Country D : KENYA

NERICA Research and Promotion in Kenya

Presented during a Joint Seminar on Sustainable Rice Farming in Africa, Accra Ghana

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On Behalf of Kenyan and JICA Team

Presentation Layout

- Brief History of Rice Cultivation in Kenya
- NERICA Introduction and Current Status
- NERICA Adaptability Trials
- Farmer's Perspective on the NERICAs
- Discussion and Conclusion

Brief History of Rice Cultivation in Kenya

- Introduced in the Country in 1907
- Total national rice production is
- Consumption is about
- The deficit imported (170,000
- Rate of increase in consumption

History cntd.

- Production fluctuates 65,000 - 80,000 MT
- Requirement > 285,000 MT
- Importation range 100,000 - 205,921 MT

	Yield per ha.	Potential (ha)	Current (ha)
Rainfed Rice	1.5 - 3.5 t/ha	100,000 ha	15,000 ha
Irrigated Rice	3.8 - 6.5 t/ha	650,000 ha	12,000 ha

GOAL

- To environmentally, socially and economically improve and revitalize the livelihoods and welfare of the Kenyan communities through increased NERICA production.

Project Support

- JICA Kenya   Mar 2003 – Mar 2005 Phase I
- AICAD   Mar 2005 – July 2007 Phase II
- AICAD   July 2007 – Dec 2009? Phase III

Rice imports, production and consumption in Kenya

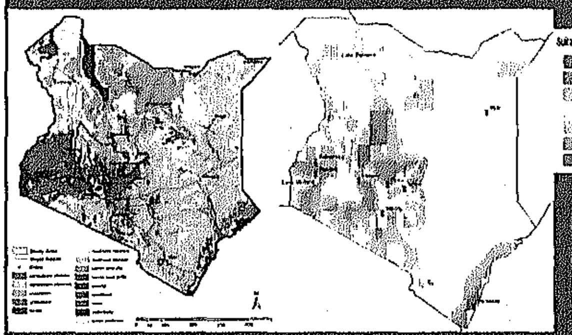
	Metric Tons				(%)
Year	Production	Importation	(Pakistan)	Consumption	increase
2005 (est)	85,000	225,951	0	310,951	8.8
2004	80,000	205,921	(150,651)	285,921	9.2
2003	70,000	191,777	(152,420)	261,777	35.2
2002	(65,000)	128,438	(131,658)	193,438	

Source: Centre for Business Information in Kenya (CBIK) of Export Promotion Council

NERICA Adaptability Trials and Current Status

- NERICAs Introduced to Kenya in 2002
- JICA Support 1st Trials at KARI Kibos 2003
- Preliminary Results Presented at JICA Conference, Nairobi Feb 2004 (AICAD)
- Impressive Performance of NERICA noted
- NERICA Committee Constituted after Conference
- JICA handed over to AICAD – March 2004
- NERICAs are Superior to Local Varieties
  - ❖ Grain Yields
    - ❖ [illegible]
    - ❖ Grain [illegible]
  - ❖ Drought and Weed Tolerance (Preliminary Results)
  - ❖ High Response to Fertilizers
  - ❖ Early Growth Vigour and Maturity

NERICAs tried in varied AEZs of different land use systems in Kenya



Participating Institutions and Scientists

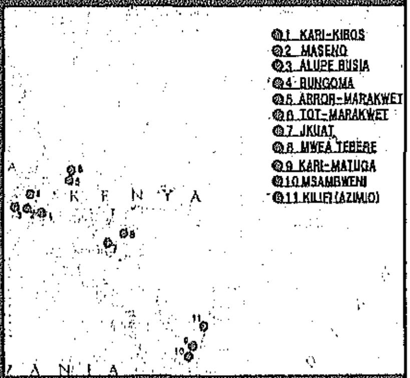
[illegible]

Sites for NERICA Trials in Kenya

Years	Sites	Remarks
2003	KARI Kibos	Long Rains March – June
2004	KARI Kibos, Masero, LBDA, SACRED Africa, Marakwet, UoN – Kabete, JKUAT-MIAD, CDA, TARDA	Long Rains March – June
2004	KARI Kibos, LBDA, SACRED Africa and MIAD	Short Rains Sept – Dec
2005	KARI Kibos, Masero, LBDA, SACRED Africa, Ahero & Tot-Marakwet, JKUAT-MIAD, KARI Matuga, CDA's Msambweni & K[illegible] and farmers fields	Long Rains March – June
[illegible]	KARI Kibos, Masero, LBDA, SACRED Africa, JKUAT-MIAD, KARI Mwea, KARI Matuga, CDA and farmers' fields	Long Rains March – June

Implementation Sites Since 2003

- ❖ Some sites Omitted:-
  - ❖ Nairobi's Kabete Campus was too cold
  - ❖ TARDA at TANA Delta sites had Management issues



Comparative NERICA Performance

- Grain Yield:
  - ❖ Aromatic irrigated rice (4.5 – 5.5 t ha⁻¹)
  - ❖ Non Aromatic irrigated rice (6 - 7 t ha⁻¹)
  - ❖ Non Aromatic upland rice 1.5 t ha⁻¹
  - ❖ NERICAs Yield Range 2.2 – 6.5 t ha
- Reduce importation of rice:
  - ❖ High yielding cultivars
  - ❖ Expanded area under cultivation
  - ❖ Reduction of field and storage losses

Mean Grain Yield and Agronomic Traits of Selected NERICA Cultivars (KARI Kibos 2005)

Variety	Grain yield (kg/ha)	1000 grain weight (gm)	Grains per panicle (No)	Filled grains (%)	Panicle length (cm)	Plant Height (cm)	Rep. Tillers (%)
IDSA 10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ITA 150 (FARO 46)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ITA [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
IAC [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WAB [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WAB 224-16-HB	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WAB [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WAB [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WAB [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WAB [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WAB [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WAB [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WAB [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WAB 450-I-B-P-160-HB	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WAB [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mean	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Range	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CV	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Means with the same letter in a column are not significantly different (DMRT)

Upland Rice Stress Screening Nursery for Drought (URSSN)

Cultivar	Grain Yield (kg ha⁻¹)	Days to maturity (no)	Filled grains (%)	Rep tillers (%)	Panicle length (cm)	Plant Ht (cm)
056 (FARO 11)	76.8	165	46	77.7	15.4	67.5
MOROBEREKAN	308.8	165	57	76.8	18.6	133.6
WAB450-11-2-BL1-DR1	1920.0	94	91	53.9	23.5	86.9
WAB450-11-2-BL1-DR2	1840.0	94	82	51.8	21.8	80.0
WAB450-12-2-BL1-DV4	475.2	165	56	80.3	16.5	67.4
WAB450-11-2-BL1-DV3	2160.0	94	87	67.4	21.1	79.0
WAB450-5-1-BL2-DV6	2400.0	94	73	53.0	20.1	75.8
WAB450-16-2-BL1-DR1	2480.0	94	86	44.0	21.2	85.9
WAB450-16-2-BL2-DR1	1920.0	94	85	40.7	22.1	85.3
WAB450-16-2-BL2-DV1	2600.0	94	86	43.5	21.5	90.6
Mean	1680.0	115	75	60.8	20.2	79.2
Range	76.8-2600	94-165	[illegible]	[illegible]	[illegible]	[illegible]

NERICA Adaptability Trials Kit (2004)

1. WAB 450 – I – B – P38 – HB (NERICA 1) Kibos
2. WAB 450 – 11 – 1 – 1 – P41 – HB (NERICA 10)
3. WAB 450 – 11 – 1 – 3 – P40 – HB
4. WAB 450 – 11 – 1 – 3 – P41 – HB
5. WAB 450 – I – B – P160 – HB (NERICA 6)
6. WAB 450 – 11 – 2 – BL1 – DR1
7. WAB 450 – 11 – 2 – BL1 – DR2
8. WAB 450 – 11 – 2 – BL1 – DV3
9. WAB 450 – 5 – 1 – BL2 – DV6
10. WAB 450 – 16 – 2 – BL1 – DR1
11. WAB 450 – 16 – 2 – BL2 – DR1
12. WAB 450 – 16 – 2 – BL2 – DV1 (NERICA 11)
13. ITA 150 (FARO 46) (TOX 502 – 41 – 1 – 1) CHECK
14. WAB 224 – 16 – HB (CHECK)

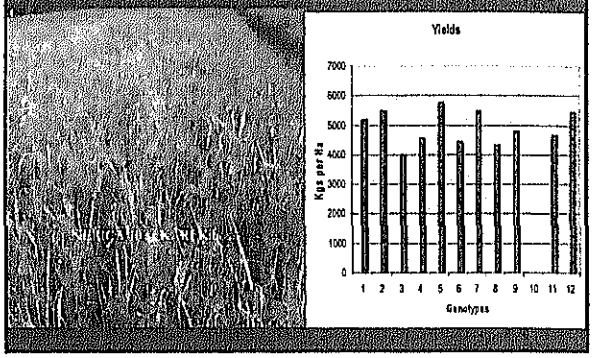
Entries 2005 LR

1. WAB 450-I-B-P38-HB (NERICA 1)
2. WAB 450-11-1-1-P41-HB (NERICA 10)
3. WAB 450-11-1-3-P40-HB
4. WAB 450-11-1-3-P41-HB
5. WAB 450-I-B-P160-HB (NERICA 6)
6. WAB 450-11-2-BL1-DR1
7. WAB 450-11-2-BL1-DR2
8. WAB 450-12-2-BL1-DV1
9. WAB 450-11-2BL1-DV3
10. WAB 450-5-1-BL2-DV6
11. WAB 450-16-2-BL1-DR1
12. WAB 450-16-2-BL2-DR1
13. WAB 450-16-2-BL2-DV1 (NERICA 11)
14. WAB 33-17 (CHECK)
15. ITA 150 (FARO 46) (TOX 502-41-1-1) CHECK
16. WAB 224-16-HB (CHECK)

Entries 2006 LR

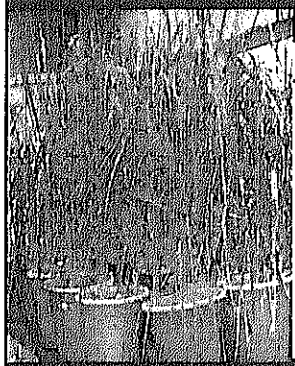
1.	WAB 450-I-B-P38-HB	(NERICA 1)
2.	WAB 450-11-1-P31-1-HB	(NERICA 2)
3.	WAB 450-16-2-BL2-DR1	
4.	WAB 450-11-2-BL1-DV3	
5.	WAB 450-I-B-P91-HB	(NERICA 4)
6.	WAB 450-11-1-P31-HB	(NERICA 5)
7.	WAB 450-11-1-3-P40-HB	
8.	WAB 450-11-1-3-P41-HB	
9.	DOURADO PRECOCE	(Local Check)
10.	WAB 224-16-HB	(Check 1)
11.	WAB 450-11-1-1-P41-HB	(NERICA 10)
12.	WAB 450-16-2-BL2-DV1	(NERICA 11)

NERICA Productivity at KARI Kibos 2006



NERICAs growing at Maseno University

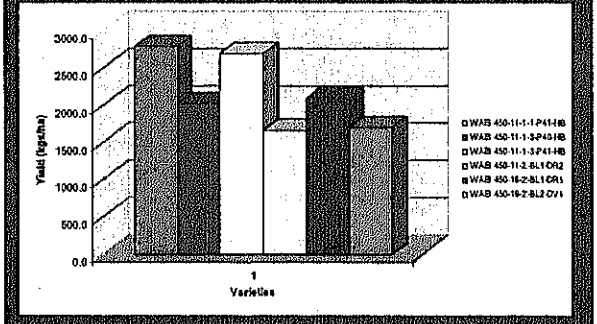
NERICAs - Maseno University Greenhouse & Field 2005



Field Trials

Cultivar	1000 grain Wt	Yield Kg/ha
WAB 450-16-2-BL2-DV1	25.9	2620
WAB 450-11-2-BL1-DR2	24.9	2464
WAB 450-16-2BL2-DR1	30.9	2235
KR-4	23.2	2579
WAB 450-11-1-3-P40-HB	22.9	1437
WAB 11-2-BL1-DV3	27.2	2365

Grain Yield of the most Promising NERICAs at LBDA Alupe-Busia 2004

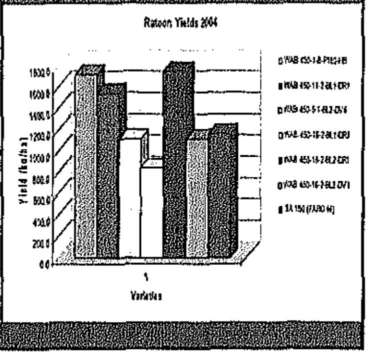


High Yielding NERICAs

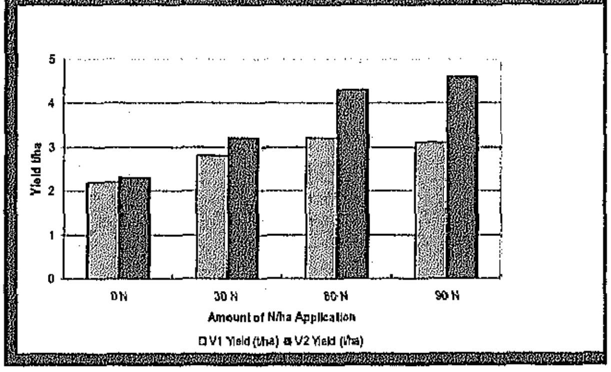
Maturity - 100 days

Yield - > 4.0 t/ha

Ratoon Yields 2004 season



Yield Response to N by the Promising NERICAs WAB 450-11-1-1-P41-HB (V1) WAB 450-11-1-1-3-P40-HB (V2)



Maturity Date & Yield at Sacred Africa 2005

Variety	Maturity Date	Yield (Kgs)
NERICA 4		
WAB 450-11-1-1-P41-HB	118	1470
WAB 450-11-1-3-P40-HB	123	900
WAB 450-11-1-3-P41-HB	110	868
WAB 450-1-B-P160-HB	123	804
WAB 450-11-2-BL1-DR1	132	421
WAB 450-11-2-BL1-DR2	118	2520
WAB 450-11-2-BL1-DV3	123	1366
WAB 450-5-1-BL2-DV6	123	853
WAB 450-16-2-BL1-DR1	132	1140
WAB 450-16-2-BL2-DR1	118	1286
WAB 450-16-2-BL2-DV1	118	973
ITA 150 (FARO 46) (TX 502-41-1-1) CHECK	118	1872
WAB-224-16-HB (CHECK)	118	1612

WAB450-16-2-BL2-DV1 Bungoma 2004

- Gave the highest yield at the Site (3.49 t/ha)
- During a very dry year
- Named - NERICA 11

Yield and Yield Components of NERICA Cultivars at SACRED Africa Bungoma (2004)

	Pan/ Hill	Fld Gr Pan	Unf Gr /Pan	Gr/Pan /Pan	% Fld Gr	1000 Gr wt	Yld (t/ha)
WAB 450 - 11 - 1 - 1 - P41 - HB	23.67	35.02	66.87	101.88	37.17	22.65	2.78
WAB 450 - 11 - 1 - 3 - P40 - HB	24.33	18.07	51.55	69.53	25.17	25.13	1.42
WAB 450 - 11 - 1 - 3 - P41 - HB	23.67	22.57	50.10	73.65	30.70	21.91	1.61
WAB 450 - 1 B - P160 - HB	31.00	25.51	53.20	78.71	32.40	23.58	2.20
WAB 450 - 11 - 2 - BL1 - DR1	21.00	33.83	52.79	84.66	39.98	32.03	2.86
WAB 450 - 11 - 2 - BL1 - DR2	15.00	20.95	74.76	95.71	22.05	22.71	1.41
WAB 450 - 11 - 2 - BL1 - DV3	16.67	27.48	59.57	87.05	32.33	25.03	1.93
WAB 450 - 5 - 1 - BL2 - DV6	12.00	22.76	102.80	125.57	18.12	25.90	1.39
WAB 450 - 16 - 2 - BL1 - DR1	19.67	16.99	47.60	64.59	27.20	31.89	1.86
WAB 450 - 16 - 2 - BL2 - DR1	20.67	12.25	30.33	42.58	35.77	29.25	1.25
WAB 450 - 16 - 2 - BL2 - DV1	24.00	32.63	54.58	87.21	33.81	28.36	3.49
ITA 150 (FARO 46) CHECK	20.67	15.95	41.73	57.69	27.90	31.17	2.42
WAB 224 - 16 - HB (CHECK)	19.00	47.21	74.51	115.09	41.00	25.27	[illegible]
CV (%)	46.47	36.65	52.13	43.43	37.58	31.04	15.49
LSD (0.05)	ns	13.78	ns	ns	17.67	12.24	1.43
LSD (0.01)	ns	18.67	ns	ns	23.94	16.59	1.37

Maturity days and Yield Components at NIB Mwea

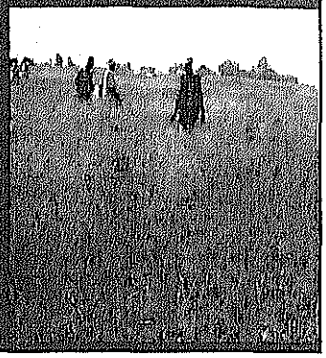
Variety	1000 Grain Wt	Yield (Kg/ha)	Maturity
WAB 450-1-B-P-38-HB (1)	24	2631	116
WAB 450-11-1-1-P41-HB(2)	21	3490	113
WAB 450-11-1-3-P40-HB(3)	23	3698	113
WAB 450-1-B-P91-HB (4)	22	3202	122
WAB 450-1-B-P160-HB(5)	23	2681	131
WAB 450-11-2-BL1-DV3(CHECK 1)	24	3329	123
WAB 450-16-2-BL1-P-DR1(CHECK 2)	31	2257	121
SE	1	826	102
5% LSD	2**	2596	7**

Yield and Growth parameters at KARI Mtitugu (2005)

Variety	Maturity Date	Yields (Kg)	Grain/panicle	Panicle Length
Replicates				
Nerica 2	103	5.92	114	25.8
WAB 56-1B	106	3.31	126	24.15
WAB 450-16-2-BL-DV1	106	3.76	128	23.3
WAB 450-11-1-3-B41-HB	108	3.78	121	18.8
WAB 450-11-2-BL-DR1	101	3.26	108	21.45
Nerica 4	100	2.22	170	23.15
WAB 450-11-1-P40-HB	108	5.77	111	23.35
IITA 150 (FARO 46)	102	3.14	127	21.6

Farmer perspective on the NERICAs

- FARMERS AMAZED BY NERICA AS AN UPLAND CROP
- FARMERS WANT THESE VARIETIES YESTERDAY
- HIGH POTENTIAL FOR YIELD IMPROVEMENT IN FARMERS' FIELDS



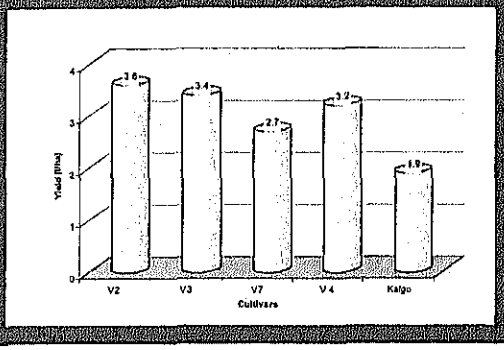
On Farm Varietal Trials in Western Kenya

NERICAs the greatest promise to Farmers in Kenya (Bungoma)

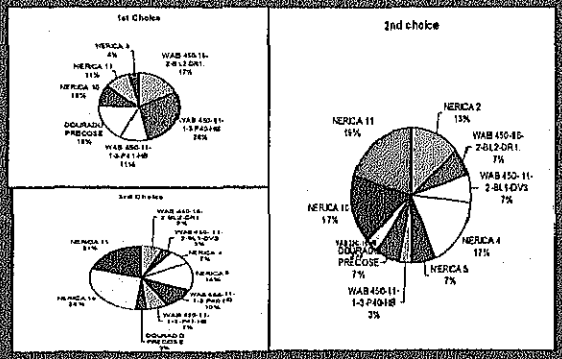
NERICA growing in Farmers' Field in Bungoma

Three NERICA Lines in a Farmer's Field Teso

Grain Yield of NERICAs in Teso Farmer's Field

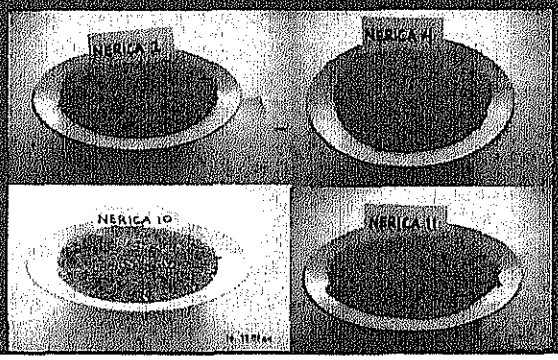


Farmers' Choice of NERICA Rice at KARI Kibos

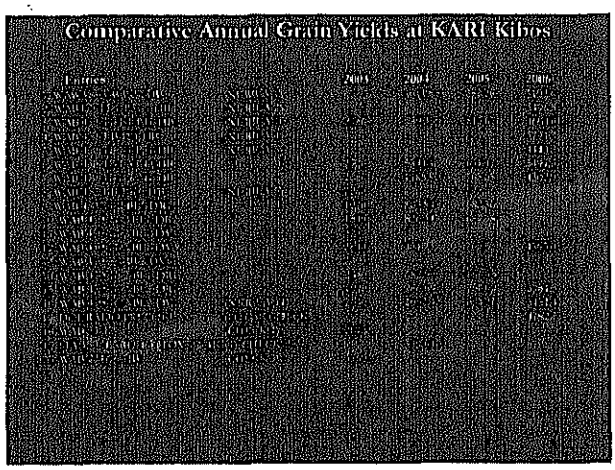


NERICA 4 at Kagio and Alupe Busia

Quality NERICA Seeds



Comparative Annual Grain Yields at KARI Kibos



Achievements:

- Training and Harmonization of adaptability trials researchers
- Four NERICAs Advanced to NPTs:
  - ✓ NERICA 1
  - ✓ NERICA 4
  - ✓ NERICA 10
  - ✓ NERICA 11
- Four highly Promising cultivars namely:
  - ✓WAB 450 – I1-1-3-P40-HB
  - ✓WAB 450 – I4-1-3-P41-HB
  - ✓WAB 450 – I12-BL1-DR1
  - ✓WAB 450 – I62-BL1-DR1
- Seed building of the cultivars conducted
  - Breeders seed for multiplication
- Registration process for selected cultivars initiated through the NERICA Technical Committee

Implementation Constraints

- Land Preparation
- Suitable Varieties
- Weed Control among others *Striga hermonthica*
- Soil Fertility
- Water Management
- Segregation Prominent in esp. NERICA 10
- Budget Limitations

Site Specific Problems

- Poor Cold Tolerance (Kabete, JKUAT, Mwea) Testing FOFEA
- Nutritional Deficiency (Kilifi, Matuga, Marakwet Arror and Tot) Foliar Feed
- *Drought and Poor rainfall Distribution (most sites)* – Proper timing
- Flooding Kwale at Msambweni – Proper Drainage
- Weeds Especially Striga in Teso and Nyando

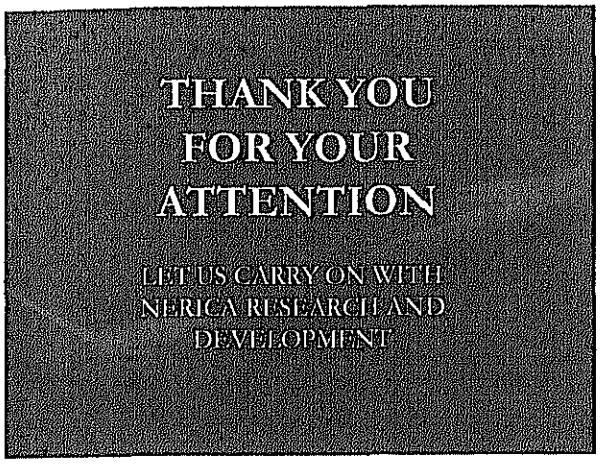
Striga infestation at Apokor WG, Teso

Way Forward

- Varietal selection and seed multiplication of NERICAs
- NERICA Registration with KEPHIS
- NERICA on Farm Verification Trials
- Production and maintenance of basic NERICA seed
- Integrated weed management
- Evaluation of farm mechanization and implements
- Evaluation of chemical pesticides
- Planting Methods and Spacing of NERICAs
- NERICA Production Manual
- NERICA Dissemination

Acknowledgement

- JICA
- WARDA
- AICAD
- KARI
- Collaborating Institutions
  - Mr. Esibot
- Other Partners
  - KEPHIS


THANK YOU
FOR YOUR
ATTENTION
LET US CARRY ON WITH
NERICA RESEARCH AND
DEVELOPMENT

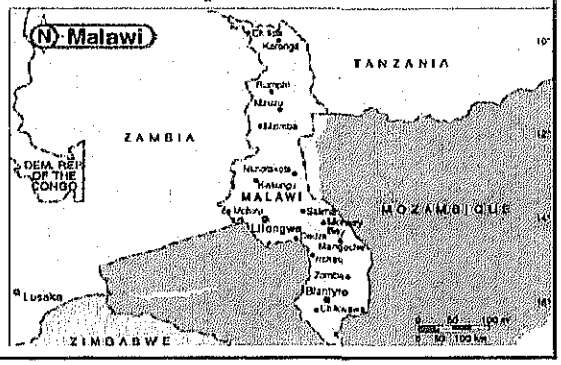
Country E : MALAWI

NEW RICE FOR AFRICA (NERICA) RESEARCH IN MALAWI.

W. A. Kanyika, C. J. J. Imani and J. Masangwa.

Introduction

Map of Malawi



Constraints of upland rice production

1. Lack of suitable varieties
2. Lack of production technologies.
3. Insect pests (stem borers)
4. Diseases (blast and brown spot)
5. Termites
6. Drought
7. Rats
8. Iron toxicity
9. Heavy weed infestations

Nerica Research in 2005/2006

- **Three trials were conducted**

1. Varietal trial on Nerica in different areas of Malawi.
   Objective: To determine the performance of Nerica in different areas of Malawi.
2. Effect of N application on Nerica 1.
   Objective: To know the appropriate N level for Nerica
3. Effect of different plant spacing on Nerica 1.
   Objective: To determine the optimum spacing for Nerica.

Materials and Methods

Treatments (varietal trial)

- NERICA 1
- NERICA 2
- NERICA 3
- NERICA 4
- NERICA 5
- NERICA 6
- NERICA 7
- NARIC 1
- NARIC 2

LOCAL VARIETY

Materials and Methods

- Treatments (Nitrogen trial)

Treatment	22 DASE	40 DASE	PI stage
T1: Control (no fertilizers)	0	0	0
T2: 0-20-20 (PK)	0-20-20	0	0
T3: 30-20-20 (NPK)	10-20-20	10-0-0	10-0-0
T4 : 60-20-20 (NPK)	20-20-20	20-0-0	20-0-0
T5: 90-20-20 (NPK)	30-20-20	30-0-0	30-0-0
T6: 120-20-20 (NPK)	40-20-20	40-0-0	40-0-0

Materials and Methods

- Treatments (Spacing trial)
- T-1: Dibble 25 x 12.5 cm (32 hills/m^2), 7 seeds/hill (60 kg/ha)
- T-2: Dibble 30 x 12.5 cm (26.7 hills/m^2, 7 seeds/hill (50 kg/ha)
- T-3: Dibble 30 x 15 cm (22.2 hills/m^2), 7 seeds/hill (42 kg/ha)
- T-4: Drill 30 x 1.5 cm (222.2 hills/m^2, 1 seed/hill (60 kg/ha)
- T-5: Drill 30 x 1.8 cm (185 hills/m^2), 1 seed/hill (50 kg/ha)
- T-6: Drill 30 x 2.1 cm (159 hills/m^2), 1 seed/hill (43 kg/ha)

Results and discussion

Table1: Evaluation of performance of upland rice varieties (Nerica) at Lifuwu in 2005/2006.

Variety	Grain yield (kg ha^{-1})	Pan m^{-2}	Spik/pan	Ripening ratio (%)	1000 gwt (gm)	Plant height (cm)	Pan length (cm)	Shattering	Milling yield (%)	Head rice (%)
Nerica 1	4560.3	190	99	80.3	28.6	76.1	23.7	Medium	75.3	40
Nerica 2	4476.9	187	105	80.9	28.4	76	23.8	Medium	74.7	53
Nerica 3	1765.0	81	91	81	26	33.1	19.5	Medium	75.2	35.1
Nerica 4	3954.1	179	101	77.9	27.7	70.2	22.7	Medium	74.2	47.3
Nerica 5	3954.0	218	81	80.5	25.4	76	22.2	Medium	75.1	43.6
Nerica 6	1001.0	75	68	58.4	27	55	19.9	Medium	73.3	49.5
Nerica 7	1019.6	79	66	66.3	29.7	54.1	19.7	Slightly strong	76.2	37.2
Naric 1	3833.2	113	65	74.6	31.1	59.4	19.1	Slightly strong	74	40.2
Naric 2	1928.3	126	77	68.4	30.6	52.6	24.3	Medium	76.2	40.6
Local	3792.5	226	72	63	35.6	79.2	21.5	Medium	66.4	24.2
Mean	2872.6	147	86	73.1	29	63.2	21.5		74.06	41.07
Significance	*	*	Ns	*	*	Ns	Ns			
S.E.±	712.9	24.8	8.4	4.1	0.9	12.5	2.6			
CV%	33.7	23.8	13.8	7.8	4.2	28	16.9			

* Significant at 5%, Ns not significant

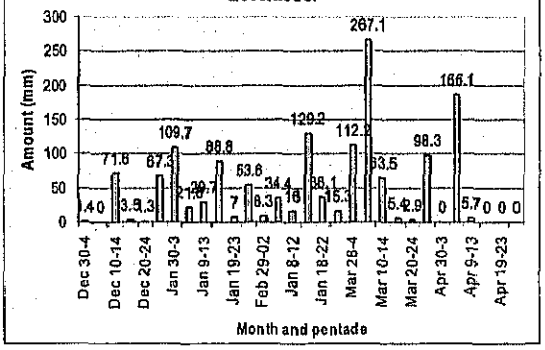


Table 2: Evaluation of performance of upland rice varieties (Nerica) at Chitedze in 2005/2006.

Variety	Grain yield (kg ha^{-1})	Pan m^{-2}	Spik/pan	Ripening ratio (%)	1000 gwt (gm)	Plant height (cm)	Pan length (cm)	Shattering
Nerica 1	1566.3	222	63	45.1	25.1	70.8	19	Medium
Nerica 2	1703.5	222	71	49.8	22.4	73.4	20.1	Medium
Nerica 3	1747	210	68	50.2	25.0	74.3	18	Slightly strong
Nerica 4	2739.9	179	86	71.2	25.1	75.6	18.8	Slightly strong
Nerica 5	1195.2	129	77	52.9	25.4	67.8	18	Slightly strong
Nerica 6	645.1	124	67	32.6	23.7	69.6	18.5	Medium
Nerica 7	1649.9	182	68	54.3	29.0	79.9	18.9	Medium
Naric 1	1668.3	178	49	64.2	30.0	72.1	17.8	Medium
Naric 2	1880.8	187	56	64.5	28.8	74.1	18	Medium
Mean	1644.1	181	66	53.7	26.0	73	18.5	
Significance	Ns	Ns	Ns	*	*	Ns	Ns	
S.E.±	312.4	23.9	10.4	5.4	1.0	2.9	0.6	
CV%	26.9	18.7	22.4	14.1	5.2	5.6	4.5	

* Significant at 5 % level, Ns not significant

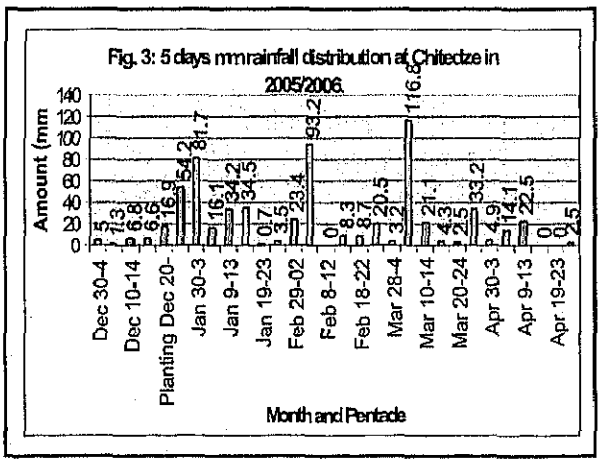


Table 3: Evaluation of performance of upland rice varieties (Nerica) at Mera in 2005/2006.

Variety	Grain yield (kg ha^{-1})	Pan m^{-2} (nos)	Spik/pan (nos)	Ripening ratio (%)	1000 gwt (gm)	Plant height (cm)	Pan length (cm)	Plant height at 55 DASE (cm)	Tillers at 55 DASE	Shattering	Days to 50 % flowering
Nerica 1	2636.2	146	78	81	29	66	19	50	6	Medium	86
Nerica 2	2599.4	190	64	74	29	69	20	40	7	Medium	82
Nerica 3	2869.3	159	80	82	28	73	18	55	7	Slightly strong	81
Nerica 4	3028.6	170	90	77	27	76	18	49	7	Slightly strong	69
Nerica 5	2462.1	194	65	72	28	67	17	49	7	weak	78
Nerica 6	1538.6	134	84	53	27	61	19	50	7	weak	94
Nerica 7	2218.7	147	63	73	32	77	17	47	7	weak	83
Naric 1	2128.3	130	57	81	32	73	17	49	7	Medium	79
Naric 2	2206	173	55	78	31	76	17	50	6	weak	84
Local								39	7		92
Mean	2489.5	160	71	74	29	73	18	48	7		
Significance	Ns	Ns	Ns	*	*	*	Ns	Ns	Ns		
S.E.±	399.9	24	9	5	0.6	2.7	1.2	4	0.7		
CV%	19.6	21.2	17.3	9	2.8	5.3	9.6	12.6	14.3		
LSD (0.05)				11	1.3	6					

* Significant 5 % level, Ns not significant

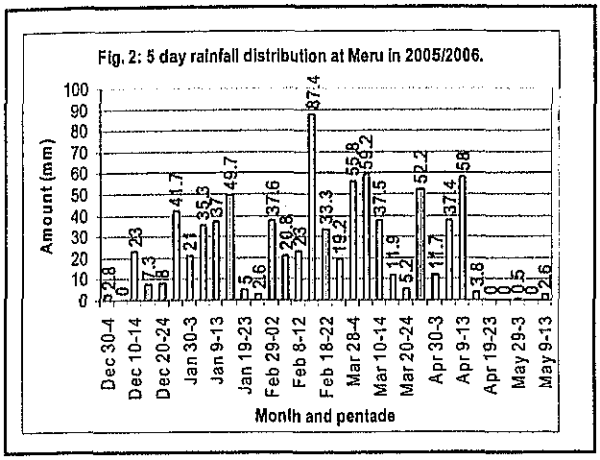


Table 4 : Effect of different N rates on Nerica 1 at Lifuwu in 2005/2006.

Treatment	Grain yield (kg/ha)	Pan/m² (#)	Spik/pan (nos)	Ripening ratio (%)	1000 gwt (gm)	Plant height (cm)	Panicle length (cm)
No fertilizer	4407.4	167	138	78.7	30.4	86.5	20.6
$N_0 P_2O_5 K_2O$	4554.0	167	114	81.9	29.6	78.1	21.3
$N_{30} P_2O_5 K_2O$	4605.7	160	135	85.9	29.6	90.1	20.6
$N_{60} P_2O_5 K_2O$	4166.9	227	216	73.4	28.8	87.5	22.0
$N_{90} P_2O_5 K_2O$	4429.1	211	206	77.6	28.9	79.5	22.6
$N_{120} P_2O_5 K_2O$	4711.6	202	204	69.6	29.6	101.7	22.5
Mean	4479.1	192	169	78	29.5	87.2	21.6
Significance	Ns	Ns	Ns	Ns	Ns	Ns	Ns
S.E.	722.1	15.9	20.8	4.2	0.3	5.2	0.2
CV%	22.8	11.7	17.4	7.6	1.5	8.5	1.5

Ns not significant

Table 5 : Effect of different N rates on Nerica 1 at Meru in 2005/2006.

Treatment	Grain yield (kg/ha)	Pan/m² (#)	Spikelets/ panicle (#)	Ripening ratio (%)	1000 gwt (gm)	Plant height (cm)	Panicle length (cm)
No fertilizer	901.5	60	66	88	30	60	17
$N_0 P_2O_5 K_2O$	2495.9	140	83	77	28	67	17
$N_{30} P_2O_5 K_2O$	2162.3	143	62	84	29	63	18
$N_{60} P_2O_5 K_2O$	2397.3	150	71	82	29	65	18
$N_{90} P_2O_5 K_2O$	2914.7	157	92	74	28	74	18
$N_{120} P_2O_5 K_2O$	2756.1	135	99	77	28	75	19
Mean	2271.3	134	79	80	29	67	18
Significance	+	+	+	Ns	Ns	Ns	+
S.E.	388.1	15	7	6	1	2	0.1
CV %	24.2	15.7	12.4	11.4	4.7	7.4	1.0

Ns not significant, + sinificant at 10 %

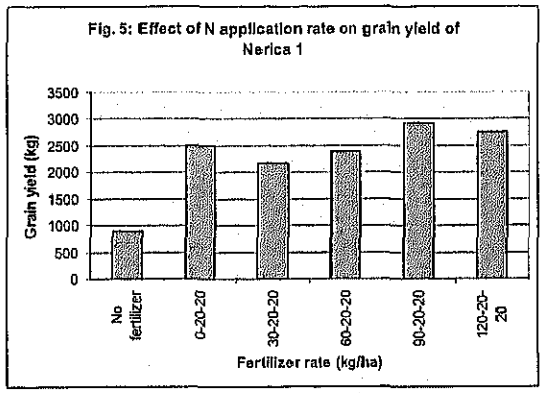


Table 6: Effect of different N rates on Nerica 1 at Chitedze in 2005/2006.

Treatment	Grain yield (kg/ha)	Pan/m² (#)	Ripening ratio (%)	1000 gwt (gm)	Plant height (cm)	Panicle length (cm)
No fertilizer	1027.5	122	47.3	25.1	69.6	18.8
$N_0 P_2O_5 K_2O$	1830.5	184	71.2	25.8	68.6	17.9
$N_{30} P_2O_5 K_2O$	1068.2	200	39.2	23.2	73.4	19.5
$N_{60} P_2O_5 K_2O$	1821.0	210	47.7	25.1	75.2	20.0
$N_{90} P_2O_5 K_2O$	2492.5	243	46.4	23.9	80	21.3
$N_{120} P_2O_5 K_2O$	1489.5	196	42.7	26.3	73.2	21.2
Mean	1621.5	193	49	24.9	73.3	19.8
Significance	Ns	+	Ns	Ns	Ns	Ns
S.E.	531.4	13	6.1	0.8	1.7	0.9

Ns not significant, + significant at 10 % level

Table 7: Effect of different N rates on Nerica 1 at Mbawa in 2005/2006.

Treatment	Grain yield (kg/ha)	Pan/m² (#)	Spikelets/ panicle (#)	Ripening ratio (%)	1000 gwt (gm)	Plant height (cm)	Panicle length (cm)
No fertilizer	1258.4	126	53	67.9	37.7	57.7	22.4
$N_0 P_2O_5 K_2O$	1366.4	146	60	65.0	38.5	60.3	21.6
$N_{30} P_2O_5 K_2O$	1787.8	145	74	59.6	38.1	59.3	17.9
$N_{60} P_2O_5 K_2O$							
$N_{90} P_2O_5 K_2O$	1207.1	135	65	52.7	37.3	55.9	21.4
$N_{120} P_2O_5 K_2O$	1493.3	124	71	63.7	36.0	55.1	17
Mean	1422.6	135	63	61.8	37.5	57.7	20.1
Significance	Ns	Ns	Ns	Ns	Ns	Ns	Ns
S.E.	126.8	9	7	5.7	0.7	1.9	3.9
CV %	17.8	13.5	22.4	16.5	2.7	3.4	27.5

Ns not significant

Table 8. Effect of different plant spacings on NERICA-1 at Lifuwu in 2005/2006.

Method	Spacing	Grain yield (kg/ha)	Pan/m2 (#)	Spik/pan (#)	RR (%)	1000 gwt (gm)	Plant height (cm)	Pan length (cm)
Dibbling	25 cm x 12.5 cm	6323.4	262	112	78	28	105	23
	30 cm x 12.5 cm	2812.9	176	102	60	26	83	23
	30 cm x 15 cm	4304.7	191	101	80	28	95	23
Drilling	30 cm x 1.5 cm	4758.7	286	80	72	30	100	22
	30 cm x 1.8 cm	3769.8	220	91	82	30	96	22
	30 cm x 2.1 cm	5976.3	227	106	78	28	93	21
Mean		4657.6	227	98	75	28	95	22
Significance		*	Ns	Ns	Ns	Ns	Ns	Ns
S.E.		567.2	33	12	6	1	9	1
CV%		17.2	20.4	17.5	11.9	6.3	13.8	9.4
LSD		1458.2						

* Significant at 5 % level, Ns not significant, RR ripening ratio

Table 9: Effect of different plant spacings on NERICA-1 at Mbawa in 2005/2006.

Method	Spacing	Grain yield (kg/ha)	Pan/m2 (#)	Spik/pan (#)	RR (%)	1000 gwt (gm)	Plant height (cm)	Pan length (cm)
Dibbling	25 cm x 12.5 cm	1325.9	157	99	37.5	29.7	66.2	18.2
	30 cm x 12.5 cm	1247.5	113	93	54.3	27.5	61	17.6
	30 cm x 15 cm	923.1	104	86	48.6	28.2	65.8	18.6
Drilling	30 cm x 1.5 cm	1154.1	168	72	41.9	28.8	59.7	16.8
	30 cm x 1.8 cm	1327.9	135	77	57.8	27.8	64.2	18.2
	30 cm x 2.1 cm	1032	101	87	54.3	27.7	57.6	18.6
Mean		1168.4	129	86	49.1	28.3	62.4	18.0
Significance		Ns	0.05	Ns	*	Ns	Ns	Ns
S.E.		124.7	10.7	8	3.0	0.5	3.2	1.0
CV%		15.1	11.7	13	8.5	2.7	7.2	7.8
LSD			27		7.6			

Ns not significant, * significant at 5 %

Table 10: Effect of different plant spacings on NERICA-1 at Chitedze in 2005/2006.

Method	Spacing	Grain yield (kg/ha)	Pan/m2 (#)	Spik/pan (#)	RR (%)	1000 gwt (gm)	Plant height (cm)	Pan length (cm)
Dibbling	25 cm x 12.5 cm	959	207	47	44	22.9	66.7	17.6
	30 cm x 12.5 cm	1538	176	73	55	22.9	70.9	17.9
	30 cm x 15 cm	1211	178	67	45	23.1	73.3	18.5
Drilling	30 cm x 1.5 cm	2012	212	81	48	23.4	72.7	19.0
	30 cm x 1.8 cm	2057	301	48	28	23.5	72.0	18.5
	30 cm x 2.1 cm	1717	223	61	55	23.3	68.9	17.7
Mean		1582	216	63	46.0	23.2	70.8	18.2
Significance		Ns	Ns	Ns	Ns	Ns	Ns	Ns
S.E.		391	33.9	6.8	8.1	0.7	2.1	0.5
CV%		34.9	22.2	15.4	25.2	4	4.1	4

Ns not significant

Summary and conclusion

- Varieties showed significant differences only at Lifuwu.
- Nerica 1 was the best at Lifuwu and Nerica 4 at chitedze and Meru.
- N application did not increase grain yield and yield components at Lifuwu, Chitedze and Mbawa.
- Grain yields were increased by N application at only at Meru. The best N rate was 90 kg N/ha.

Summary and conclusions

- Spacing showed variations on grain yield only at Lifuwu
- The spacing of 25 cm x 12.5 cm and 30 cm x 2.1 cm were the best.
- The method of drilling was better than dibbling.

Thank you for giving me the necessary attention.