Rice Research Towards A Green Revolution In Nigeria

by

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INTRODUCTION

Rice is one of the few Nigerian crops whose production is increasing at a very fast rate. Rice is grown in all 12 States of the country but concentrated production is much more confined. It is a food that is liked and eaten frequently or periodically by people throughout the country. Two species are cultivated in Nigeria: Oryza sativa and Oryza glaberrima. Oryza sativa is rapidly replacing O. glaberrima. The sativa species was introduced into Nigeria probably through the Arab traders and the Portuguese in the 13th, 15th and 16th centuries (1). The glaberrima species has been cultivated in Nigeria along the rivers Niger, Sokoto, Hadejia and others for centuries.

ECOLOGY OF RICE CULTIVATION

Rice can grow on well drained soils or under deep flooded conditions and at different temperatures and elevations. It is grown in Nigeria from near sea level to 800 meters above sea level on the Jos Plateau.

In Nigeria rice is grown in four major ecological zones, the naturally inundated riverine lands, the non-inundated irrigable lowlands, the rainfed uplands and the fresh water mangrove (5). Historically, naturally inundated lowland is the most important zone for rice production in Nigeria. Statistics are lacking but it may be guessed that now about 40% of the

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total rice production in the country is from this zone. Rice cultivation in this zone is found along big rivers and their tributaries throughout the country. The most important areas are Ilushin and Birnin Kebbi.

Upland rice cultivation is restricted by rainfall and its distribution and by soil conditions. Upland rice is found mostly in Lagos State, Western State, Mid-Western State, Rivers State, East Central State, South Eastern State, Kwara State and Benue Plateau State. Its cultivation in the Northern State is done only under semi-swamp conditions. In general, upland rice is most successful on soils with a high water retention capacity. For good establishment, fine textured soil is desirable.

Irrigable lowland cultivation is on the increase but is still very small. There are a few irrigation projects in the country such as the Baguda in Kano, South Lake Chad basin irrigation project in the North Eastern State, the Peremabiri project in the Rivers State. There are other small irrigation projects for farmers or State Ministry multiplication sites such as Rabah irrigation project in Mokwa, Dep irrigation in Benue Plateau State and the Uzouwani Farm Settlement Irrigation Scheme in the East Central State. Rice is grown sporadically in the fresh-water mangrove area in a narrow coastal band.

RICE RESEARCH AND DEVELOPMENT

The beginning of scientific agriculture in Nigeria could be said to be in 1893 (2) and the establishment of Moor Plantation was in 1899. Some type of rice research might have started in the 1920s. Apparently organised rice introduction and trial started in the 1950s (3,7). Recently institutions other than the Federal Department of Agricultural Research (FDAR) have become involved in rice research.

The Faculties of Agriculture at the Ibadan and Ife Universities have rice research programs. Rice research is also conducted at the Institute of

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Agricultural Research and Training (IAR & T) which is part of the University of Ife. Some State Ministries of Agriculture are carrying out various forms of rice research and development. Prominent among these are the Midwestern State, Rivers State and North Western State, which have qualified personnel working full time on rice. Other States as well as those above are involved with rice extension activities The International Institute of Tropical Agriculture,(IITA) began rice research work in 1970. Rice research at IITA is closely linked back to that at the International Rice Research Institute (IRRI) at Los Banos, Philippines. Development as contrasted with research is an important element in increasing rice production. Other government and quasi-government agencies are important in rice development in Nigeria. These are of paramount importance in the realization of the Green Revolution in Nigeria. The newly established National Accelerated Food Production Project has rice as one of the cereals involved in this project, with 6 staff working full time on rice.

The Peremabiri Rice Project is developing polders or rice paddies in the delta area of Rivers State, to 1215 hectares for rice production (10).

Similar to the Peremabiri is the South Chad Irrigation Pilot Project (SCIPP) in the North Eastern State. The staff are carrying out varietal trial and general agronomy investigations. (SCIPP Agronomy report, rice season 1973 - unpublished). Others already established are the small Raba irrigation scheme near Mokwa and the Kadawa Pilot Farm in Kano. The Norwegian Church Agricultural Project (NCRCAP) at Abakaliki, East Central State, is also involved with limited rice extension work. The Shell-BP in Warri and in East Central State are also contributing to rice development through extension services.

The Christian Council of Nigeria and the Catholic Church agricultural services contribute to development through extension work. Table 1 below shows the various organisations directly or indirectly involved with rice research and development in Nigeria.

RESEARCH ACTIVITIES

Some of the past and present research objectives of FDAR have included the following:

1. Production of high yielding floating varieties of shorter duration than Mali ong (5)
2. Production of a higher yielding non-glutinous variety to replace the glutinous Aghede variety (4).
3. Production of high yielding, blast resistant varieties with the same or shorter duration than Mas 2401 for shallow swamp condition.(6)
4. Production of a higher yielding variety than OS6 with improved traits (1968 - 69 draft annual report - unpublished).

Currently the rice research program have at its objective the improvement of cultural and management practices and the estimation of water requirements of the rice plant. These entails studies on fertilizer requirements for the various ecological zones in the country, the use of chemicals for control of diseases, weeds and pests. Other studies include the processing of rice and soil nutrition.

The highlights of the most recent work are presented below.

The Federal Department of Agricultural Research which started rice research with fewer than 100 cultivars in the 1954 - 55 season had 877 new introduction during 1974 alone. (Nigeria 1975 Rice Research Program; 1974-75 Progress Report and results unpublished other facts below are from the same source).

Table 1 Major organizations involved with rice research and development in Nigeria.

Institution	Location	No. of staff with B.Sc and above	Major trial and sites
	R E S E A R C H		
FDAR	Ibadan, Badeggi, Birnin Kebbi, Njala	28	Birnin Kebbi, Bakara, Wurno, Shendam, Yola, Edozighi, Wasimi, Irruwa, Jema'a Oturkpo, Bende, Abakaliki, Warri, Shaki, Barakinladi, etc.
IITA	Ibadan	9	20 cooperators
IAR & T	Ibadan, Ikenne	6	Ilesha, Saki
Universities	Ibadan, Ife	3	
3 States	Port Harcourt, Ogba, Bida etc	5	Irruwa, Gbior, Badeggi, etc.
	D E V E L O P M E N T		
NAFPP	Ibadan	6	Various sites in 4 States
All States	various location	3	
Peremabiri	Peremabiri	2	
SCIPP	Maiduguri	2	
NORCAP	Abakaliki	2	
Raba Scheme	Mokwa	1	
Shell-BP	Warri, Uboma	3	

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The best 5 cultivars from the introduction are shown in Table 2.

Table 2. Performance of the 5 top yielders among new introductions at Badeggi, 1974.

Cultivars	Yields (Kg/ha)	Days to Maturity
TOs 46	6458	147
Tox 6-19-9-1-13	4166	143
IR 841-67-1-2	4370	124
Tx 52-101	3916	127
Cauvery	3666	109

Zonal short duration irrigated variety trials were carried out during 1974 at 24 sites. The yields and maturity obtained in some of the sites are presented in Table 3.

Table 3. Average yields in kg/ha of 5 irrigated short duration cultivars from 3 sites in zonal tests in 1974.

Cultivars	Badeggi	Bakura	Ogoja	Average yields (all sites)	Average days to maturity (all sites)
FAROE 75-69	1065	8829	2092	3902	135
FAROE 70-67	1304	8159	3288	4006	131
FAROE 162-67	1960	7665	3362	4134	132
FAROE 69-66	3464	6331	3586	4377	136
FAROE 13-71	1890	10,308	3661	4532	133

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Similarly trials were carried out for medium duration irrigated zonal tests at 19 sites. On the average the highest yielding varieties produced yields more than 4 tons/ha. These were FAROE 95-69, FAROE 39-69, FAROE 80-69 and FAROE 96-69. Maturity ranged from 134-160 days. Most of these varieties were highly susceptible to blast and leaf bronzing.

Eighteen cultivars were screened at Badeggi, Bende and Shendam. FARO 15, FARO 16 and FARO 17 were resistant to blast at two locations.

Floating rice breeding.

Twenty-seven varieties of O. glaberrima were studied with the objective of choosing best parents for interspecific hybridization. Several of the entries yielded very well especially at Birnin Kebbi.

Shallow swamp Agronomy herbicide trial.

Among many herbicides tried, Saturn, Stam F-34 (Propanil) and Preforan (Fluorodifen) and a combination of the last two were found very promising.

Other Agronomy experiments conducted were the effect of rice straw on fertility and several fertilizer trials. Response was obtained for nitrogen up to 80-120 kg/ha under irrigated conditions.

Other experiments currently undertaken are the methods and rates of seeding on deep flooded rice, different irrigation frequencies and screening for insect and Helminthosporium oryzae.

Upland trials.

A zonal upland trial at 4 sites with 15 entries was repeated in 1974. Table 4 shows the average performance of best seven entries.

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Table 4. Mean yield at 14% MC and other data on 7 entries at 3 sites of an upland yield trial 1974.

Cultivar	Days to Maturity	Ht. at flowering (cms)	% lodging	Mean yield kg/ha	Susceptible to*
IR 20	129	62	0	2669	B.S. & blast
IR 22	125	50	0	2331	Blast
IR 1154-242-1	125	140	70	2304	Blast
IR 293-2-6-2-1	131	54	0	2223	B.S. & blast
IR 5-47-2	121	131	50	2014	Blast
OS 6	121	149	70	1874	B.S. & blast
IR 440-8-1-1	131	73	0	1712	Blast

* B.S. = Brown leaf spots or Helminthosporium oryzae.

Seven lines obtained by crossing Tjina with high yielding upland rice varieties were compared with OS6, E425 and Agbede. None of the new lines yielded higher than OS6 and E425.

Blast.

Screening for blast resistance was also done under upland condition. Eight cultivars had a score of 4 or less at 70 days.

Several cultivars were screened by the FDAR rice breeder under upland condition. Some of the data on 14 of the lines are shown in Table 5 below.

Upland rice agronomy.

a. Fertilizer trials N.P. & K: A response was obtained for up to 250 kg/ha of sulphate of ammonia using 3 upland varieties. A significant negative response was found for potash, while there was a positive response to sulphate of ammonia and superphosphate application at 250 kg/ha levels.

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Table 5. The grain yield and maturity period of 14 upland rice cultivars in Moor Plantation 1974.

Cultivars	Grain yield (kg/ha)	Days to maturity
TOX 7-3-11-6-B2	4760	108
TOX 7-4-2-1-B1-1	4296	115
Ikong Pao	4191	112
TOX 7-4-2-5-1	4110	116
TOX 7-3-20-8-B1	4044	110
OS 6	4018	121
TOX 7-3-12-16-1	3947	110
IR 49	3808	125
TOX 7-4-10-B	3784	113
TOX 7-3-5-B1-B1	3717	113
TOs 4112	3662	114
Canvery	3015	110
Iguape Cateto	2560	124
M1-48	116	108

b. Weed control. Results indicated that Propanil (stan F-34) and Propanil analogues such as Surcopur, Synpran and Fluzodifen (Preforan) with additional handweeding gave very good weed control.

c. Drilling trial. The results of drilling trial are shown in Table 6. For FARO 11 a rate of above 30 kg/ha seems necessary.

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Table 6. The yield data, percentage of unfilled grains and lodging percentage on rates of drilling FARC 11 at Moor Plantation 1974.

Rates of seeding (kg/ha)	Grain yield (kg/ha)	% of unfilled grains	% lodging
11	3160	10.4	15
23	3527	14.5	25
34	3717	17.2	25
45	3942	20.7	40
56	3886	20.5	45
67	4329	20.6	55

Rice Entomology

a. Survey of insect pests. From the survey of four States in Nigeria the major stem borers found were Chilo sp., Maliarpha separatela, Sesamia calamistis.

b. Yield losses due to insect attack. In a pot controlled experiment it was found that loss on a susceptible variety could be from 9 to 100% and 44-87% in a less susceptible variety.

Rice Pathology

a. Disease survey. New diseases reported to be on the increase are:

i. Sheath blight Corticium sasakii found in Ahudike, Ikenne and Coker farm centre.

ii. False or green smut due to Ustilaginoidea virens was found in Lonkart, Benue Plateau State and at Ibadan on Moroberekan. Other areas were at Ado Ekiti, Western State and Onitsha in East Central State.

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Other pathological experiments involved leaf scald Rhynchosporium oryzae and leaf spot Helminthosporium oryzae.

The blast Pyricularia oryzae continued to be the most important. Similar experiments as those by FDAF are carried out under upland conditions at IAR & T (information from unpublished reports given at the 1975 In-House Review.) Population and fertilizer trials were carried out. Spacing used were 30.5 x 30 cm, 30.5 x 30.5 cm and 30.5 x 22.9 cm. Most of the varieties had highest yields with 30.5 x 22.9 cm. spacing. A significant nitrogen response was recorded at Shaki with OS 6 variety but negative response was obtained in Ibenne due to lodging.

The Institute has done a comprehensive work on the vertebrate pests of upland rice (9).

IITA rice research objectives include the following:

1. Development of high yielding varieties with high grain qualities for upland and lowland condition
2. Development of varieties that are resistant to pests and diseases.
3. Determination of appropriate cultural practices and chemical inputs.

A detailed account of the IITA's rice research is not given. Information on results of experiments are available in Cereal Improvement Program annual report series from 1971 to 1974 and staff publications. The Institute carried out research on all aspects of rice and there are more than 4000 cultivars in their rice collection. Several crosses are made each year and the Institute makes cultivars and other research information available to other researchers and extension personnel in national programs.

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IITA has supplied several introduced and screened varieties and upland advanced lines to cooperators, researchers and extension workers for breeding or selection purposes and for evaluation on farmers fields (Table 7.) Some of these presently bear TOs or TOX designations, it is suggested they bear researcher's local names when released or recommended. The Institute welcomes, seeks for cooperation with whosoever desires to and aims only to supplement the national research activities wherever possible.

The entomology research program at IITA is oriented towards the development of high yielding rice varieties with moderate levels of resistance to the various insect pests in Africa, and the development of a method of chemical control which is inexpensive and safe from toxicity hazards.

A large number of rice varieties are presently being screened in the search for resistance to the following insect pests.

Common name	Scientific name
African striped borer	Chilo zacconius
Stalk-eyed fly	Diopsis thoracica
Caseworm	Nymphula depunctalis
whorl maggot	Hydrellia sp.

Integration of chemical control with varietal resistance will receive great emphasis in the future; thus it is hoped to reduce the number and frequency of insecticide treatments.

On the pathological aspect cultivars resistant to blast have been identified through series of blast nursery screening. Various agronomic results on chemical inputs have been obtained.

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Table 7. Rice cultivars made available to researchers and cooperators in Nigeria by IITA. 1974.

State	No. of cultivars	Approximate weight (kg)
Benue Plateau	52	74
East Central	34	353
Kano	24	39
Kwara	30	62
Lagos	13	12
Midwest	41	26
North Central		-
North Eastern	33	17
North Western	10	10
Rivers	40	22
South Eastern	2	20
Western	60	108
FDAR & NAFPP	80	280

ACHIEVEMENTS OF RICE RESEARCH IN NIGERIA

The achievements of rice research activities in Nigeria can be illustrated by considering the number of recommended varieties and other cultural and processing recommendations.

It is noteworthy that very high yielding selections have been obtained in many locations and exceptionally good paddy yields of over 6,000 kg per hectare have been demonstrated in such irrigation schemes at Bakura in North Western State as observed in Wurno.

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Table 8 illustrates these varieties under different ecological zones. Although these varieties possess some desirable traits. Their imperfections are currently being looked at closely. The future varieties will combine their good traits with improvements in their defects. Active breeding programs are going on in both the FDAR and IITA using these varieties as parents. The two institutions have developed several strains that are being tried under farmers' fields in different ecological zones.

In the area of cultural and management practices, fertilizer recommendation have been made for major rice ecological zones in the country.

For the flood plains of the Sokoto Rima Valley of over 405,300 ha. of naturally inundated fadamas which constitute primarily a major area of maximum production in Nigeria, optimum fertilizer recommendation of 53 kg N per hectare and 40 kg P_2O_5 per hectare have been recommended for such floating rice varieties as the high yielding variety FARO 14. (FDAR memo 108 unpublished).

These vast inundated deep flooded area have been assessed to produce over 170,000 tons of paddy annually with an average 1200 kg of paddy per hectare without inorganic fertilization.

When the recommended fertilizer rates are applied, yields of over 3775 kg of paddy have been demonstrated indicated nearly a three-fold increase over the traditionally low yields obtained without fertilizer.

In the low lying area on the Alau river at Jere Borol near Maiduguri with about 2,025 hectares of rice cultivated annually, fertilizer recommendations of 36 kg P_2O_5 per hectare in the form of single superphosphate and 52 kg N per hectare in the form of ammonium sulphate have increased yield two fold over that without fertilizer application. (FDAR memo 90, unpublished).

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Table 3. List of Recommended Rice Varieties in Nigeria.

Recommended Rice Varieties	Ecological Areas of Recommendation	Years of Release	Duration
1. FARO - 1	Shallow swamp areas with available water, available water for 4½ - 5 months.	1954-1955	135-174 days
2. FARO - 2	Shallow swamp areas to replace FARO-1 in Southern Zaria, North Central State and Jere Bowl in North Eastern State.	1957	135-176 "
3. FARO - 3	Upland rice areas in West, Mid-West and Northern States with adequate rainfall well distributed.	1958	95-120 "
4. FARO - 4	Deep swamp areas with rainfall up to 5-7 months can withstand water up to 1-2 meters.	1959	189-220 "
5. FARO - 5	Shallow swamp areas with available water for 4½-5 months in Bauchi and Bornu Provinces.	1960	135-54 "
6. FARO - 6	Deep flooded 'floating' rice areas of up to 2 meters at peak of flood. Recommended for flooded areas of Rima Valley in Sokoto and Kirnia-Kebbi in North Western State and deep flooded areas of Ilushi Mid-Western State.	1961	175-198 "
7. FARO - 7	As above to replace FARO 6 because of high yield.	1962	160-217 "

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List of Recommended Rice Varieties in Nigeria (Contd)

Recommended Rice Varieties	Ecological Areas of Recommendation	Years of Release	Duration
8. FARO - 8	Shallow swamp areas with available water for 4½-5 months especially in Higher Kaduna River Basins: Abakaliki, Ogoja areas in East Central State. Recommended to replace FARO - 1.	1963	155-160 days
9. FARO - 9	Shallow swamp variety for areas where water is available for 6-7 months.	1963	189-220 "
10. FARO - 10	Shallow swamp variety adaptable to low water temperatures. Recommended for High Plateau areas around Jos.	1963	115-162 "
11. FARO - 11	Upland rice areas in West, Mid-West and Northern States with adequate rainfall well distributed during plant growth recommended to replace FARO - 3.	1966	110 days
12. FARO - 12	Shallow swamp areas with available water for 4½-5 months for areas as in FARO-3. None lodging stiff strawed variety	1969	145 "
13. FARO - 13	Shallow swamp areas as in above and in irrigation schemes in the North for double cropping.	1970	135-140 days
14. FARO - 14	Deep flooded "floating" rice areas could withstand 2 meters of water at peak of flood. Recommended to replace FARO-6.	1971	170-190 "
15. FARO - 15.	Shallow swamp and irrigated areas as in FARO-3 High nitrogen fertilizer responsive.	1974	145-160 "

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List of Recommended Rice Varieties in Nigeria (Contd)

Recommended Rice Varieties	Ecological Areas of Recommendation	Years of Release	Duration
16. FARO - 16	As above	1974	140-160 days
17. FARO - 17	As above	1974	145-160 "
18. FARO - 18	Shallow swamp areas with available water up to 5-6 months. Resistant to blast infection.	1974	179 "
19. FARO - 19	Shallow swamp areas and irrigation schemes in Kadawa (Kano State) Katsina Ala, Dap, Longkart (Benue Plateau State) Bakina (N. Western State) and for areas in Yau, South Chad (N. Western State).	1974	135-140 "
20. FARO - 20	For shallow swamp and irrigated areas as above moderately resistant to blast.	1974	125-130 "
21. FARO - 21	Shallow swamp areas and irrigated schemes such as Niger-Kadawa river basins, Bakura (N. Western State). Highly nitrogen responsive and high yielding, Early maturing and non-lodging.	1974	90-110 "
22. FARO - 22	Irrigated and shallow swamp areas such as in Kadawa (Kano State), Katsina Ala (Benue Plateau). Moderately nitrogen responsive, high yielding and non-lodging.	1974	145-140 "
23. FARO - 23	Irrigated and shallow swamp areas such as in Abakaliki Ogoja areas, Niger-Kaduna river basins non-lodging and high yielding variety.	1974	145-150 "
24. FARO - 24	Irrigated and shallow swamp areas such as in Murno (N. Western State), Yau, Ngala irrigation schemes (N. Eastern State). Very good grain quality.	1974	135-145 "

In the Niger - Kaduna river basins with over 20,000 hectares of paddy and in Ogoja and Abakaliki area of the East Central State, yield responses have been demonstrated to applications of nitrogen and phosphorous fertilizers with high nitrogen responsive varieties. Recommendations of 79 kg N per hectare and 30 kg P_2O_5 have been made for thse major rice producing areas using such varieties as FARO 8, FARO 12 (which has a long grain similar to the popular Uncle Bens rice) and also FARO 18. (FDAR memo 109, unpublished).

The above quoted yields are further increased with the demonstrated deep placement of the fertilizers under flooded conditions. The yield of paddy of about 5600 kg per hectare have been demonstrated using the deep placement method of fertilizer as against the traditional low yield of 1300 kg per hectare.

In the upland rice areas, the application of 26 kg N per hectare and 36 kg P_2O_5 per hectare have been found to increase threefold, the low yields of the rainfed rice.

In other areas of cultural practices in rice production, chemical weed control has been introduced to off set the unavailability of labour at the right time for weeding and alleviate the drudgery of handweeding.

Herbicides like Stam F-34 (3.4 dichloro-propionanilide) at the rate of 3.4 kg/ha and Fluorodifen (Preforan) at the rate of 7.0 litre/ha applied post-emergent to the weeds at the 2-3 leaf stage have been very effective in controlling weeds in lowland rice areas. These chemicals have been found effective in weed control also in upland rice areas.

In conditions where insect pests have attacked the rice plants, chemicals like Gammalin (BHC) at the rate of 1.0 kg/ha has been very effective in the

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control of the insects. The application of chemicals like Blastin and Blasticidin have been found to effectively reduce blast infection in lowland rice.

For large scale mechanization of rice where drilling the rice seeds is a necessity, the optimum seed rate has been found to be 34 kg/ha and this should be done when the soil has been thoroughly worked by ploughs and rotavators to obtain a fine tilth.

The method of parboiling rice which anneals the cracks and reduces breakage during milling has been improved. The old method of cold water soaking for 2 to 3 days which imparts objectionable odour to the milled rice has been replaced by the hot water method which is fast and does not leave any odour. The rice paddy are soaked in hot water at 70°C for 6 hours and thereafter parboiled for 15 minutes. The parboiled paddy is then air-dried in the shade up to 13% moisture content before milling. This method of parboiling increases the protein content of parboiled milled rice to 12% protein in contrast to the 7% of the unparboiled milled rice.

The Department of Agricultural Research also tries to meet the demands of all State Ministries of Agriculture for improved seed. Every year over 4,540 kg of pure seeds are supplied to all States Ministries of Agriculture. These improved and recommended varieties are later multiplied by the State Ministries before giving them out to the farmers. A cross - checking program of assessing the purity of the multiplied seeds is also in force.

The most important factor in measuring research contribution towards bringing about the Green Revolution is by looking at the effects on the farmers. The effect on the farmers can be determined by considering the

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increase in cultivation and/or in yield. With the advent of systematic introduction and research work on rice the red-grained, poor quality Oryza glabberima has been replaced by white-grained Oryza sativa. Unlike in the past 99% of the rice grown in the country is now white grained varieties (7).

Besides the quality aspects, considering the area under cultivation and production record will convience one of the ways that research has contributed towards a green revolution in Nigeria. From Table 9 it is obvious that there has been a steady increase from 200,000 tons in 1966 to 600,000 tons in 1972. This is an increase of 200% as compared to an increase of about 16% for maize during the same period. Definitely the combination of research and extension work is responsible for this output.

Similarly the area of cultivation has increased as can be seen in Table 10. There is 15% increase in area from the 1968 - 69 to 1970 - 71 season.

Table 9. Rice and maize production (thousand tons) in Nigeria.

	1966	1967	1968	1969	1970	1971	1972
Rice (paddy)	200	386	353	325	490	580	600
Maize	1020	1000	950	1426	1310	931	1188

Source: United Nations 1973 Economic Commission for Africa. Part 2.

Table 10. Area of rice cultivation in Nigeria.

Year	Hectares '000
1968 - 1969	543
1969 - 1970	518
1970 - 1971	630

Source: Calculated from Table 1 appendix II in the 1972-1973 FDAR annual report.

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SUGGESTIONS AND COMMENTS FOR THE FUTURE TO LEAD FASTER TOWARDS GREEN REVOLUTION

Although rice research has contributed towards increased rice production researchers have no room for complacency. There is a need for :

1. Clear identification of practical objectives which could be of use to farmers.
2. Coordination of efforts to avoid unnecessary duplication.
3. Cooperation between the various groups of researchers.
4. An attempt to develop a single interlocking research program in the country.

An important counterpart of research is extension. It is to be hoped that with the creation of the NAFPP (?) in 1973, the time it takes to bring the fruits of research to our farmers will be reduced. The separate extension activities of the States should also be strenghtened.

On the socio-economic side, the practice of selling rice by volume should be changed to weight sales and different rice qualities should attract different prices. Considerations for these should include transparency, shape, length and percentage of broken grains. Parboiled rice when properly done should command higher price than unparboiled rice.

CONCLUSIONS

Although national rice yields are still under 1000 kg/ha, production has increased from 200,000 to 600,000 tons in 1972. As a consequence of a series of introductions and breeding research, relatively high yielding and good white grained sativa rice is grown on more than 99% of the area under rice cultivation in replacement of the low yielding and poor red-grained glaberrima rices of the early 1920's. Through the intensification of extension activities, and some changes in socio-economic practices coupled with integrated and more dynamic research activities the target production figures of 1.1, 2.6, and 6.0 million lon long tons will be reached in 1975, 1980, and 1985 respectively (7). The realization of these goals will surely lead Nigeria towards a green revolution in rice.

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