JAICAF Seminar (Ghana)

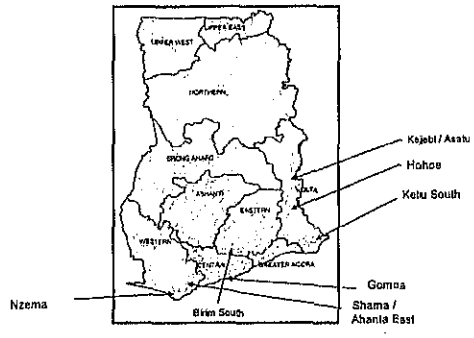
EXTENSION OF TECHNOLOGIES FOR SUSTAINABLE FOOD PRODUCTION IN GHANA

Presentation of results of 3-year study conducted by GIDA in collaboration with JAICAF
in
the Coastal Savannah zone of Southern Ghana

OUTLINE OF ACTIVITIES FOR THE 3-YEAR STUDY (2004 – 2006)

Year	Activity
2004	i.Socio -economic study of farm households ii.Experimental cultivation of NERICA Nerica 1 - 7
2005	Verification trial – Farmers' field
2006	Verification trial – Farmers' field

Districts and communities covered in the socio-*economic survey (Southern Ghana*



Summary of results and characteristics of rice base farming system in Southern Ghana

- Earliest time of rice cultivation was during the 1960's.
- *Around the year 1970, eight (8) out of the farmers* interviewed were already cropping rice.
- Cultivation in the early years was largely based on rain fed system.
- Irrigation system of rice cultivation became operational in 1980 at Afife and 2000 in Okyereko.

cont.

- Where irrigation facility does not exist, rice is cultivated in association with crops such as maize, cassava, okra, sugar-cane etc.
- Earnings from livestock, poultry and in some cases fish farming constitute a large percentage of household income.
- Few indications of high profitability at the irrigation sites exist, though sustainability is doubtful.

Categorization of rice base farming system in Southern Ghana

- Cultivation ecology is mainly rain fed lowland and irrigation, with very little upland situations.
- Holdings per household is relatively small (about 0.4 of a hectare *averagely).*
- Cassava, maize and some vegetables especially okra are the other crops that are cultivated largely.
- Small ruminants and limited number of poultry in free range, forms an important part of household income.
- Rice cultivation provides only a third or less of the total household income.

EXPERIMENTAL CULTIVATION OF NERICA – 2004

- Objectives:
- To study the performance of NERICA varieties in different agro- ecological zones.
- To know the yield, yield components and agronomic traits of NERICA varieties.
- To multiply and obtain pure seeds for subsequent cultivation.

Outline of cultural method

Planting	Transplanting Nursery of 21 days 25 cm. x 15 cm.
Field Condition	Irrigated
Plot design / Plot size	Block by seed source, 2.0 m x 5.0m, 8 rows x 34 hills, 2 replications
Fertilizer : NPK kg / ha.	20:20:20 plus N 20 at 20DAT

Results and Analysis

	Pht. Ht. cm.	No. of Panl. / Hill	50% Heading	No Spikelets / Panicle	Ripen ratio	No. of Days to Maturity	Wt. of 1000 filled Grains g	Yield kg / ha	
								Cal.	Actual
Variety	a - b	a - b	a - b	a - b	a - b	a - b	a - b	1	2
N - 1	99 - 92	4.7 - 5.7	73 - 76	68 - 85	81 - 79	105 - 106	31.1 - 29.6	2,618	3,494
N - 2	108 -105	6.5 - 5.6	75 - 74	110 - 93	80 - 75	106 - 104	26.9 - 25.9	3,371	3,536
N - 3	105 -107	4.8 - 5.6	76 - 74	100 - 97	75 - 73	105 -104	27.2 - 28.4	2,790	2,910
N - 4	102 -104	5.1 - 5.3	77 - 76	101 - 96	74 - 72	107-108	27.3 - 29.0	2,814	2,880
N - SW	97	5.6	74	94	74	104	25.8	2,673	2,961
N - 6	117 - 116	4.4 - 4.6	78 - 81	136 -125	70 - 65	108 -111	27.6 - 27.6	2,832	3,278
N - 7	112 -110	4.1 - 4.1	78 - 78	86 - 89	79 - 75	108 -109	31.0 - 31.8	2,291	3,196
TOX 3377	108 -103	5.4 - 5.0	82 - 85	83 - 98	88 - 88	112 -115	30.2 - 30.0	2,924	3,215

VERIFICATION TRIAL: farmers field - 2005 { Selection of farmers to participate }

Name	Sex	Age	Region	Farming System	Location
Hope *AFEDOH*	Male	39	Gt.Accra	Rice Okra Maize Goats Poultry	Ashaiman
Faustina ANNOBIL	Female	49	Central	Rice Maize Livestock	Okyereko

Objectives of the verification trial

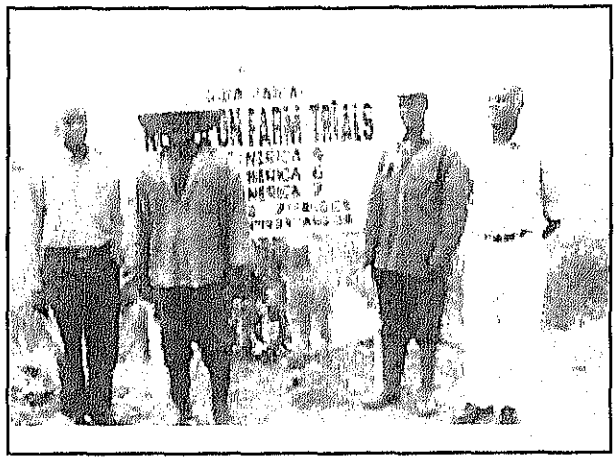
To ascertain the technological and economic relevance of incorporation of Nericas into agricultural systems of farmers.

Method and design of verification Trial

Site	Ashaiman	Okyereko
Name of Farmer	Hope AFEDOH	Faustina ANNOBIL
Planting	Transplanting (22 days nursery) 25cm x 15cm (1 seedling / hill)	Transplanting (21 days nursery) 25cm x 15cm (1 seedling / hill)
Varieties	Nerica 4, 6, 7	Nerica 1, 2, 3
Field Condition	Irrigated	Irrigated
Plot Design	RCBD: 2 replications	RCBD: 2 replications
Fertilizer	NPK kg / ha. *83.5 : 37.5 : 37.5* 15:15:15 (Basal) + N 46% (49 DAT)	NPK kg / ha. *83.5 : 37.5 : 37.5* 15:15:15 (Basal) + N 46% (48 DAT)

Results and analysis

iety	Plt. Ht. cm.	No. of Panicles / Hill	50% Heading	No. of Spiklets / Pani.	Ripen ratio	Days to Maturity	Wt. g 1000 filled grains	Yield kg / ha. calculated
1	123.25	7.65	86	179	85	116	29.95	7293
2	124.50	9.70	85	169	85	115	26.55	7928
3	124.65	7.15	78	174	87	108	29.90	7794
4	105.10	6.8	78	134	78	104	27.65	5276
6	119.05	4.75	82	141	77	112	28.55	4072
7	121.00	5.05	81	115	76	108	32.10	3722



ON-FARM NERICA TRIALS – 2006

Objectives of the trial

To continue evaluating Nerica on farmers plot in more detailed form i.e. shattering habits, tolerance/resistance to biotic and abiotic stresses, fertilizer responses etc.

Method and design of on-farm trial

Site	Ashaiman	Okyereko		
Name of Farmer	Hope AFEDOH	Faustina ANNOBIL	Enoch ESSILFIE	Stephen ASIGBETSE
Planting	Transplanting (21 days nursery) 25cm x 15cm (1 seedling / hill)	Transplanting (21 days nursery) 25cm x 15cm (1 seedling / hill)	Direct sowing (dry broadcast	Direct sowing (dibbling
Varieties	Nerica 4, 6, 7 and local check B-189	Nerica 1, 2, 3 and local check B-189	NERICA 1	NERICA 1
Field Condition	Irrigated	Irrigated	Rainfed lowland	Upland
Plot Design	RCBD: 2 replications	RCBD: 2 replications	Typical farmers' practice	Typical farmers' practice
Fertilizer	NPK kg / ha. 83.5 : 37.5 : 37.5 15:15:15 (Basal) + N 46% (49 DAT)	NPK kg / ha. 83.5 : 37.5 : 37.5 15:15:15 (Basal) + N 46% (48 DAT)	zero	zero

Results and analysis

uriety	Plt. Ht. cm.	No. of Panicles / Hill	50% Heading	No. of Spiklets / Pani.	Ripen ratio	Days to Maturity	Wt. g 1000 filled grains	Yield kg / ha. calculated
1	108.65	5.0		104	75	116	30.0	3,042
2	105.20	5.8		130	78	117	25.6	3,914
3	118.00	5.6		112	76	112	28.7	3,556
UPL								
4	106.35	5.8		126	78	104	27.0	4,386
6	120.40	5.4		125	77	115	28.5	3,851
7	121.00	6.0		95	77	114	32.0	3,651
189	113.85	9.2		108	78	121	27.0	5,440

Summary of three year results in terms of grain yield in Kg / ha.

Variety / Year	Nerica 1	Nerica 2	Nerica 3	Nerica 4	Nerica 5	Nerica 6	Nerica 7	TOX 3377	B 189
2004	3,494	3,536	2,910	2,680	2,961	3,278	3,196	3,215	
2005	7,293	7,928	7,794	5,276		4,072	3,722		
2006	3,042	3,914	3,556	4,386		3,851	3,651		5,440

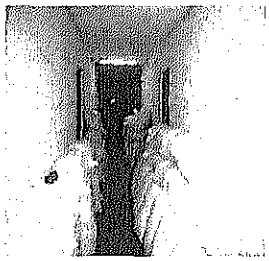
Considerations / Prospects for Nerica dissemination in the coastal zone of Southern Ghana

- NERICA is already in the limelight in Ghana, and is being considered as one of the commodities that are targeted for food security.
- For faster dissemination, it is essential to establish reliable seed supplying system.
- MoFA, recognising that seed production under irrigation is safer, is in recent times contracting seed growers at GIDA irrigation sites to produce seed for supply to farmers.
- Already the Crops Services Directorate has taken delivery of about 15 metric tonnes of Nerica 1 and 2 seeds produced at Okyereko and Ashaiman irrigation sites.

cont.

- It is therefore appropriate for the southern zone to conduct seed production especially where irrigation facility is reliable, and supply seeds to the Central and Northern zones for production.
- Finally profitability of seed production must not be compromised in order that growers can compete favourably with vegetable growers in the region.

Nerica seed production in Southern Ghana



Part of 12 MT. Nerica 1 and 2 seeds produced from Okyereko and Ashaiman Irrigation sites in March 2006.

Thank you.....

RESEARCH FOR DEVELOPMENT

CSIR – CROPS RESEARCH INSTITUTE

EVALUATION OF UPLAND NERICAS IN SOUTHERN GHANA

Kofi Dartey, Crops Research Institute, P.O. Box 3785, Kumasi

Collaborators

The African Rice Centre (WARDA)

District Directorate of Agriculture — [illegible]

DADU — [illegible]

DADU — [illegible]

DADU — [illegible]

Ghana Irrigation Development Association — [illegible]

Faculty of Agriculture/KNUST — Kumasi

Selected farmers in Districts aforementioned

[illegible]

GATSBY Charitable Foundation – UK

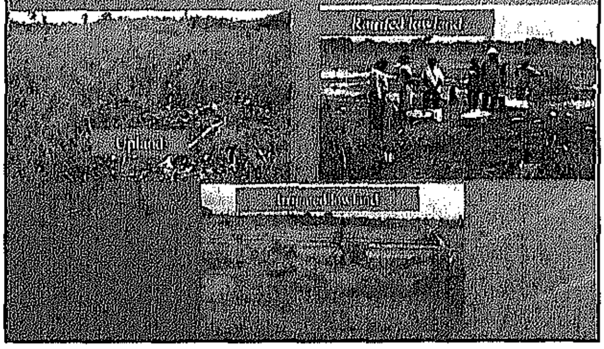
The African Rice Centre (WARDA) – Benin

Nerica Rice Dissemination Project – Accra

Japan Association for International Collaboration of Agriculture and Forestry – JAICAF

Importance of rice – food for millions

Rice adapted to all ecologies



National production far below demand

Deficit met by importation – 60% imported using US$200m

But rice not to benefit directly or indirectly from the millennium challenge account donated to Ghana by the USA

Imported rice is accompanied by aggressive promotion on radio, TV and print

Strategies/policies to reduce the dependency on importation include:

- Decreasing consumption – not a viable option
- Increasing tariffs on imported rice – restrictions by international trade agreements
- Proper post-harvest practices to minimize loss as well as improve quality
- Increasing rice cultivated area – environmental degradation
- Increasing yield per unit area – e.g., use of higher yielding varieties best option

In 2004, JAICAF gave seeds of upland NERICAs 1 to 7 from two sources (Japan and WARDA) to CSIR-CRI for multiplication on lowland soil. These varieties were grown side by side in un-replicated plots in Nobewam. N4 from the two sources were different. N5 was very similar to N2

Nobewam 2004: JAICAF seed multiplication

Dr C. Kaneda to present full results of the seed multiplication in 2006 at this workshop

N1, N2, N3, N4-J, N4-W, N5, TOX3377, IDSA85 and Asante Mo as farmer check evaluated in Adumasa in 2005 – Experiment 2

In 2006, Africa Rice Initiative supplied limited seeds of NERICAs 6-18 for PVS evaluations. N1, N2 also supplied to many farmers in Ejura and Hohoe under the Nerica Rice Dissemination Project. Project declines supply of IDSA85 and TOX3377 to their farmers. These 4 varieties (N1, N2, IDSA85 and TOX3377) used as improved checks in the PVS evaluations reported – Experiment 1

The 4 varieties also evaluated in replicated trials at some sites. Data from these have been added to those generated from Experiments 1 and 2, and is reported in Experiment 3

The objective of these trials is the identification of stable, high yielding and consumer acceptable upland rice varieties tolerant to biotic and abiotic stresses for cultivation principally by smallholder farmers so as to create wealth and reduce national dependency on imported rice

MATERIALS & METHODS

Glyphosate applied after which land was ploughed and harrowed

Or

Land manually slashed and burnt, and re-growth sprayed with glyphosate

Seeding = Direct by dibbling
Plant spacing = 20 x 20 cm
Density = 2-3/hill
Plot size mostly = 10m²

Fertilizer rate was 90-60-60 NPK with application of 60-60-60 (as NPK 15-15-15) after 1st weeding (~ 18 days after seeding – DAS) and top dressing of 30N after second weeding (~ 36 DAS). Harvesting was by panicles.

Experiment 1

2006 at two sites each in Hohoe and Ejura districts (Hohoe – Noamesi and Ve-Kloenu; Ejura – Kobriti and Yaya

Noamesi's field 2006: Planting (left) and maturity (right)

Ve-Kloenu 2006: Evaluating varieties at maturity

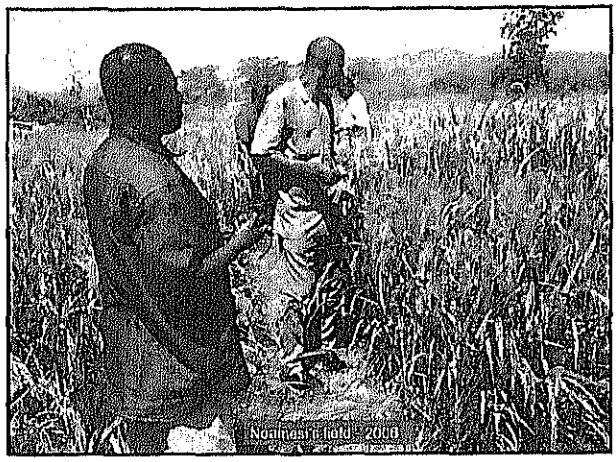
Kobriti 2006: Planting (left) and nutritional disorder (right)

Yaya 2006: Planting (left) and eroded field (right). PVS field was unaffected.

Experiment 2

N1, N2, N4-J, N4-W, N5 (similar to N2), TOX, IDSA, and Asante Mo (= farmer check) evaluated in Adumasa in 2005.


Experiment 3
N1, N2, TOX and IOSA were evaluated at Le plat
Adjumasa 2006


Nonmanra field 2006


Adjumasa 2006


Vé Klodzi 2005 - Farmers evaluating fields


Gallikope 2005 - Farmers evaluating fields


Unesco 2005 - varietal trial (left) and weed response trial (right)

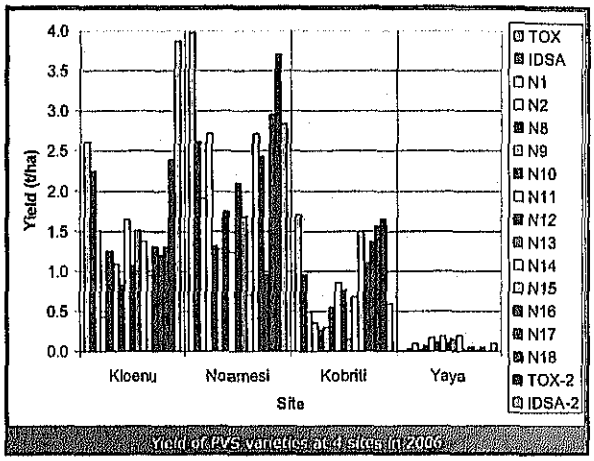
RESULTS AND DISCUSSION

Experiment 1

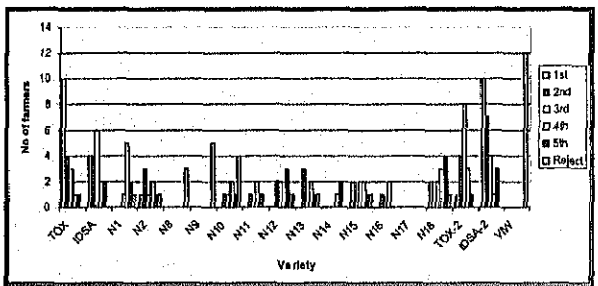
ANOVA on yield of varieties

Source	Type III (SS)	df	Mean Square	F	Sig.
Main	1465.26	26	56.41	21.27	.000
VAR	12.006	16	.751	.283	.995
SITE	41.354	3	13.785	5.196	.000
Error	10.5%	48	.345		
Total	183.391	68			

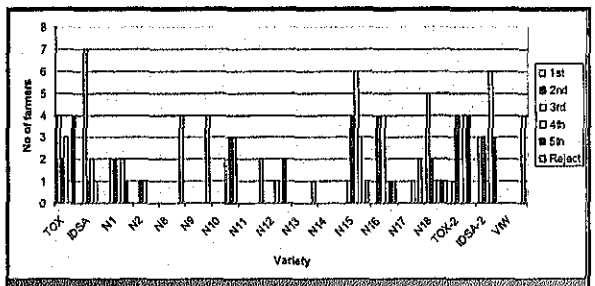
R² = .949 (Adjusted R² = .856)



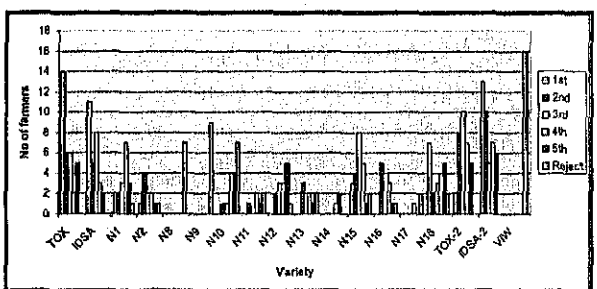
Yield of PVS varieties at 4 sites in 2006



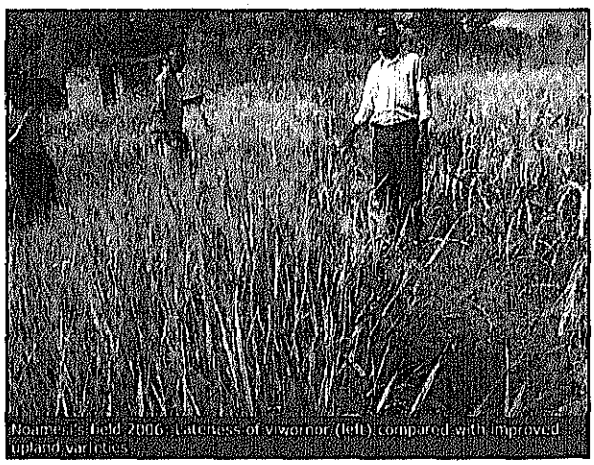
Farmer preference – Kloenu 2006



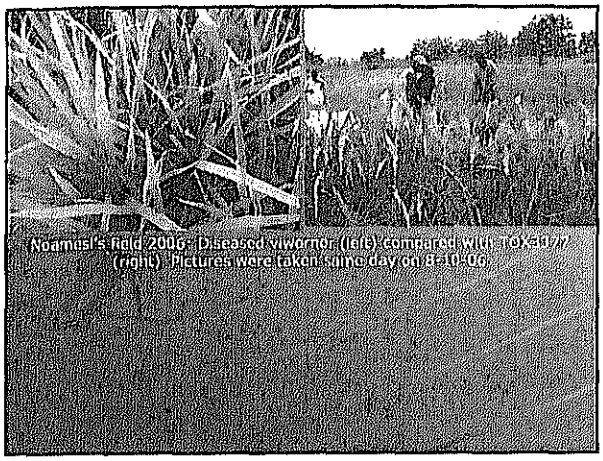
Farmer preference – Noamesi field 2006

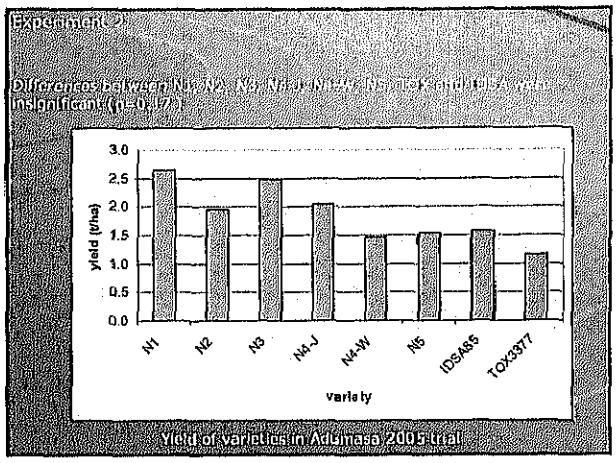


Farmer preference for varieties in Kloenu and Noamesi field



Noamesi field 2006: Lateness of vivernar (left) compared with improved upland varieties


Noamsi's field 2006: Diseased viwarrior (left) compared with TOX3377
(right). Pictures were taken same day on 8-10-06

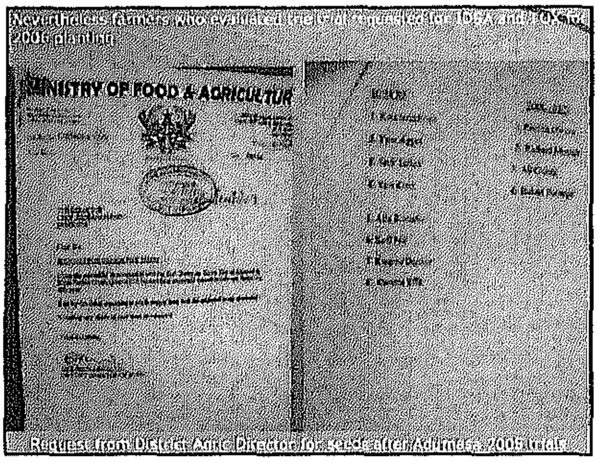

Experiment 2
yield (t/ha)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
N1
N2
N3
N4-J
N4-W
N5
IDSA85
TOX3377
variety
Yield of varieties in Adumasa 2005 trial

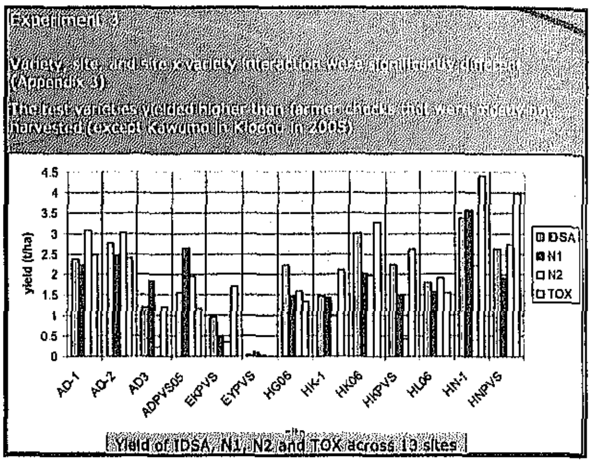

Compared with TOX and IDSA, the NERICAs escaped terminal drought
Asante mo
TOX3877
N1


NERICA
Asante mo


Asante Mo


TOX 3877

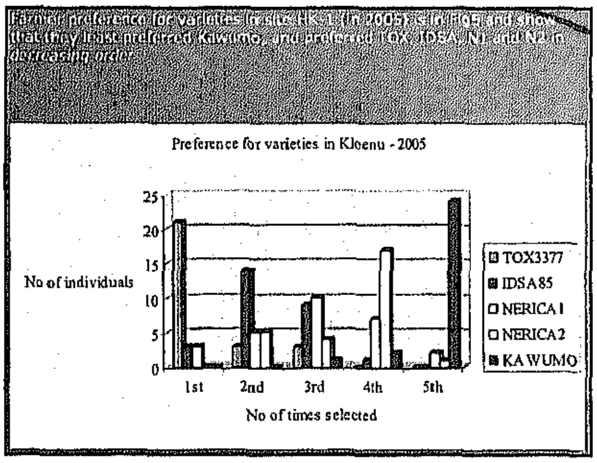




Duncan's separation of varietal means in Experiment 3

Variety	N	Subset 1	2	3
N2	74	1.49		
N1	74		1.92	
IDSA	74		2.04	2.04
TOX	74			2.21
Sig.		*1*	*0.3*	*0.2*

The error term is Mean Square(Error) = 0.665.
Uses Harmonic Mean Sample Size = 74.



Conclusion

- NERICA varieties evaluated were much better than all farmer varieties at all sites

- NERICA varieties were not higher yielding than TOX3377 and IDSA85 that are improved japonicas

- Farmers preferred *TOX3377* and *IDSA85* to the *NERICAs*, particularly when these are compared with N1 and N2

- Maturity dates are not shown here, but the NERICAs matured about 10 and 20 days earlier than IDSA85 and TOX3377. The maturity dates of these japonicas have to be shortened by crossing to the *NERICAs. In the process the single aroma gene of NERICA1 should* be transferred to make them more acceptable

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- These conclusions agree with those reported in 2002 in the GATSBY End of Phase Report submitted through WARDA to the GATSBY Charitable Foundation. Part of the summary was:

- *"The results showed farmers' upland varieties would have to be replaced as a matter of urgency. Farmers' upland varieties were either not selected or outright rejected by themselves at all sites. Farmers' varieties were very late maturing and therefore prone to terminal drought, making them unsuitable for the bimodal rainfall pattern in Southern Ghana.*

- *The upland New Rice from Africa (NERICA) varieties, although performing better than the farmers' varieties, were also selected in lower frequency compared with selection of some improved upland japonicas. NERICA varieties, particularly NERICA1 (WAB450-I-B-P38-HB), were however earlier maturing than the selected improved japonicas, and are being further developed to increase their acceptability".*

- Crossing *O. glaberrima* with *O. sativa* is a **tremendous scientific breakthrough** but we have to improve the offspring in order to realize the full potential of the cross

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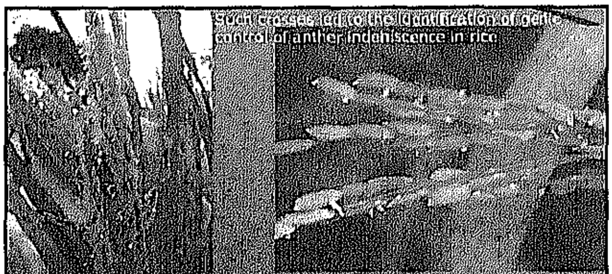
We are doing just that, and now have seeds the length of IDSA85 maturing as early as N1

Upland varietal development – Potted F3 plants in Kwadaso 2005

Such crosses led to the identification of genic control of anther indehiscence in rice



3 complimentary genes control anther indehiscence in rice

Anthers dehisce when all 3 genes exist in the homozygous state, but indehiscence results if one, two or all 3 genes exist in the heterozygous state

This is contrary to Maekawa et al., (1997)'s report, in which indehiscence is controlled by three dominant complimentary genes

There is presently no terminology for such genetic behaviour

Study on the extension of Technologies for
Sustainable Food Production in Ghana

Final report on Socio-economic survey of rice-based farming systems and evaluation of NERICA varieties in the Guinea Savanna agro-ecological zone of Ghana

By

The Savanna Agricultural Research Institute (SARI)
in collaboration with Japan Association for International
Collaboration of Agriculture and Forestry

NERICA Trials in Farmers' Fields in Northern Ghana

Wilson Dogbe (SARI, Ghana), Inusah Baba, Esther Wahaga and C. Kaneda (JAICAF, Japan),

The Japanese Ministry of Agriculture, Forestry and Fisheries (MAFF) initiated this project in 2004 with the fund of MAFF to find farmers in Africa with advanced agricultural operations involving rice farming. MAFF also wished to encourage dissemination of NERICA varieties for alleviating hunger and poverty. The task was entrusted to JAICAF (the Japan Association for International Collaboration of Agriculture and Forestry).

The Savanna Agricultural Research Institute of CSIR (CSIR-SARI) was one of the institutions selected in Ghana to collaborate on this project. CSIR-SARI was responsible for activities within the Northern Savanna of Ghana.

Socio-economic survey of 100 farmers randomly selected from major rice growing districts in Northern Region of Ghana was conducted by SARI in 2004. The data was analyzed to find farmers with noticeable management and better income in rice farming.

The result of the survey was used to select 5 farmers who for the past two years (2005 & 2006) participated in the evaluation of three NERICA varieties on-farm.

Another activity under the project was evaluation of 7 NERICA varieties (NERICA 1 to 7) along a toposequence. The objectives of this study were

We present below some results of these activities.

Activity 1a Survey of rice based farming systems in the northern savanna agro ecological zones of Ghana

- Objectives:
  - Identify the major farming systems in the Northern Savanna agro-ecological zone
  - find farmers with advanced agricultural operations involving rice farming
  - Implement with identified farmers on-farm trials on NERICA

Methodology

A questionnaire survey was conducted in three major rice growing districts in Northern Ghana in 2004. Based on the result, a short list of farmers was selected from the data obtained considering conditions mentioned by the Japanese side for detailed study with the JAICAF experts in 2005.

Results:

The predominant farming system is a crop livestock system. Crop farming constitutes the dominant land use form. Almost all households keep some number of small ruminants and poultry in the free range

Farming system including rice cultivation in Northern Ghana

Farming sytem	Principal livelihood	Annual rainfall	Altitude	Social characteristics	Acreage cultivated (Ha)
Irrigation	Rice, soybean vegetables, poultry, livestock	900 - 1200		Bulsa, Kasim, frafra, Dagomba etc	0.2-2
Lowland rice mixed	Rice, maize sorghum, vegetable, poultry, livestock	1000-1200		Dagomba, Mamprusi	1-50
Cereal Root crop mixed	Maize, sorghum, cassava, yam, legumes, livestock	1000-1200		Dagomba, Gonja,	1-3
root and tuber-cereal-legume mixed	Yam, cassava, maize, legume and livestock	>1200		Gonja, Konkomba, Nanumba & chala ethnic groups	1 - 4

Production systems of selected farmers as reported by the Jaicaf team (July 2005):

The first visit was to the rice field of Mr. Ahmed Mahamod, near SARI, Nyankpala, which was quite impressive because of its cleanliness, and uniform plant growth, though not very vigorous due to insufficient soil moisture. He was applying the first compound fertilizer at about one month after seeding, and a team of about 10 men were weeding the second field. His varieties are Digang and GR18, growth duration of which is 115 and 135 days respectively. According to him both competes well with weeds. He cultivates rice on 4 acres, and gets his technology from SARI which has rice fields on the opposite side of the main road. He always tries to compete with SARI in terms of his crop management and sometimes he is better than her (SARI). Other than rice, he grows maize, cassava, and vegetables and keeps several animals. Rice contributes about 70 %. of his annual income.

Two farmers each in Golinga, in the Tolon/Kumbungu district, and one in Adubilyili, Tamale district, were also visited. These were noticed in the relative significance of animal husbandry and poultry keeping. However, the number of animals and poultry was found to be much lesser than reported in last year's questionnaire survey. The goats were all either titred up or kept in a fenced area (with wire net) to avoid them feeding on crops in the fields. In the case of Mr. Yamali Salifu, goat and sheep were kept at night on drain board to collect faeces for organic fertilizer.

The last farmer visited was in Yendi district, who was noticed by his large cultivated land area and extremely wide area of rice compared with other regions. Mr. Adam

Abubukari Mobila, 71, increased his rice area more than double, from 50 acres in 2004 to 120 acres in 2005. He could attain this with the help of his brothers, using his two tractors. He was the Northern regional the best farmer in in 1998. He started reclamation of the land in 1981 in an area very remote (47 km) from his residence, considering that it is necessary to obtain more fertile land. Geographically, his land is under hydromorphic conditions, and in August to September the rice fields are said to be flooded. His headache is how to control weeds better. He now grows Tox 3107, GR18 and GR19. He knew a little about NERICA through information from SARI,

Activity 1b On-farm evaluation of NERICA's

For the on-farm evaluation, 5 farmers one each from Nyankpala, Adubilyilli and Yendi, and 2 from Golinga were selected to evaluate 3 out of the seven Nericas (N-1, -4 and -6 in mid July 2005 and 2006. These varieties were compared with the farmer's variety. The trial in Yendi was discontinued in 2005 since the field was flooded soon after sowing. In the other sites the trial was repeated in 2006 with the same farmers.

Except for the Yendi farmer, land preparation in all the farms were done manually: hand hoe weeding, turning of the soil and levelling.

Planting was by way of dibbling in rows (20 cm x 20 cm). Each plot (or variety) was approximately 10 m×10m. Each of the four (4) collaborators planted the following:

NERICA 1 (Black Colour code)
NERICA 2 (Red Colour Code)
NERICA 6 (Yellow Colour Code)
Local variety

Since the farmers are illiterates, the varieties were colour coded for easy identification and description by farmers.

The fields were all been kept weed free and received basal fertilization 2-3 weeks after sowing. NPK-15-15-15 at 2 bags i.e. 100 kg/acre, (about 38 kg N per hectare) and top dressing of sulphate of Ammonia (S/A) at 1 bag (50 kg)/acre (i.e. 26 kg N per hectare) at or about the stage of panicle initiation.

All the 4 locations performed fairly well in 2005. However this wet season 2006 was characterised by two long drought spells- in July and August which affected significantly the productivity of the NERICA's at all the sites except Nyankpala.

Data collected

1. Plant Height
2. Tillers per square metre
3. 50% flowering
4. Duration

5. Pests and Disease incidence
6. Panicles per m^2
7. 1000 grain weight
8. Grain yield.

Results:

Except at Yendi (which was discontinued at an early stage), germination was very, or fairly, good. The field at Adubilyilli was sown with 30 cm spacing, and this led to shorter plant with more panicles, and the yield was much less than other testing sites, partly due to severe attack of various types of head-sucking bugs at the milky dough stage. Damage by stem borers tended to be more on N-4, than N-1 and N-6. Average yield (kg/ha) of the four trials is shown on table 2 below. Preference for varieties by 4 farmers were different, but they considered that if they had sown earlier in June or early July, they would have had better yields.

Yield of Upland Nerica's On-farm In Northern Ghana In 2006

Variety	Paddy yield (kg/ha) at on-farm site				Average yield (kg/ha)
	Nyankpala	Golinga1	Golinga 2	Adubiyili	
Nerica 1	3677	2333	2871	1467	2587
Nerica 4	3665	2890	2194	1472	2555
Nerica 6	4274	2826	1544	1554	2549
Average	3872	2683	2203	1497	2564

Yield of Upland Nerica's On-farm in Northern Ghana in 2005

Variety	Paddy yield (kg/ha) at on-farm site				Average yield (kg/ha)
	Nyankpala	Golinga 1	Golinga 2	Adubiyili	
Nerica 1	2576	4982	3288	1235	3020
Nerica 4	2531	3653	2384	4156	2506
Nerica 6	3171	4955	3593	1951	3418
Average	2759	3429	3087	2447	2981

Activity 2a Evaluation of 7 NERICA varieties in the Northern Savanna zone of Ghana

Objectives:

- To study the performance of NERICA varieties in the Guinea Savanna agro- ecological zone.
- To study the yield, yield components and agronomic traits of NERICA varieties.
- To multiply and obtain pure seeds for subsequent cultivation.

Materials and methods

Experimental Site:

In 2004, the experiment was conducted between June and October on the lowland and hydromorphic upland ecologies of the Savanna Agricultural Research Institute experimental fields at Nyankpala.

The same NERICA varieties from two sources (6 from Japan and 7 from WARDA) were evaluated. A local variety, (IR 12979-24-1-1 (Digang) released in 2002 by SARI for the hydromorphic upland ecology was used as a check/control.

The six and the seven NERICA varieties from Japan and WARDA respectively and

the local check/control (IR 12979-24-1-1) from SARI, constituted the treatments.

Number of treatments: 14

Experimental design: Split plot design (Source of seed as main plots and variety as subplot. A replication each at lowland and upland ecologies.

Land preparation: Disc plough followed by one disc harrow

Plot size: 2.0 m x 5 m (10 rows x 25 hills)

Planting density: 20 cm x 20 cm

Planting: Method = Dibbling at 2-3 seeds per hole and was thinned to 1 seedling per hill after germination

Planting date: 18th June 2004

Fertilization: 60-60-30 NPK kg/ha (30-60-30 NPK kg/ha at 24 days after germination and 30 kg N at panicle initiation stage

Cultural Management: Initial spray with pre-emergence herbicide (Stomp) followed by two hand weeding at 3 and six weeks after emergence

Harvesting date: Upland 18-10-04
Lowland 20-10-04

Data collected

Data was collected as per parameters below and at various growth stages

i. Plant Height: At harvest.

ii. Tiller and panicle numbers: Two months after seeding and at harvest respectively

iii. Heading date: 50% heading

iv. Yield: Paddy weight at 14% Moisture content after harvest.

v. Yield components:

- Number of panicles/hill
- Number of spikelets/panicle
- Filled grain ratio (% maturation)
- 1000 grains weight (g)

vi. Insects and diseases occurrence

vii. Meteorological data:

- Daily rainfall
- Maxi. and Mini temperature (10 days to and after harvest)

Sampling method

Measurements for Plant height, Tiller number, heading date were taken randomly from the 10 M^2

plots according to the SES for rice (IRRI .....). Yield components data were taken from randomly selected 20 hills whilst yield was calculated from a crop cut area of 3-m^2. (75 hills)

RESULTS

Table 1. **Field germination percentage and Tiller ability of NERICA varieties from different two sources grown under hydromorphic upland and lowland ecologies.**

Variety ID	Entry ID	Germination %			Tiller/plant (avg 12 hills)		
		Source		Mean			Mean
		Japan	WARDA		Japan	WARDA	
HYSROMORPHIC UPLAND ECOLOGY							
V_1	NERICA I	80	75	77.5	8	9	8.5
V_2	NERICA 2	75	70	72.5	7	5	6
V_3	NERICA 3	80	50	65	6	6	6
V_4	NERICA 4	80	60	70	6	5	5.5
V_5	NERICA 5	-	50	50	-	5	5
V_6	NERICA 6	75	70	72.5	6	5	5.5
V_7	NERICA 7	60	75	67.5	7	6	6.5
V_8	IR 12979-24-1-1*	85		80	9		9
LOWLAND ECOLOGY							
V_1	NERICA I	75	55	65	9	8	8.5
V_2	NERICA 2	70	80	75	8	7	7.5
V_3	NERICA 3	70	70	70	7	7	7
V_4	NERICA 4	75	80	77.5	7	8	7.5
V_5	NERICA 5	-	45	45	-	5	5
V_6	NERICA 6	80	45	62.5	5	5	5
V_7	NERICA 7	65	60	62.5	8	7	7.5
V_8	IR 12979-24-1-1*	80		80	10		10

* Control variety

Table 2. **Number of days to Heading for NERICA varieties from different two sources grown under hydromorphic upland and lowland ecologies.**

Variety ID	Entry ID	Days to first flower			50% heading		
		Source		Mean			Mean
		Japan	WARDA		Japan	WARDA	
HYDROMORPHIC UPLAND ECOLOGY							
V_1	NERICA I				83	83	83
V_2	NERICA 2				77	83	80
V_3	NERICA 3				74	76	75
V_4	NERICA 4				75	80	77,5
V_5	NERICA 5				-	74	74
V_6	NERICA 6				76	74	75
V_7	NERICA 7				74	71	72.5
V_8	IR 12979-24-1-1*				87		87
LOWLAND ECOLOGY							
V_1	NERICA I				74	81	77,5
V_2	NERICA 2				67	74	70,5
V_3	NERICA 3				69	70	69,5
V_4	NERICA 4				70	75	72.5
V_5	NERICA 5				-	70	70
V_6	NERICA 6				76	76	76
V_7	NERICA 7				74	70	72
V_8	IR 12979-24-1-1*				84		84

* Control variety

Table 3. **Plant Height and Yield of NERICA varieties from different two sources grown under hydromorphic upland and lowland ecologies.**

Variety ID	Entry ID	Plant Height (cm) at maturity			Yield (kg/ha)		
		Source of variety		Mean	Source of Variety		Mean
		Japan	WARDA		Japan	WARDA	
HYDROMORPHIC UPLAND ECOLOGY							
V_1	NERICA I	111	112	111,5	1802	2340	2071
V_2	NERICA 2	100	103	101,5	1148	2033	1591
V_3	NERICA 3	112	109	110.5	1547	1429	1488
V_4	NERICA 4	106	123	114.5	1386	1419	1403
V_5	NERICA 5	-	99	99	-	2283	2283
V_6	NERICA 6	129	121	125	2208	1992	2100
V_7	NERICA 7	133	131	132	2752	1710	2231
V_8	IR 12979-24-1-1*	107		107	2416		2416
LOWLAND ECOLOGY							
V_1	NERICA I	100	92	96	2576	1352	1964
V_2	NERICA 2	101	99	100	2098	2398	2248
V_3	NERICA 3	104	103	103.5	2395	2127	2261
V_4	NERICA 4	106	125	115.5	2887	3546	3285
V_5	NERICA 5	-	104	104	-	2680	2680
V_6	NERICA 6	129	123	126	3676	2894	3285
V_7	NERICA 7	127	129	128	2579	3328	2954
V_8	IR 12979-24-1-1*	102		102	6336		6336

* Control variety

Table 4. **Number of Panicles per hill and number of spikelets per panicle of NERICA varieties from different sources grown under hydromorphic upland and lowland ecologies.**

Variety ID	Entry ID	Number of panicles per hill			Number of spikelets per panicle		
		Source of variety		Mean	Source of Variety		Mean
		Japan	WARDA		Japan	WARDA	
HYDROMORPHIC UPLAND ECOLOGY							
V_1	NERICA I	4.7	5.7	5.2	68.8	67.4	68.1
V_2	NERICA 2	5.0	5.5	5.3	54.8	62.9	60.7
V_3	NERICA 3	4.5	4.5	4.5	63.6	62.8	63.2
V_4	NERICA 4	4.6	4.6	4.6	57.8	77.6	67.7
V_5	NERICA 5	-	4.8	4.8	-	72.7	72.7
V_6	NERICA 6	3.9	4.4	4.2	98.6	92.5	95.6
V_7	NERICA 7	6.0	4.7	5.4	78.2	65.9	72.1
V_8	IR 12979-24-1-1*	6.5		6.5	70.3		70.3
LOWLAND ECOLOGY							
V_1	NERICA I	7.5	6.0	6.8	38.4	74.9	56.7
V_2	NERICA 2	6.0	7.5	6.8	62.8	59.9	61.4
V_3	NERICA 3	5.3	6.6	6.0	58.9	64.3	61.6
V_4	NERICA 4	5.5	7.2	6.4	73.7	70.7	72.2
V_5	NERICA 5		6.7	6.7	-	50.0	50.0
V_6	NERICA 6	5.5	6.3	5.9	89.3	95.2	92.3
V_7	NERICA 7	5.9	7.3	6.6	58.5	53.0	55.6
V_8	IR 12979-24-1-1*	8		8	49.5		49.5

* Control variety

Activity 2b. Evaluation of 7 NERICA's along the toposequence

In 2006 the seven NERICAs were again evaluated along the toposequence starting from the upland through the hydrmorphic area to the lowland. The control variety was digang.

Experimental design: Randomized complete block (RCBD) with three replications.

Land preparation: Disc plough followed by one disc harrow

Plot size: 3.0 m x 5 m (15 rows x 25 hills)

Planting distance: 20 cm x 20 cm

Planting: Method = Dibbling at 2-3 seeds per hole and was thinned to 1 seedling per hill after germination

Planting date: 6th July 2006

Fertilization: 60-60-30 NPK kg/ha (30-60-30 NPK kg/ha at 24 days after

germination and 30 kg N at panicle initiation stage

Cultural Management: Two hand weeding at 3 and six weeks after emergence

Data Collected: Except Number of spikelets/panicle and filled grain ratio (% maturation) which were not collected in 2006, all other data collected in 2004 presented above were collected in 2006.

Results:

Days to maturity of Upland Nerica's along a topo-sequence in Northern Ghana

Ecology	Variety								Grand Mean
	Nerica 1	Nerica 2	Nerica 3	Nerica 4	Nerica 5	Nerica 6	Nerica 7	Digang	
Lowland	86	76	83	81	89	83	86	108	86
Hydromorphic	103	98	101	101	106	102	99	112	102
Upland	100	96	96	97	107	96	97	114	100
Mean	96	90	94	93	101	94	94	111	

Yield of Upland Nerica's along a topo-sequence in Northern Ghana

Ecology	Variety								Grand Mean
	Nerica 1	Nerica 2	Nerica 3	Nerica 4	Nerica 5	Nerica 6	Nerica 7	Digang	
Lowland	1103	1021	1084	1653	682	816	1460	3523	1418
Hydromorphic	1792	1627	1324	1291	1799	1740	1234	2794	1700
Upland	3092	2685	2921	3181	1916	3899	3350	823	2734
Mean	1996	1778	1776	2041	1467	2152	2015	2290	1950

Other Nerica Related activities undertaken in collaboration with the NERICA Dissemination project WARDA.

- *Farmer Training in NERICA Community seed Production:*

For 2005 and 2006 we trained 105 farmers across the Tolon Kumbungu district in community seed production system. These farmers are supposed to produce seed for the Nerica dissemination project in the Tolon Kumbungu district.

- *Foundation seed production for NERICA 1 and 2*

Under the Nerica dissemination project SARI has been producing foundation seed for the Tolon Kumbungu pilot site. The Foundation seed plots which were showcased last year during a field day on NERICA attracted many farmers and news reporters for many days after the Field Day.

- *Participatory selection of new upland NERICA varieties.(PVS)*

  A PVS of the 18 upland NERICAs was conducted in 2006 in three communities within the Tolon kumbungu district. Farmer participation in the evaluation was very high and were 98, 77 and 45 at the three sites

- *Component technology development*

The following constraints identified by upland rice farmers are being studied both on-station and on-farm

  - Time of planting
  - Weed management
  - Fertilizer management

- *Germplasm collection*

- *Post harvest evaluation*

- *Evaluation of lowland NERICAs*

  This activity started in 2004 when we evaluated 72 lowland Nericas in a PVS nursery. 16 of these materials are currently being evaluated at our multi-location research sites

- *Nitrogen and Phosphorus nutrition of lowland NERICAS*

  This collaborative activity with a WARDA scientist started this year. The experiment has just been harvested.

NERICA Trials
in
Farmers' Field

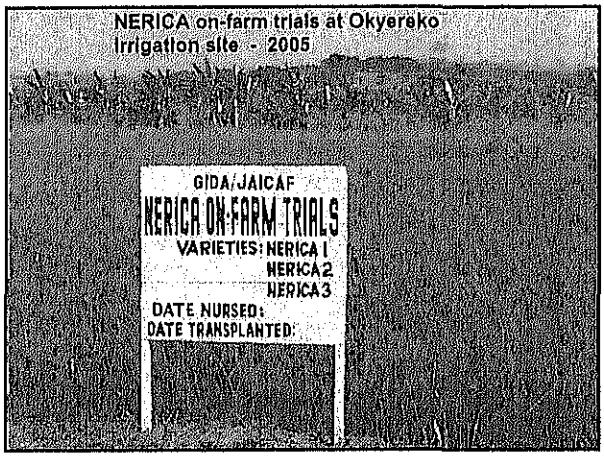
(Ms. Faustina Annobil)

Conducted at Okyereko Irrigation site in the Coastal Savannah zone of Southern Ghana

SELECTION OF PARTICIPATING FARMER

JAICAF study team member interacting with Ms.Faustina Annobil to seek her views on participating in the trial.

Trial objectives were also discussed.



Mid cropping season

Nerica is early maturing therefore daily observation for timely application of inputs is necessary for a successful crop.

MATURITY stage of Nerica trial on farmer's field

Schedule inspection of Nerica trial on farmer's field

- JAICAF study team member and GIDA staff on a visit to the trial field at Okyereko to appraise the real situation before harvesting.

NERICA SEED PRODUCTION

Rouging of seed farm (Nerica 1) at Okyereko Irrigation site; March 2006

My positive views about Nerica

- Panicles are large and may contribute to high yield
- Matures quickly
- Resistant to lodging
- Nerica 1 is aromatic and tastes good
- Performs well even under water stress
- Response to fertilizer is high

My negative views about Nerica

THRESHABILITY OF NERICA

Some of the Nerica varieties particularly Nericas 2, 3 , and 4 are very difficult to thresh.

Manual reaping and threshing of Nerica

- Harvested panicles are usually packed on tarpaulin ready to be threshed manually.

- Threshing cribs / boxes commonly referred to as bambam is used to facilitate easy collection of grains.

Mechanical aided threshing

- Harvested panicles are fed into a Mechanical threshing drum which is powered by a walking tractor (power tiller) This device which is fabricated at IDC,Ashaiman is convenient for handling the difficult to thresh Nericas.