WEED CONTROL WITH AND WITHOUT NITROGEN

A trial was conducted this season to evaluate the effect of different cultivation and weed control methods with and without nitrogen on weed growth and rice yield in the associated grass swamp. Urea was applied at the rate of 60 kg N/ha three weeks after transplanting. Higher yields were obtained under mechanical cultivation than manual cultivation possibly due to increase in effective utilization of soil nutrients and weed control. As to be expected, handweeding and herbicide produced higher yields under the two cultivation methods. It appears that when nitrogen is applied weed control is much mora important in manual cultivation plots than mechanically cultivated plots where weeds are suppressed by better ploughing and puddling.

SOIL SCIENCE

The objective of the Soil Science programme is to increase rice production through efficient fertilizer use, improved agronomic practices and soil management.

RESPONSE TO NITROGEN

Deep placement by the injection technique increases the efficiency of nitrogen utilization by rice in the mangrove ecology but, depending on the depth of application, the nitrogen may not be immediately available to the rice plant. The effect of depth of application of nitrogen on the growth and yield of mangrove rice was reinvestigated in 1981 using a level of 60 kg N per hectare.

The evidence fron nitrogen uptake by leaves suggest that nitrogen may be immediately available to the rice plant when broadcast or injected at shallow depths. Fig. 2 shows that uptake of the applied nitrogen occurred between the first and second weeks in the broadcast treatment. Uptake of the injected nitrogen was delayed for at least one week and in this case more nitrogen was taken up from the 5 cm depth application than from the 20 cm depth application between the second and third weeks of application. The highest amount of uptake occurred at the 20 cm depth of application and while nitrogen uptake tended to level out with time at the shallower depths of application, a greater amount of nitrogen remained available to plants in 20 cm depth treatment.

The depth of root penetration by the rice in mangrove swamps may be an important factor in determing the amount of uptake and time of response for nitrogen applied at depths below 10 cm. Less than 6 percent of the roots of the fully grown plants are present below 10 cm depth, therefore injecting nitrogen in a young crop at 20 or 40 cm below the soil surface puts the fertilizer below the effective rooting zone. The pattern of nitrogen uptake and growth response obtained from nitrogen applied at 20 or 40 cm depth suggests that the nitrogen eventually moves Upwards into the root zone of the crop and the delay in response may depend on the depth of application and time taken for the nitrogen to reach the root zone.

The grain yield data, presented in Table 107 show that for a single application of nitrogen in mangrove swamps, the injection technique was more efficient than broadcast in increasing the grain yield of rice. Also grain yield increased with increasing depth of injection.

Table 107 Response to depth of nitrogen application in mangrove swamps (Grain in kg/ha)

Treatment	Grain Yield
Control	3166
Broadcast	3416
Injection 5 cm depth	3542
Injection 10 cm depth	3729
Injection 20 cm depth	4334
Injection 40 cm depth	4386
C.V.	11.4%
LSD (0.05)	+651.9 kg/ha
LS (0.01)	+904.9 kg/ha

Fig. 8 Nitrogen uptake in leaves of rice variety ROK 5 as Influenced by the depth of application in Mangrove Swamp.

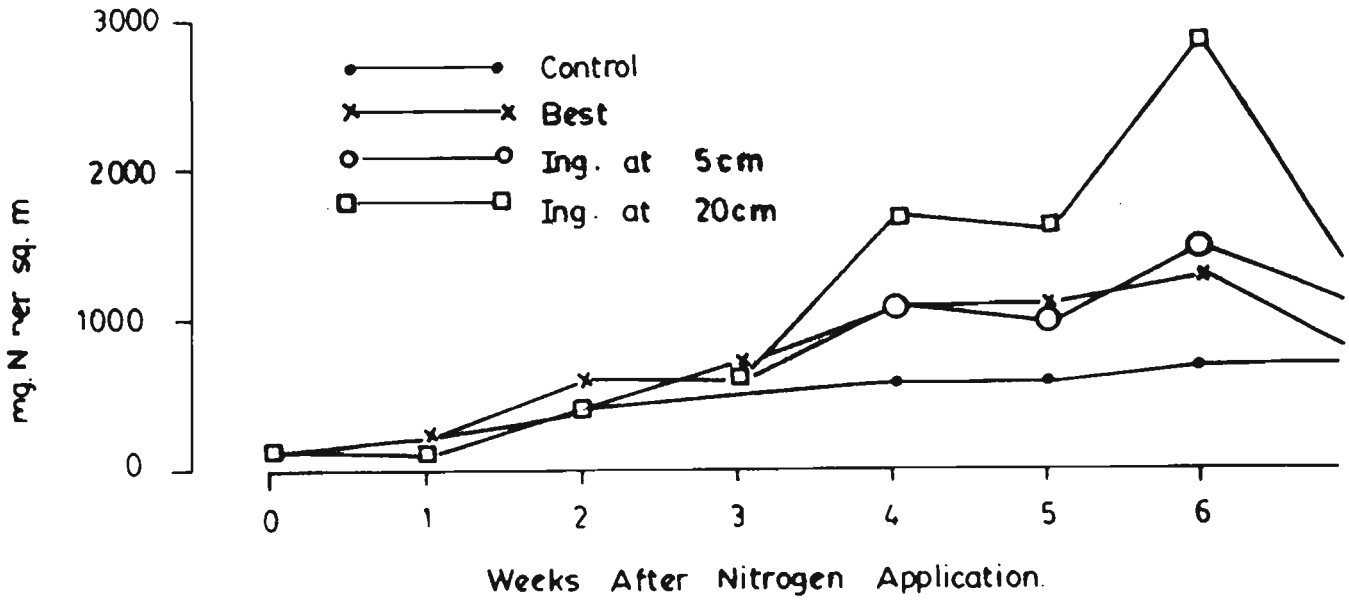
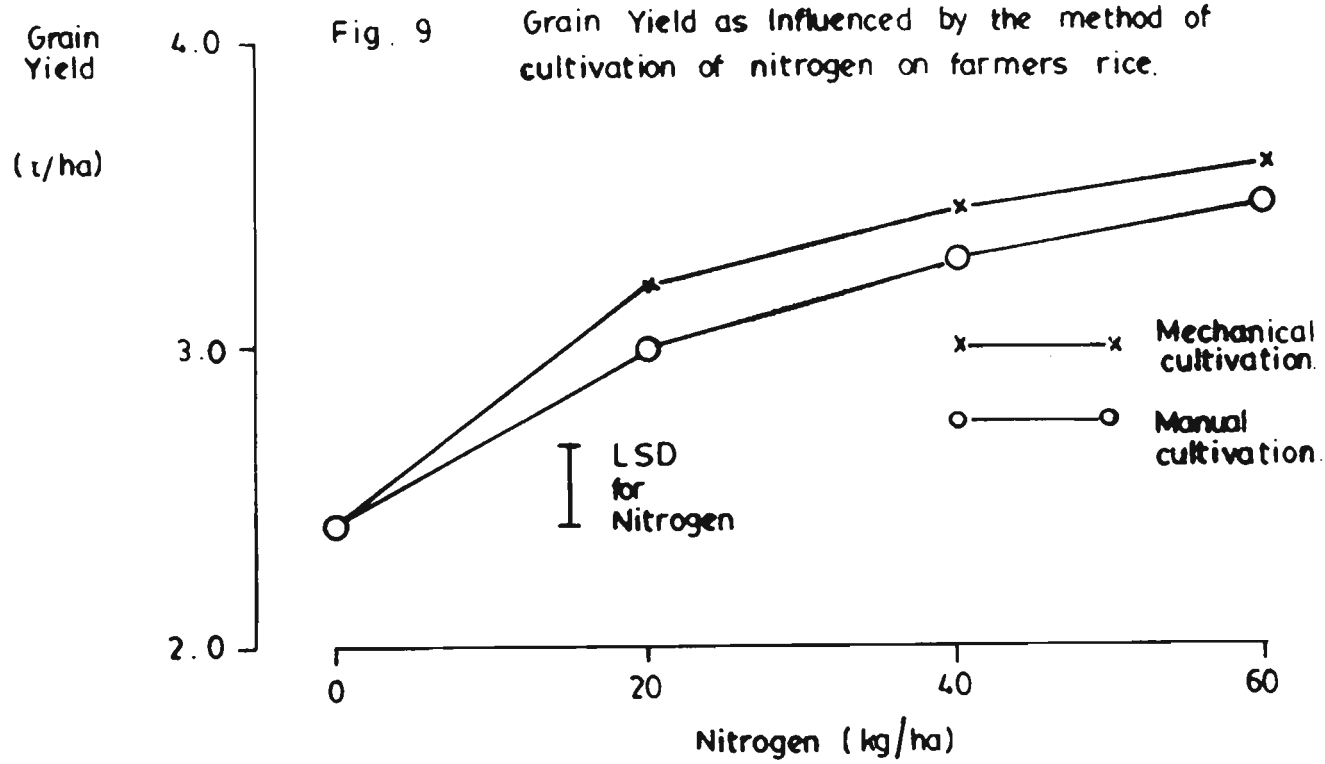


Fig. 9 Grain Yield as Influenced by the method of cultivation of nitrogen on farmers rice.



Time of Nitrogen Application: A trial was conducted at two sites, river edge and deep flooded, on the swamp catena to determine the effect on grain yield of nitrogen applied at different physiological stages of growth and to evaluate the response of additional nitrogen applied at later stages of growth.

The results obtained showned no difference in grain yield between the different times of application in both sites. This conforms with results obtained in earlier trials (1978) and indicates that for a long duration rice variety, nitrogen could be injected at any time from transplanting to panicle initiation with no adverse effect on grain yield. Application of an additional 40 kg nitrogen did not produce significantly higher yields over the single application of 40 kg N although the best yields were obtained from the early tillering and panicle initiation split of 80 kg N at both sites. Leves of nitrogen in excess of 40 kg N induce lodging at the river eadge site.

ALTERNATIVE SOURCE OF NITROGEN

Effect of Azolla as a green Manure: The effect of Azolla as a green manure on the growth and yield of rice was evaluated on the associated grass swamp during the past cropping season. Incorporation of one crop of Azolla (Table 108) equivalent to 17 tons (fresh weight) per ha, at 10-15 cm depth two weeks before transplanting increased grain yield significantly over the no-nitrogen treatment. Incorporation of a second layer of Azolla two weeks after transplanting was as effective as 40 kg N per ha of urea injected at 15 cm depth in increasing grain yield.

TABLE 108 Effect of Azolla on the grain yield of rice variety ROK 5 grown at the tidal limit of mangrove swamp – Mawiir.

Treatments	Mean Grain Yield kg/ha
No–Nitrogen control	2531
Urea; 40 kg N/ha	3652
Azolla; 17 t/ha fresh wt.	3162
Azolla; 34 t/ha fresh wt.	3581

This indicates that Azolla effectively contributes nitrogen and is quite promising as a source of nitrogen for wet land rice production.

COMPARISON OF MECHANICAL AND MANUAL CULTIVATION ON FARMERS' FIELDS

The trial was conducted on ten sites along the Great Scarcies river as a long term trial to evaluated response of farmers traditional rice varieties ti nitrogen under mechanical and manual methods of cultivation.

The yield from mechanical cultivation was higher than manual cultivation as in the previous two years (Fig. 7). This may be attributed to a more thourough digging by the single axle tract tractor which possibly led to efficient used of the fertilizer. In five of the ten sites the trial was conducted on the same piece of land for the second year in succession and on these sites the yield benefit of mechanical over manual cultivation tended to be less than in the previous year. The response to nitrogen was positive with a decreasing rate of response as the level of nitrogen increased for the both manual and mechanical cultivation.

AGRICULTURAL ECONOMICS

The section contunies with socio-economic and post production loss studies during the year under review. The final reports of the socio-economic studies are expected to be ready in abotu September 1982.

Farming system and Yields: Most of the households listed in eight villages along the Great Scarcies area grow mangrove swamp rice (80%) though 45 per cent of them have other farms in addition to mangrove. Only 10 percent of the total number of farmers listed did not own mangrove swamp farms and another 10 per cent were regarded as non-farmers.

The varieties grown by farmers in the long duration areas arranged in descending order of importance are Zoro Kent, Bundu, Dambaya, and White Zoro. Manique, Marisa, and Mayoni are the most popular varieties in the medium duration areas. The yield are generally above 2,000 Kg per hectare except the mangrove rice limit (fartherest from the sea) which had an average of 1808 kg/hectare. The mid-section nearest the sea recorded an average of 2589 kg per hectare. More than 50 per cent of the farmers store rice in boxes (Kuma). Some of the other storage methods found in the study area were cylindrical baskets (Kothi), bags and empty drums. Other crops grown in the area included cassava, sweet potatoes, and vegetables.

Pest Production Loss Studies: The results are summarized as follows for the storage less assessment due to insect damage:

(a) With the volume/weight method of assessment in farmers' stores for a period of 4 months, farmers lose an average of 1.7% in the first month which increase to 2.2% in the second, 2.9% in the third, and 3.9 in the fourth month.

(b) The rice stored for a period of one year in the store of the Rice Research Station showed a loss of between 2.9% and 5.9% (using the count and weight method).

The study of the effects delayed harvest on yield of mangrove rice showed that CP 4 tends to shatter more that other carieties tested, ROKO 9, Bundu, Zorro Fern and Adny 301.

PROGRESS ACTIVITIES - NATIONAL AND REGIONAL

The Project's final success may be assessed by the simple technology developed for the farmers and research methodology transferred to other mangrove swamp rice workers in the region. The multi-disciplinary team of scientists st Rokupr over the period of five seasons have developed improved farming operations which the newly created section of Project - Extension Liaison Function - will be testing further for their adoption by farmers i.e. for their profitability and simplicity.

The farming operations are:

Use of high yielding varieties;
ROK 5 for short season areas, 3-4 months
Kuatik Kundur for medium season areas 4-5 months
CP for long season areas, over 5 months
Land preparation, use of single axle tractor
Mangrove Swamp - ploughing or pudding.

Mangrove Swamp - ploughing or puddling.
Associated swamp - ploughing and puddling
Fertilizer use in the nursery to improve seedling vigor
Use of old vigorous seedlings to reduce crab damage
Early transplanting i.e. immediately after clearing
Use of injection technique 20-60 kg N per ha as urea at 20 cm dept
up to the maximum tillering stage of growth.

Training: Five Njala University Agriculture students worked at Rokupr during July - September vacation for the Project's scientists. Selected topics were related to the project's programme of activities and serve to train the students in rice research methodology. This training scheme started two years ago and it is intended to continue.

Two technicians of Freedom from Hunger Campaign (FFHC) in The Gambia were recently trained at Rokupr in the use of instruments for measurement of PH and pH and conductivity. The Berretto Swamp being reclaimed by FFHC has over recent years accumulated very high levels of salt. Assistance is now being provided by the Project scientists in monitoring the salt concentrations and distribution in the soil for a remedial steps to be developed. The Project scientists have twice travelled to The Gambia to work on the problem.

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   23 October, 1981.

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   USAID, REDSO/WA.
   29 October, 1981.

7. Mr. John Dorman,
   USAID, REDSO/WA
   29 October, 1981.

8. Dr. Y. Efron
   Assistant Director & Leader of Cereal Improvement Program
   IITA, Ibadan, Nigeria.
   Nov. 8-11, 1987.

9. Mr. Bryan Locke, Senior Programme Officers,
   Special Unit for T.C.D.C., UNDP, New York, U.S.A.
   26 November, 1981.

10. Mr. Francis Stephens, Finance Officer
    Seed Multiplication Project, Freetown
    Sierra Leone - 18 December, 1981.

11. Dr. Walter Kreil, Project Manager,
    Seed Multiplication Project,
    Freetown, Sierra Leone,
    18 December, 1981.

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