

Country M : UGANDA

RESEARCH & ON-GOING EFFORTS FOR PRODUCTION OF NERICA IN UGANDA

G. Bigirwa, T. Tsuboi, G. Asea, G. Onaga and J. Kikafunda,
D. Ochola, S. Alibu
NaCRRRI - Uganda

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Introduction

- Rice is an important commodity in Uganda serving both as a major food and cash crop.
- Hectarge has been going up ever since 3 upland varieties were released in 2002:
NARIC 1= ITA 257
NARIC 2 = ITA 325
NARIC 3 = NERICA 4
- By end of 2002, about 6,000 ha were put under NERICA 4 and presently it is estimated to be close to 20,000 ha.

Rice as an important cash crop in Uganda

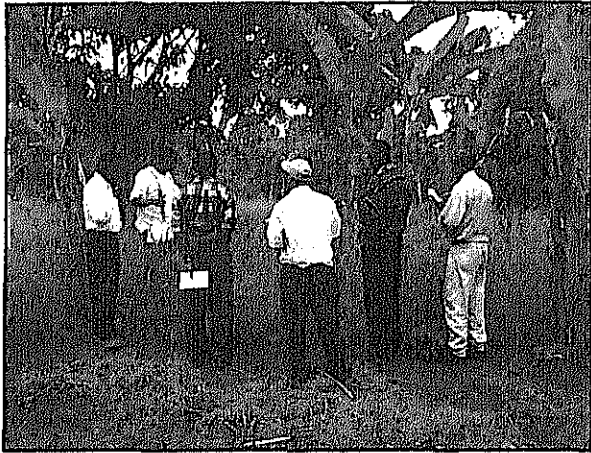
1st NEWS VIEW: Wednesday, November 10, 2010 BUSINESS

Gulu to get sh100m bakery

Rural poor reap sh17b from VP's upland rice

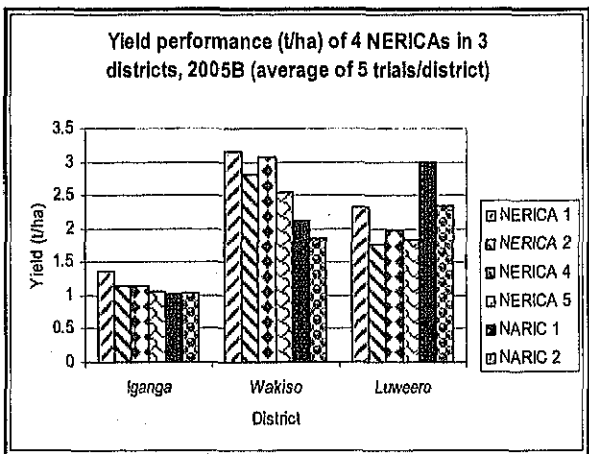
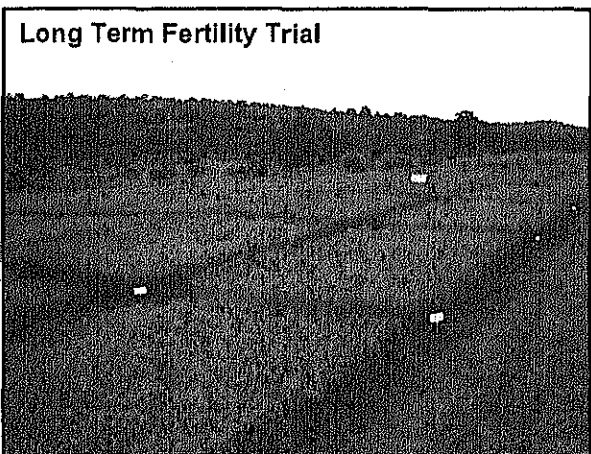
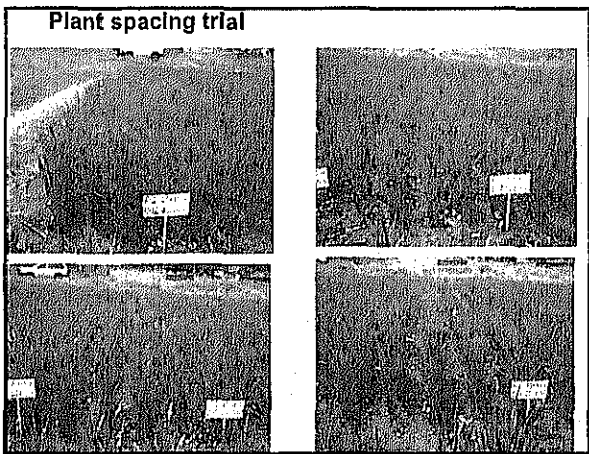
Ushs. 17 billion = US \$9M





On-going research

- Variety evaluation
- More NERICAs for both upland & lowland ecologies
- Non-NERICA for upland & lowland conditions
- Fertilizer response trials
- Seed rate trials
- Weed control (herbicide pre-screening)
- Water application trials

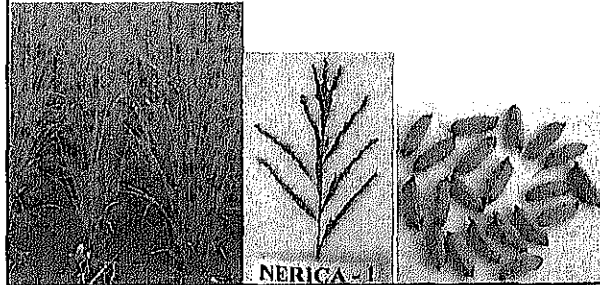


Yield and yield components of NERICA 8-18 under supplementary irrigation condition

Variety	PH at harvest	TH	Fan. No.	Fan. No. / Panicle	G No./ Panicle	Filled grain ratio	1000 grains weight (g)	Yield / ha (t/ha)	Days to 50 % heading	Shortfall grains
NERICA 8	98.8	8.6	8.8	375.8	125.5	28.8%	23.6	3,228	71	E
NERICA 9	101.4	7.5	7.5	331.7	134.9	35.1%	21.0	3,883	74	E
NERICA 10	102.7	7.4	7.7	298.9	179.9	36.3%	27.8	4,709	69	VE
NERICA 11	103.3	6.7	6.9	267.8	154.8	37.3%	23.8	4,158	73	E
NERICA 12	110.2	7.6	8.8	281.4	81.3	48.8%	32.6	4,642	77	VE
NERICA 13	120.8	8.9	4.2	175.8	171.5	47.3%	33.1	3,606	77	VE
NERICA 14	88.3	7.1	1.4	233.8	129.5	46.4%	30.3	4,114	87	E
NERICA 15	112.8	4.9	3.8	162.8	111.8	6.4%	31.8	511	77	D
NERICA 16	108.9	4.4	4.7	165.8	81.8	15.7%	31.8	808	70	B
NERICA 17	108.4	8.2	6.5	187.5	77.8	44.2%	36.5	3,983	78	E
NERICA 18	104.1	3.7	1.1	170.8	198.8	28.1%	32.5	1,123	84	D

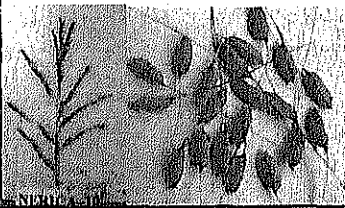
Candidate for release NERICA 1

- Fitting in the growing seasons
- Gives relatively good yield (3-4 t/ha)
- Resistant to blast
- Aromatic



Another candidate: NERICA 10

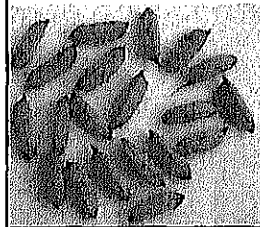
Early maturing (69 days to 50% flowering)
Gives good yield (over 5 t/ha)
White grain
Resistant to blast



NERICA 4



NERICA 1



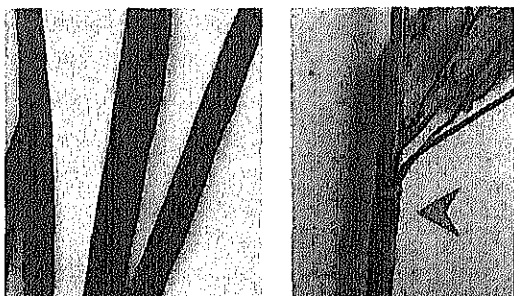
NERICA 10



Some few drawbacks

Susceptibility to diseases

Leaf and neck blast especially NERICA 14



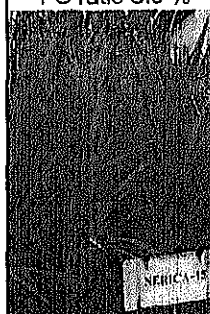
Shortfall cont'd

• Failure to attain grain filling

NERICA 15
FG ratio 8.8 %

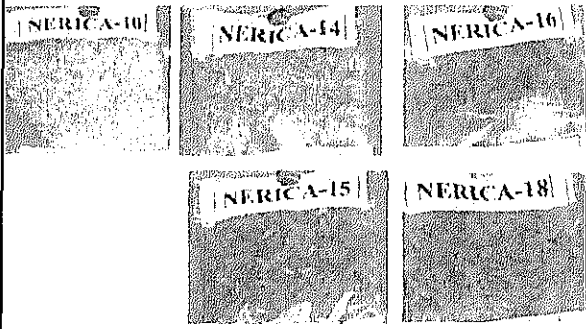
NERICA 16
FG ratio 15.7 %

NERICA 18
FG ratio 20.1 %



Shortfall cont'd

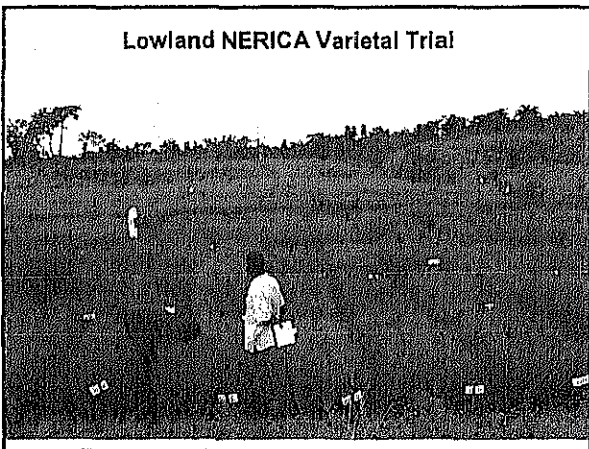
- Red rice in some varieties (N14, 15, 16, 18)



Weed control trial



Lowland NERICA Varietal Trial



Rice plants catch insects (stalked-eyes flies) ?

WAB 1159 - 2 - 12 - 11 - 6 - 9 - 1 - 2



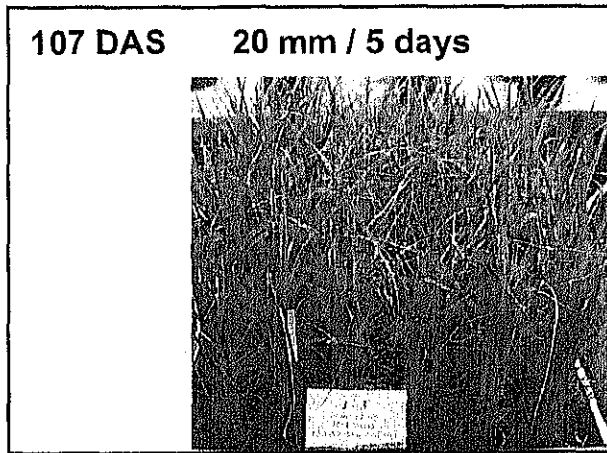
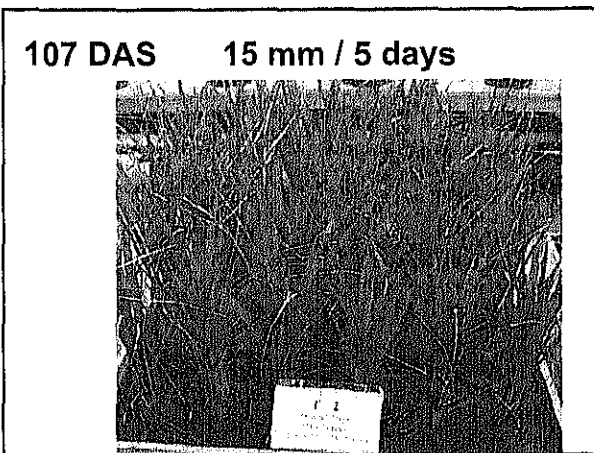
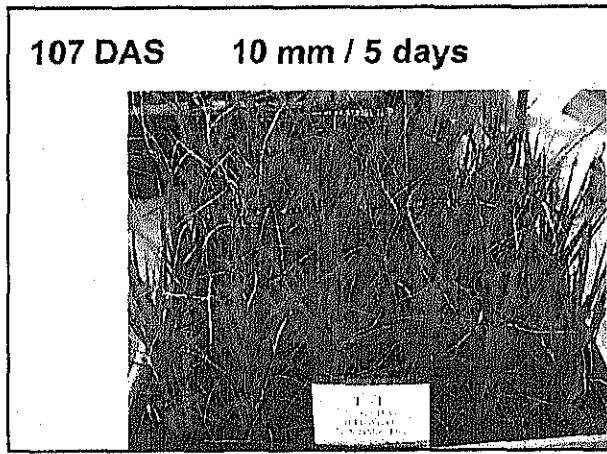
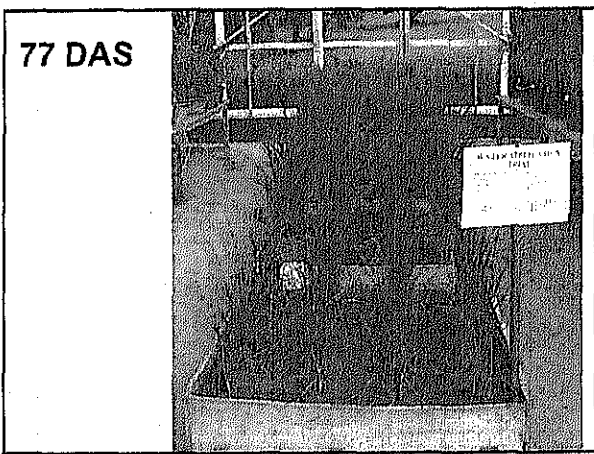
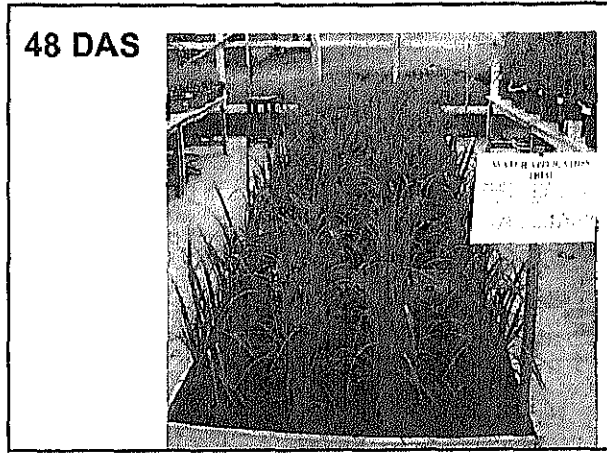
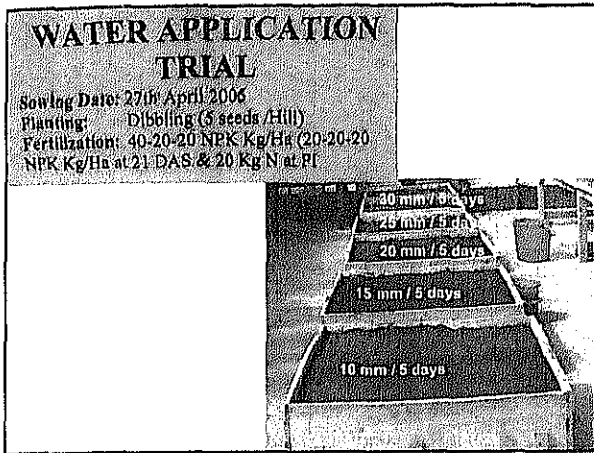
Varietal Trial on RYMV

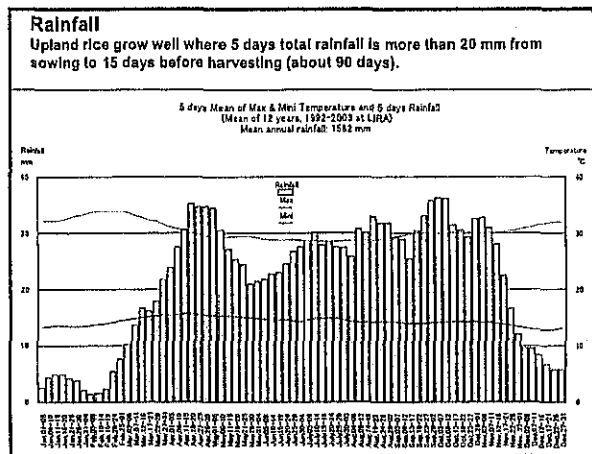
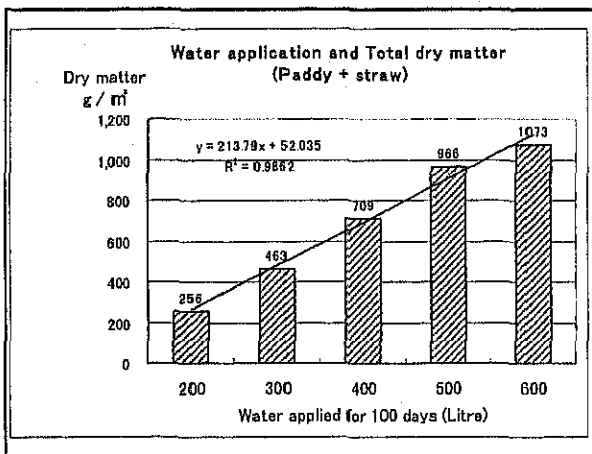
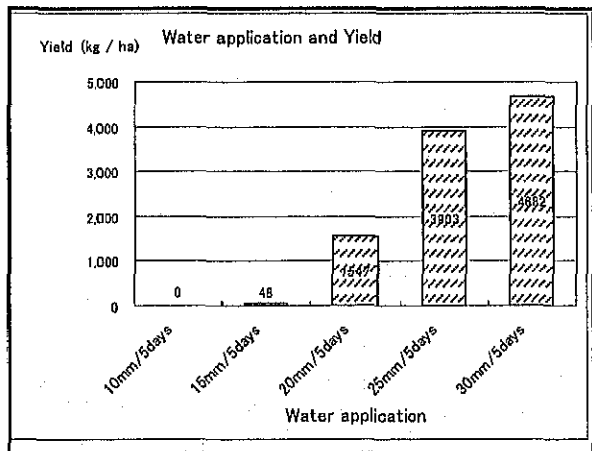
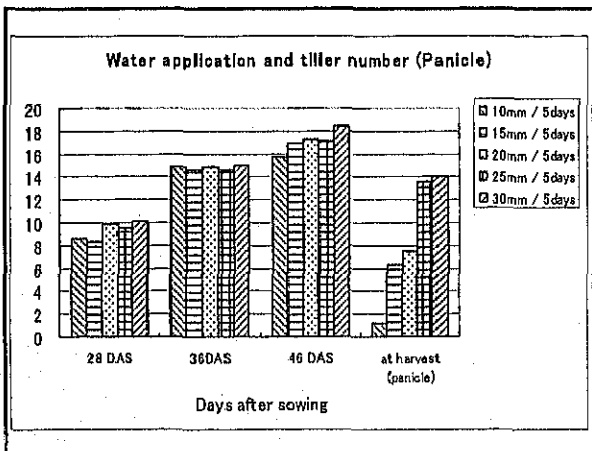
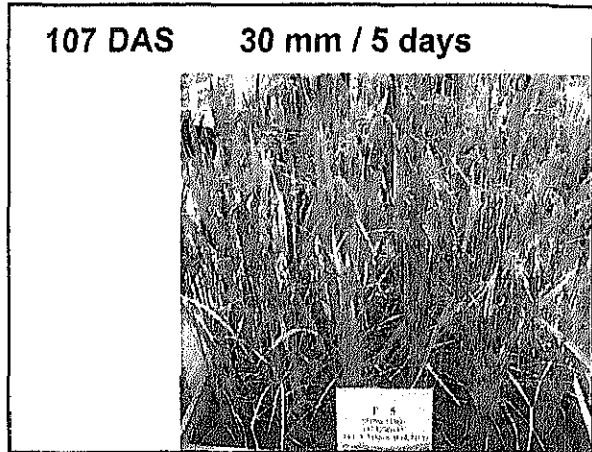
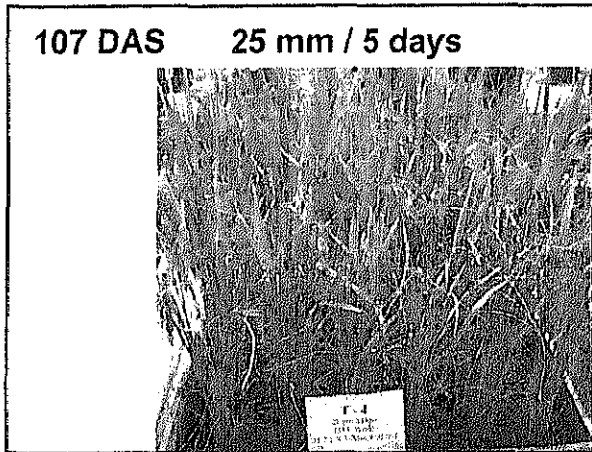


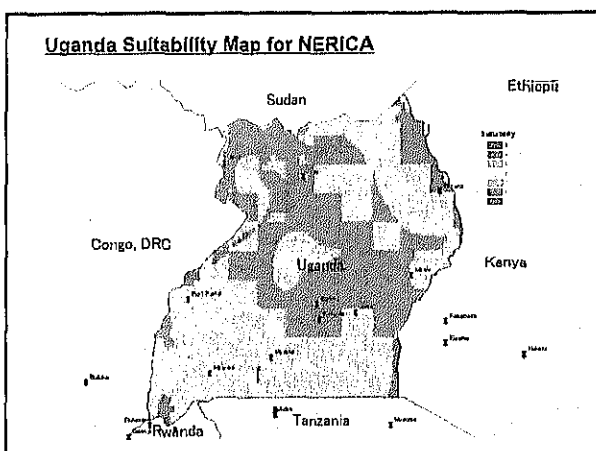
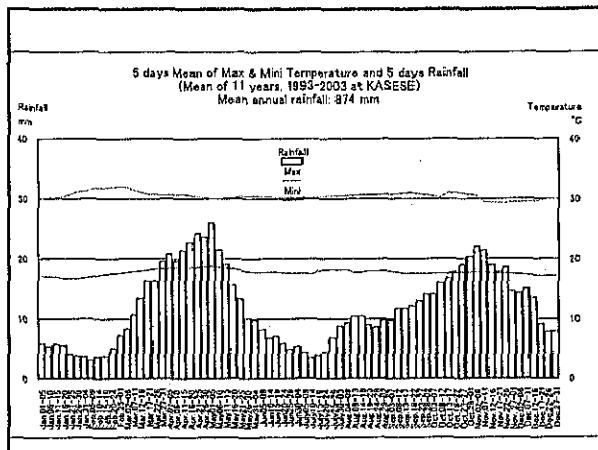
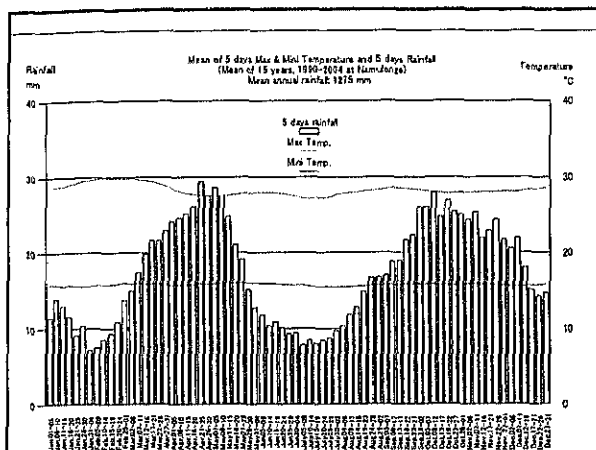
18 Days after inoculation

Concerns

- In some areas, the varieties are failing to fit in the growing season
- Drought is hitting them
- Crop failures are frequent









- ### On-going efforts for NERICA Production in Uganda
1. Availing foundation seed to:
 - Seed companies
 - NGOs & CBOs
 - Farmer groups
 - Individual farmers
 2. Creation of awareness
 - Demonstrations
 - Agricultural shows
 - Use of mass media

- ### Efforts for production cont'd
3. Training of farmers – crop production practices
 4. Partnerships with other stakeholders (NGOs e.g. SG 2000, seed companies, NAADS)
 5. Government's initiative to promote upland rice
 6. Involvement of farmers in early stages of variety evaluation

Constraints farmers face in NERICA production

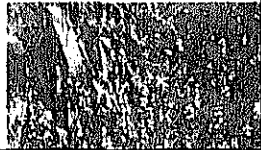
- Poor post harvest methods
- Most activities are still manual hence tedious and time consuming

Constraints cont'd





• Drought

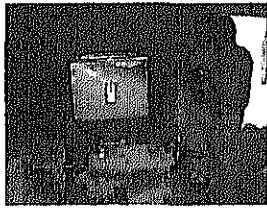

Weeds



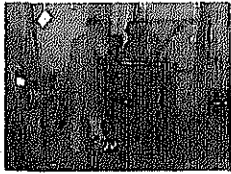


Birds damage




Mills still too few, inferior models leading to poor grain quality

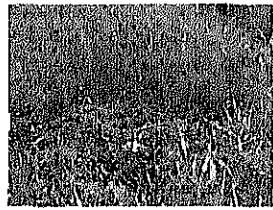
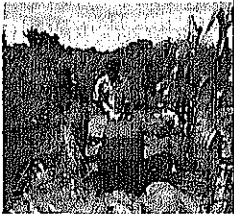
Thresher Fabrication Training
Nakawa Vocational Training Center

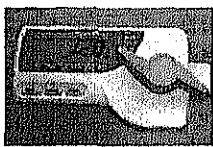

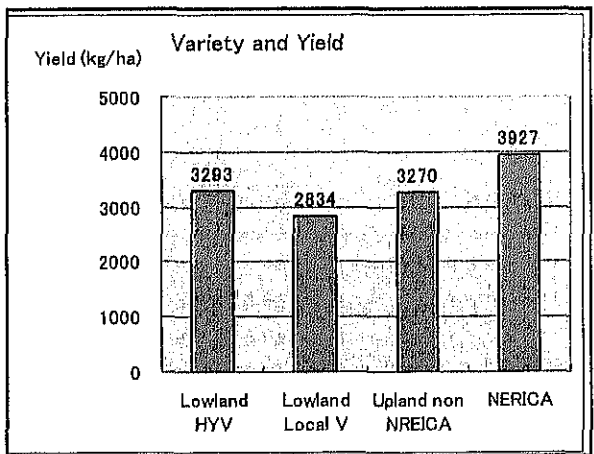
Thresher Demonstration In Doho Irrigation Scheme

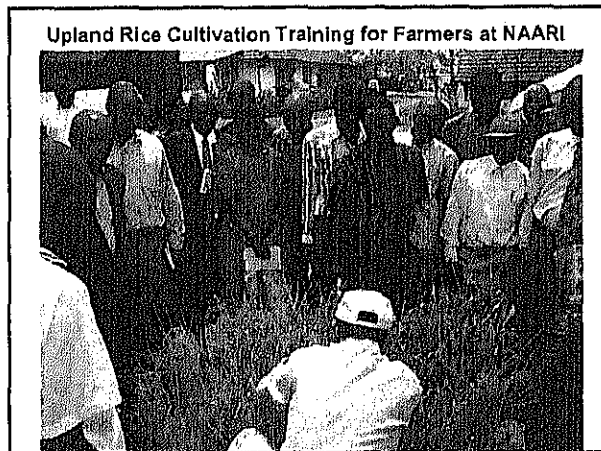
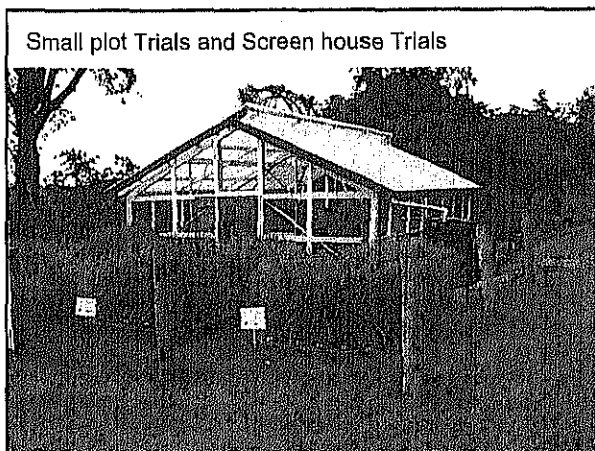
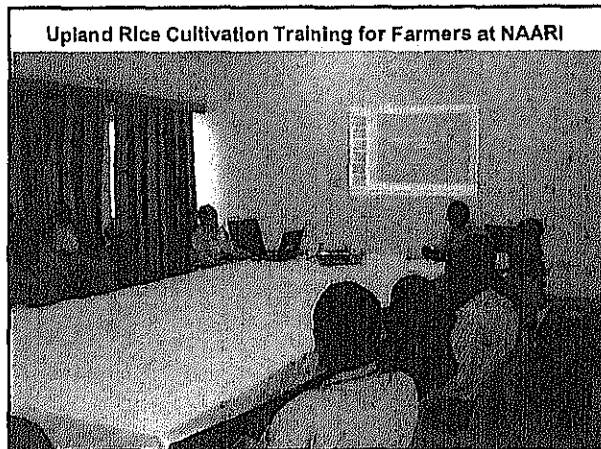
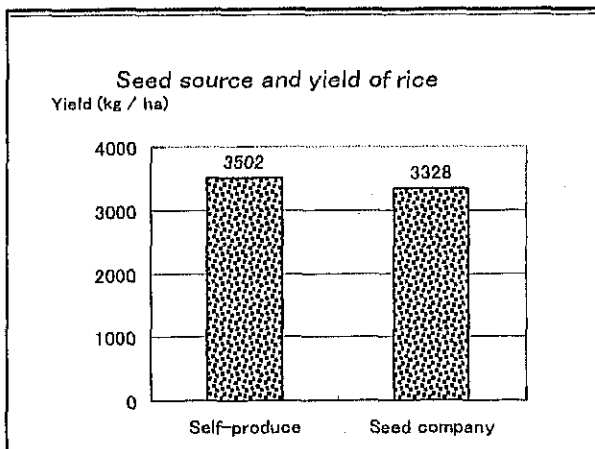
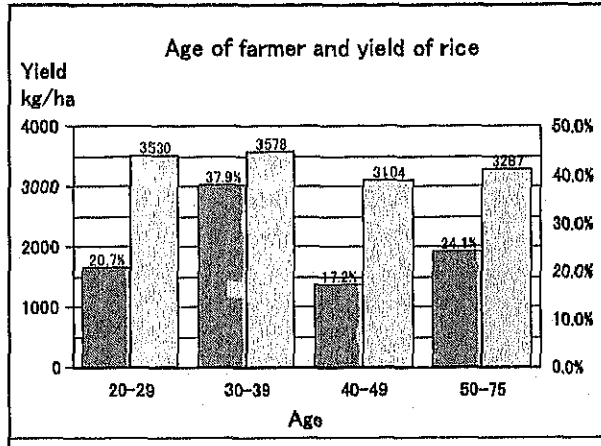
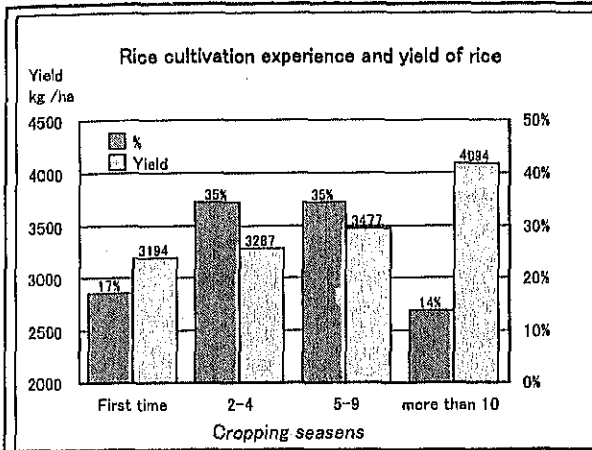


Rice Yield Survey

Yield



**NERICA dissemination Program
in Ziobwe**

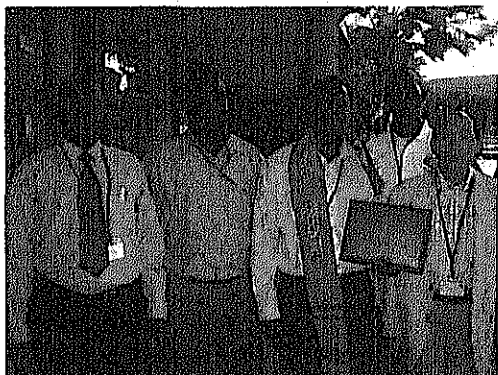


ACKNOWLEDGEMENT



- Farmers
- Rockefeller Foundation
- JICA
- Seed companies
- Government of Uganda
- SG 2000
- NGOS

Thank you for your attention



1. Present Status of NERICA in Uganda

Research Situation

Item	Contents
<p>1. Implementation structure for NERICA research</p>	<p>Some of the key NERICA related organizations in Uganda include Japan International Cooperation Agency (JICA), Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), Vice Presidents Office (VPO), National Agricultural Research Organization (NARO), Sasakawa - Global 2000 (SG2000), Agricultural Productivity Enhancement Project (APEP) and National Agricultural Advisory Services (NAADS), FICA seeds and Nalweyo Seed Company (NASECO).</p> <p>The centre of NERICA research is at: National Crop Resources Research Institute (NaCRRRI) - Namulonge, P .O. Box 7084, Kampala, Uganda</p> <div data-bbox="470 1220 1348 1691" style="text-align: center;"> <p>UPLAND RICE (NARIC 3) DISSEMINATION STRATEGIES</p> </div>
<p>2. Content of research topics</p>	<ul style="list-style-type: none"> • Varietal trials under supplemental irrigation • Water application

2) Results of trials conducted in 2006

Summary of trials

NERICA VARIETAL TRIAL (under supplemental irrigation)	
Objective:	<ul style="list-style-type: none"> To know the performance of NERICA rice varieties. To know the yield, yield components and agronomic traits of different NERICA rice varieties.
Methodology: Location Experimental design Plot size Planting Fertilization Cultural management Treatments	Namulonge Upland Rice Field RCB with 2 replications 2.1 m x 4 m (7 rows x 32 hills) Dibble 30 cm x 12.5 cm (26.6 hills / m ² 7seeds / hill) 40-20-20 N-P ₂ O ₅ -K ₂ O kg / ha 20-20-20 N-P ₂ O ₅ -K ₂ O kg / ha at 21 DAG and 20 kg N at PI Hand weeding twice at 3WAG and 6WAG V-1 NERICA-8 V-7 NERICA-14 V-2 NERICA-9 V-8 NERICA-15 V-3 NERICA-10 V-9 NERICA-16 V-4 NERICA-11 V-10 NERICA-17 V-5 NERICA-12 V-11 NERICA-18 V-6 NERICA-13
Data collection Plant Height Tiller number Flag leaf length Heading date Yield	28, 56 DAS and at Harvest 28, 56 DAS and Panicles at harvest At harvest First and 50% heading Paddy weight (14% Moisture content)

Yield components	<ol style="list-style-type: none"> 1. Panicle length 2. Shattering habit 3. Panicle number / hill 4. Grains / panicle 5. Filled grain ratio 6. 1000 grain weight
Meteorological data	Rainfall, Max. and Min. Temperature (5 days average) through the season
Sampling method	Plant height, tiller number, heading date, flag leaf and yield components were collected from 20 hills, while yield was collected from 3 m ² crop cut.
WATER APPLICATION TRIAL	
Objective:	<ul style="list-style-type: none"> • To know the water requirement of NERICA-4 at different water application rates. • To know the performance of NERICA-4 yield, yield components and agronomic traits at different water application rates.
Methodology: Location Experimental design Box size Planting Fertilization Cultural management Treatments	Namulonge Rice Screen house Single factor experiment 1 m x 1 m x 40 cm (4 rows x 6 hills) Dibble 25 cm x 16 cm (7seeds / hill) 40-20-20 N-P ₂ O ₅ -K ₂ O kg / ha 20-20-20 N-P ₂ O ₅ -K ₂ O kg / ha at 21 DAG and 20 kg N at PI Weed free T-1 10 L / 5days T-2 15 L / 5days T-3 20 L / 5days T-4 25 L / 5days T-5 30 L / 5days

Data collection	28, 36, 46 DAS and at Harvest
Plant Height	28, 36, 46 DAS and Panicles at harvest
Tiller number	At harvest
Flag leaf length	First and 50% heading
Heading date	Paddy weight (14% Moisture content)
Yield	1. Panicle length
Yield components	2. Shattering habit
	3. Panicle number / hill
	4. Grains / panicle
	5. Filled grain ratio
	6. 1000 grain weight
Meteorological data	Rainfall, Max. and Min. Temperature (5 days average) through the season
Sampling method	Plant height, tiller number, heading date, flag leaf and yield components were collected from 20 hills, while yield was collected from 3 m ² crop cut.

Table 1: Agronomic traits, yield and yield components of NERICA 8 – 18 under supplemental irrigation (April - July, 2006 Namulonge, Uganda)

Variety	Plant height		at harvest	Tiller number		Flag leaf length (cm)	Panicle exertion (cm)	Panicle length (cm)	Panicles / Hill	Panicles / m ²	Grains / Panicles	Filled grain ratio	1000 grains Weight	Yield / ha (kg)	50 % heading	Shattering habit
	28 DAS	56 DAS		28 DAS	56 DAS											
NERICA 8	47.5	84.1	98.8	6.4	8.0	34.4	-1.3	22.2	6.6	275.0	89.8	45.7%	28.6	3229	71	E
NERICA 9	46.8	87.2	105.0	6.7	7.5	32.1	-0.6	21.2	7.0	291.7	92.4	49.8%	29.0	3893	74	E
NERICA 10	38.3	74.9	102.7	7.3	7.0	29.8	2.5	22.1	7.1	295.9	94.8	73.6%	27.6	5705	69	VE
NERICA 11	45.5	85.0	100.3	5.8	6.7	30.0	-0.9	23.3	6.9	287.5	92.5	54.3%	28.6	4136	73	E
NERICA 12	40.4	78.1	115.2	6.0	7.0	28.9	-1.7	24.7	6.8	283.4	66.5	65.8%	32.6	4042	77	VE
NERICA 13	40.2	76.5	120.9	6.1	6.0	31.7	-2.0	25.6	4.2	175.0	96.9	64.2%	33.1	3608	77	VE
NERICA 14	42.1	79.7	96.3	6.1	7.1	29.2	4.3	23.4	5.4	225.0	94.9	63.6%	30.3	4114	67	E
NERICA 15	40.4	79.9	112.6	4.0	4.9	31.2	-2.7	23.9	3.9	162.5	61.4	16.2%	31.6	511	77	D
NERICA 16	41.2	77.0	109.9	3.6	4.6	27.8	-3.1	23.9	4.7	195.8	48.3	27.1%	31.5	809	70	D
NERICA 17	36.3	65.7	100.4	5.2	6.2	32.6	-1.1	23.3	4.5	187.5	58.2	65.0%	36.5	2593	79	E
NERICA 18	41.2	65.9	104.8	2.6	3.7	27.1	-2.4	22.8	4.1	170.8	60.4	33.5%	32.5	1123	86	D

5 days rainfall at NAARI (2006)

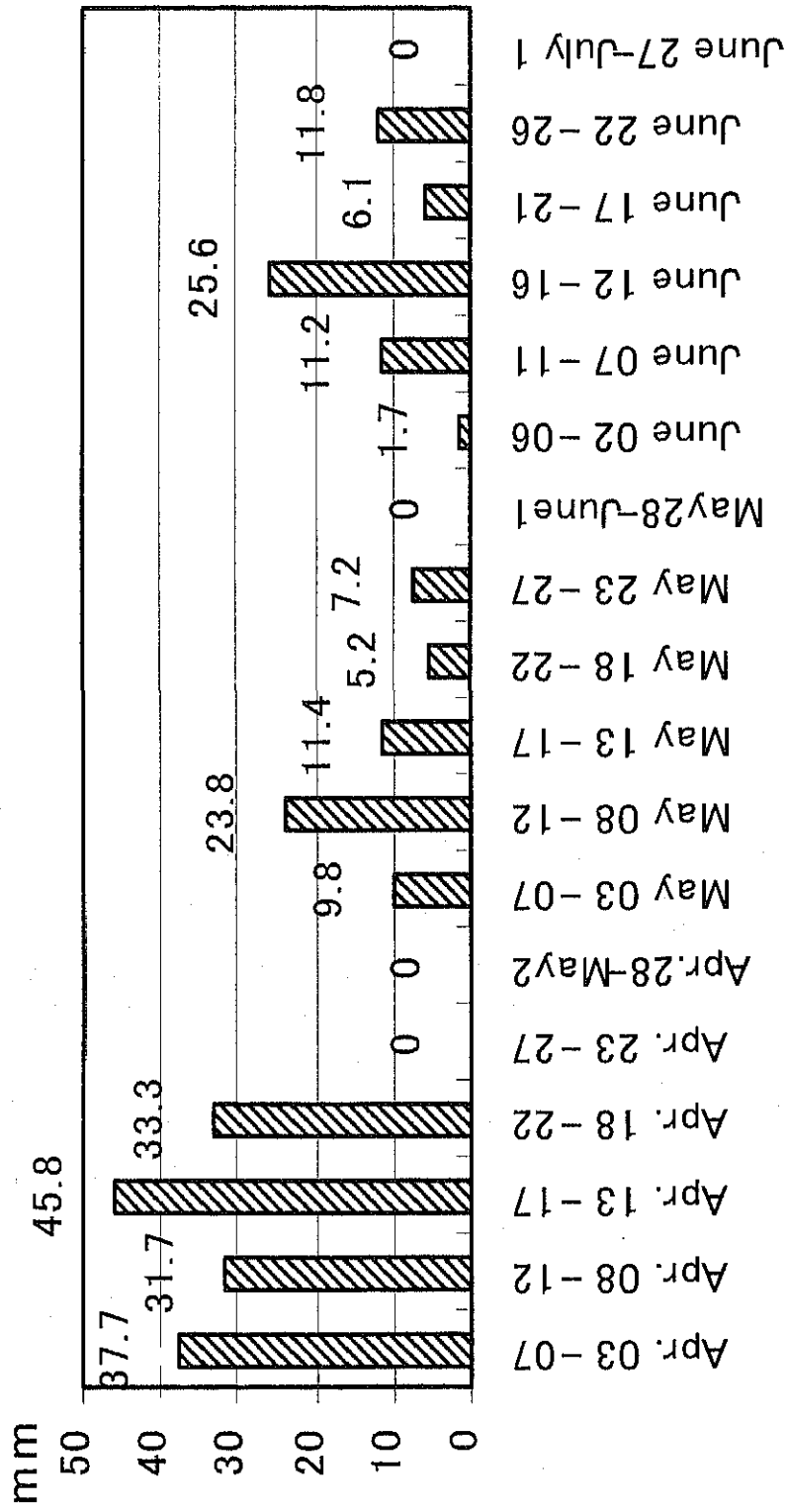
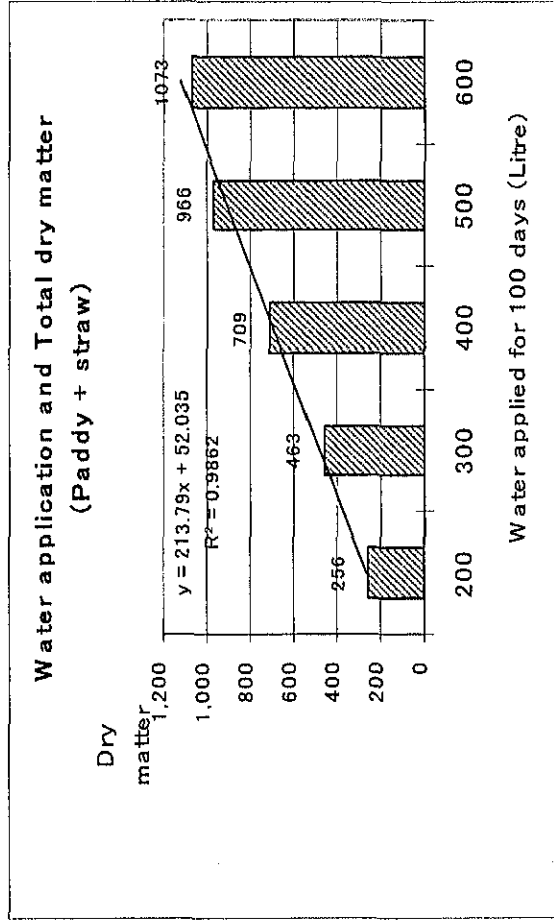
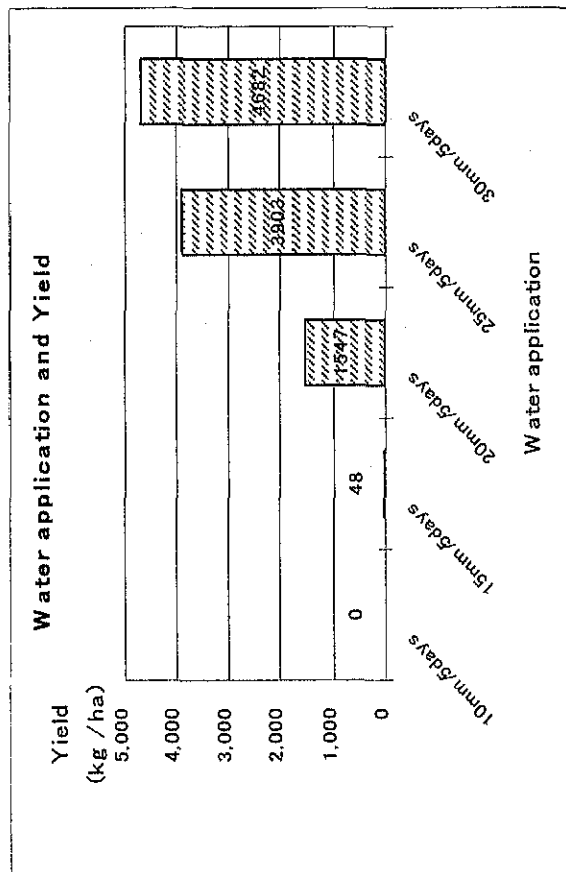
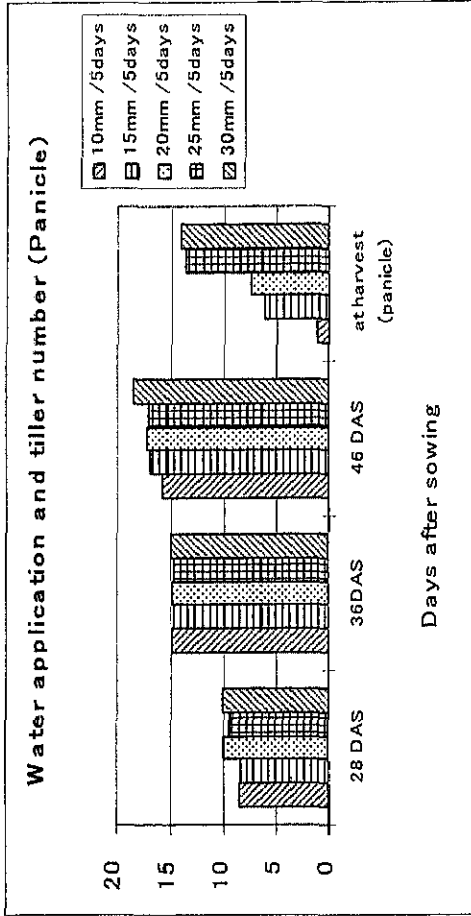
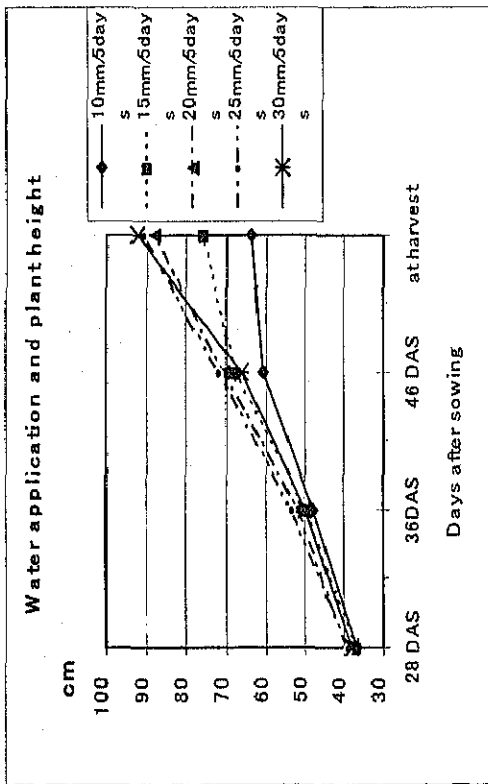


Table 2: Agronomic traits, yield and yield components of NERICA-4 during Water application trials

Water / 5days	Plant Height (cm)					Tiller Number				Panicle / hill	Grain / panicle	Filled G ratio	Total D.M kg/ha	1000GWT (g)	Yield kg/ha	Straw Wt (kg/ha)	Grain / straw ratio	Panicle length
	28DAS	36DAS	46DAS	100DAS	28DAS	36DAS	46DAS	46DAS										
T-1	36.9	48.0	61.0	63.6	8.0	14.9	15.8		1.2	29.0	0.0%	2,560	—	0	2,560	0%	7.3	
T-2	36.5	49.5	67.5	75.7	9.5	14.6	16.9		6.3	39.7	4.1%	4,628	20.3	48	4,580	1.1%	11.4	
T-3	39.0	51.5	70.6	86.0	11.0	14.9	17.6		7.5	94.4	42.9%	7,087	21.0	1,547	5,540	27.9%	15.5	
T-4	38.8	53.5	71.9	90.9	11.4	13.9	16.1		13.6	77.1	61.8%	9,663	24.1	3,903	5,760	67.8%	18.7	
T-5	37.8	50.0	66.3	92.4	11.5	15.0	18.5		14.0	82.3	61.6%	10,732	26.4	4,682	6,050	77.4%	16.4	



Findings from research

- Fe²⁺ toxicity effect on NERICA-1 and NERICA-4 under lowland condition.
- Rice Blast disease attack on NERICA-14.
- Poor grain filling of NERICA-15, 16, 17 and 18
- Presence of awned and non-awned NERICA-1 and NERICA-10.
- RYMV inoculation showed infection in all the NERICAs, most severe in NERICA-1 while Javanica varieties NARIC-1 and 2 showed high resistance

Constraints to research

The greatest challenge to upland research and production has been the erratic rainfall patterns resulting in severe drought damage during the periods 2005 to early 2006.

NERICA Dissemination Plan

Situation of NERICA dissemination

Implementation structure for NERICA dissemination	Development, promotion and dissemination of NERICA technologies is the responsibility of NARO / NaCRRI, in partnership with JICA, SG2000, VPO, APEP, NAADS and Farmer groups that help in the transfer of these technologies across Uganda, in form of rice cultivation training or demonstrations.
Variety release procedure	<ul style="list-style-type: none"> • NARO/ NaCRRI acquire a limited quantity of germplasm from WARDA or IRRI. • Germplasm bulked in buckets under water logged conditions. • Varietal screening and evaluation of new germplasm in comparison with previously released varieties for biotic and abiotic resistances. • Foundation seed multiplication • Variety is certified and released to seed companies for dissemination.
Seed production	NERICA seed is being grown bulked

Estimated area (ha) suitable for NERICA	83, 931 km ² 2 / 3 of Uganda					
Major cultivated area	Over 15,000 ha					
NERICA cultivation area	Time course change of cultivation area of NERICA					
	Variety	Year				
		2002	2003	2004	2005	2006
NERICA 4	6,000	8,000	10,000	12,000	15,000	

Constraints to NERICA dissemination in Uganda

- 1) Inadequate knowledge in rice farming especially for upland rice,
- 2) Strenuous and time consuming rice farm operations,
- 3) Lack of appropriate farm implements for rice farming, post harvest processing, value-addition, and for rural transportation,
- 4) High crop damage/loss caused by rice diseases and pests (including weeds),, and by poor crop handling and processing,
- 5) High cost and often scarcity of farm inputs (improved seed, farm implements and equipment, fertilizers, herbicides and pesticides, etc),
- 6) Inadequate options of rice varieties that meet biological attributes of early maturing, high yielding, resistance to drought, diseases and pests, yet also with good milling and cooking qualities, taste and aroma,
- 7) Absence of viable options to mitigate drought and floods in rice production;
- 8) Inefficient marketing system as reflected by low farm-gate and fluctuating commodity prices.
- 9) Narrow utilization base of rice with inadequate exploitation of rice by-products tends to discourage NERICA adoption.
- 10) Poor mechanisms for rice information access and sharing.

11) Inadequate sensitivity to gender and environmental concerns in rice production, processing and marketing.