The Republic of the Sudan
Ministry of Agriculture and Forestry

The Republic of the Sudan

Capacity Building Project for the Implementation of "the Executive Programme for the Agricultural Revival"

Project Final Report

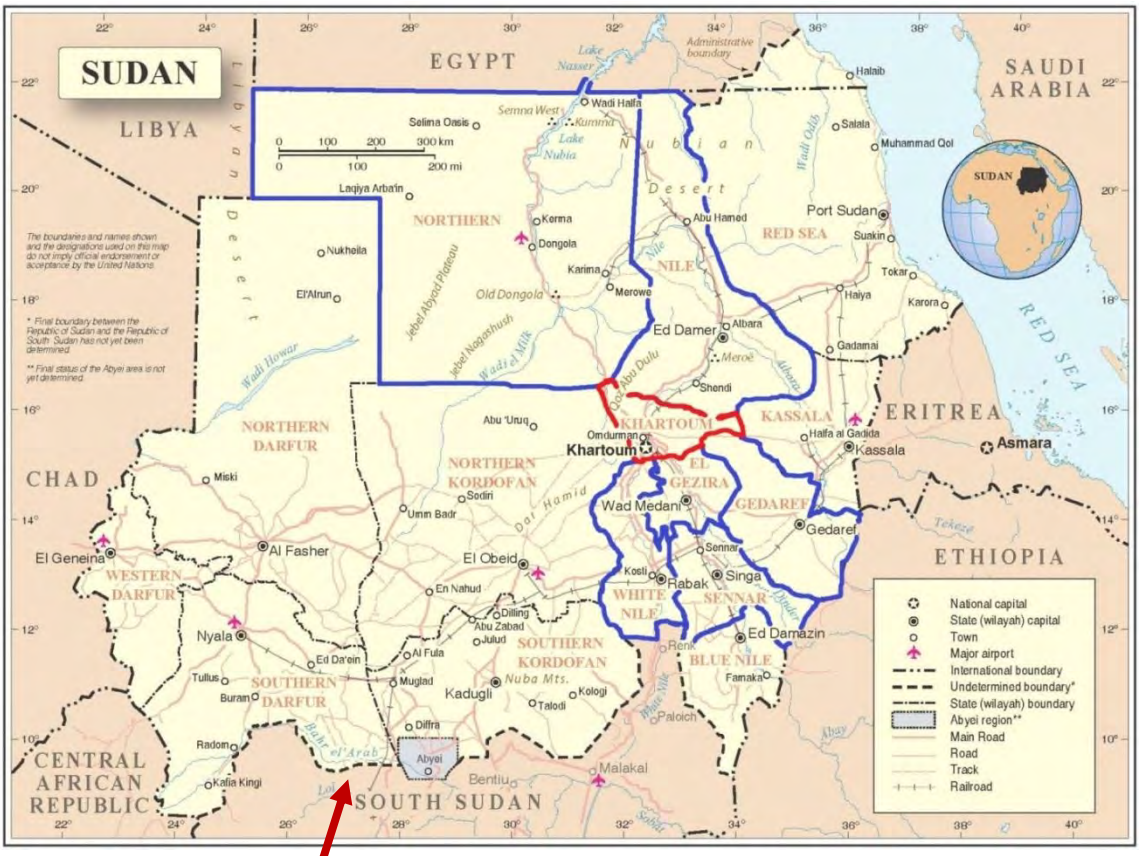
February 2016

Japan International Cooperation Agency (JICA)

Vision and Spirit for Overseas Cooperation Co., Ltd. (VSOC)
C. D. C. International Corporation

S U
J R
15-002

Location Map



Source: United Nations Cartographic Section (Edited by Project Team)

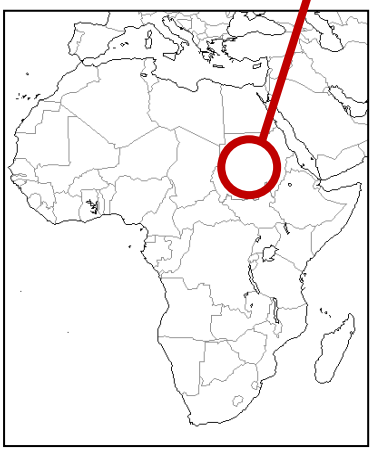


Table of Contents

ANNEXES

Abbreviation

AAAID	Arab Authority for Agricultural Investment and Development
ARC	Agricultural Research Corporation
AS	Ammonium Sulphate
CDC	C. D. C. International Corporation
C/P	Counterpart Personnel
CTC	Central Trading Company
DG	Director General
EICA	Egyptian International Center for Agriculture
EPAR	Executive Programme for Agricultural Revival
FMoAF	Federal Ministry of Agriculture and Forestry
FMoAI	Federal Ministry of Agriculture and Irrigation
FY	Fiscal Year
GM	General Manager
IC	International Cooperation Directorate
JCC	Joint Coordination Committee
JICA	Japan International Cooperation Agency
M&E	Monitoring & Evaluation
M/M	Man Month
NERICA	New Rice for Africa
NRC	National Rice Council
NRDS	National Rice Development Strategy
NRP	National Rice Project
ODA	Official Development Assistance
OJT	On the Job Training
PAE	Planning and Agricultural Economics Directorate
PDM	Project Design Matrix
PO	Plan of Operation
PRiDe	Promotion of Rice Development Project
RMU	Rice Milling Unit
RRTC	Rice Research and Training Center
RTTC	Rice Technology Training Center
SMoA	State Ministry of Agriculture
TOT	Training of Trainers
TTE	Technology Transfer and Extension Administration
VSOC	Vision and Spirit for Overseas Cooperation Co., Ltd.

Chapter 1 Outline of the Project

1.1. Background of the Project

In December 2009, the Government of the Republic of the Sudan and the Government of Japan signed the agreement for a technical cooperation project by Japan International Cooperation Agency (hereinafter as "JICA") with the Federal Ministry of Agriculture and Forestry (hereinafter as "FMoAF", reorganized from Federal Ministry of Agriculture and Irrigation "FMoAI" in June 2015), and then "Capacity Building Project for the Implementation of the Executive Programme for the Agricultural Revival" (hereinafter as "the Project") was launched in March 2010. The Project duration was 4 years until March 2014.

The Project aimed to materialize the strategies and policies under "the Executive Programme for the Agricultural Revival (EPAR)" through capacity development activities for the staff working for federal and state MoAs, farmers and concerned people.

In June 2012, JICA contracted with the Joint Venture consisting of Vision and Spirit for Overseas Cooperation Co., Ltd. (VSOC) and C. D. C. International Corporation (CDC) to entrust the Project operation in the 3rd year and 4th year. VSOC, CDC and long term JICA experts implemented the project activity with the counterpart personnel (C/P) of federal and state MoAs.

In February 2014, FMoAI and JICA agreed and officially signed to extend the duration of the Project for 2 years (the 5th year and the 6th year). JICA contracted again with the Joint Venture consisting of VSOC and CDC to entrust the Project operation in the 5th year and the 6th year.

1.2. Objective of the Project

As the result of the discussion between FMoAI and JICA on 12 February 2014, Project Design Matrix (PDM) was modified (PDM version 5.0 is per attached as Annex 1). Narrative Summary of the PDM is shown in Table 1-1 below.

Table 1-1 Narrative Summary of the PDM version 5.0

Overall Goal: The quality of public services provided by the Ministry of Agriculture and the organizations concerned is improved through their capacity development.
Project Purpose: Human and organizational capacity of the Ministry of Agriculture and the organizations concerned is strengthened to materialize "The Executive Programme for the Agricultural Revival."
Output: 1. Through the experimental activities of the Project, a model system of human resource development and organizational capacity development of the Ministry of Agriculture has been developed. 2. Planning, implementation, monitoring & evaluation for promotion of rice production are enhanced.
Activities: 1.1. To develop a model system of human resource development for the Ministry of Agriculture 1.2. To develop a model system of organizational capacity development of the Ministry of Agriculture

1.3. To establish a monitoring and evaluation (M&E) and management system of capacity development activities
1.4. To prepare annual reports compiling review of Activities in 1.1, 1.2 and 1.3 and recommendation for plans in next year on human resource development, organizational capacity development, and the M& E and management system
2.1. To carry out planning, monitoring and evaluation for promotion of rice production in Sudan
2.2. To develop appropriate upland rice cultivation technique
2.3. To improve upland rice seed production technique
2.4. To train agricultural extension workers to be trainers on appropriate upland rice cultivation
2.5. To demonstrate rice cultivation to expose farmers to appropriate upland rice cultivation technique
2.6. To prepare a handbook on rice cultivation technique based on results of activities in 2.2 together with those in 2.3, 2.4 and 2.5.
2.7. To conduct planning, monitoring and evaluation of rice development on a regular basis

In the discussion between FMoAI and JICA in February 2014, both parties recognized that the Project implemented all activities related to Output 1 (Activity 1.1 – 1.4) and Output 1 was completely achieved. Regarding Output 2, they agreed that the Project completed Activity 2.1, 2.3 and 2.7. However, out of 7 indicators for Output 2, two remained unachieved.

In order to achieve Output 2 and to materialize the Project Purpose, the Project focused on achieving those 2 indicators, which are "2.4 A practical/technical handbook on upland rice cultivation is prepared" and "2.6 More than 80% of training participants are qualified as trainers on appropriate rice cultivation technique (except for Gezira State)".

Concrete activities are expected as follows;

- The Project will finalize "Handbook of Upland Rice Cultivation". The handbook was submitted by the Project to FMoAI in the 4th year, but technical issues to be discussed still remain.
- In order to overcome those technical issues, the Project will conduct field experiments for identifying factors and collecting data. The Project will also cooperate with ARC and support their experiments. Moreover the Project will discuss technical issues on rice harvest & post-harvest processing.
- The Project will conduct various trainings such as training in Uganda and Egypt, training in Japan, training in the demonstration field (OJT; On the Job Training). At least 2 extensionists in each state (except for Gezira State) will be nurtured as a trainer on appropriate upland rice cultivation.

1.3. Target Areas

The target areas of the extension period are Gezira, Sennar, Gedaref, River Nile, Northern and White Nile State.

1.4. Target Groups and Stakeholders

The target groups (beneficiaries) of the extension period are as follows;

- Federal MoAF including Agricultural Research Corporation (ARC) and National Rice Project (NRP)
- State MoAs (Gezira, Sennar, Gedaref, River Nile, Northern and White Nile State)
- Farmers in the target states

The C/Ps are the staff of the respective organization.

It was recommended at the 2nd Rice Sector Development Forum and Joint Coordination

Committee (JCC) meeting in February 2014 that FMoAI should be more involved in the activity of rice sector development.
Bottleneck Issues Working Group members (Private sectors, AAAID [Arab Authority for Agricultural Investment and Development], University) and International organization, etc. are considered as Stakeholders.

1.5. Progress of the Activities up to March 2015

In FY2014 (the 5th year of the Project), Japanese experts arrived to Sudan in June 2014, and then the Project started their activity. In Gezira State Ministry of Agriculture (SMoA), Minister, Director General (DG) and Head of Rice Production Unit were all changed in the beginning of the season 2014. Therefore the Project communicated new Minister, new DG and new Head immediately after their change in order to implement the project activity smoothly and to acquaint them with the project activity.

Regarding the activity 2.2 "To develop appropriate upland rice cultivation technique", the Project conducted 4 field experiments with Gezira SMoA. Four experiments are 1) Irrigation Interval Trial, 2) Plant Spacing Trial, 3) Seed Rate Trial and 4) Fertilizer Trial (Nitrogen). The Project also cooperated with ARC. The Project discussed with rice researchers and conducted a seminar for researchers in ARC headquarters. Regarding rice post-harvest processing, the Project gave technical advice to assemble RMU and 21 RMU out of 22 were assembled. The Project also held a seminar to discuss issues on post-harvest processing such as appropriate timing of harvest and technical problem to operate RMU.

Regarding the activity 2.4 "To train agricultural extensionists to be trainers on appropriate upland rice cultivation", the Project prepared several training opportunities in Sudan and abroad. In Sudan, Japanese experts conducted OJT in the field. The Project also invited 2 prominent experts from Uganda from August to September 2014 to give technical advice to extensionists. Outside of Sudan, the Project sent total 57 extensionists in FY2014 to 3 training courses (Water management, Weed control, Post-harvest processing) in Egypt and 1 advanced training course in Uganda. Moreover the Project designed and observation programme in Egypt for high officials to push forward the rice development in Sudan. Fourteen high officials from federal and states participated in the programme. There were also training courses in Japan. The Project sent 10 C/Ps to 9 courses.

Regarding the activity 2.5 "To demonstrate rice cultivation to expose farmers to appropriate upland rice cultivation technique", the Project and 6 SMoAs cultivated upland rice in 24 demonstration farms (total area is 78.5 feddans) in FY2014. One demo farm in Gezira State achieved 5.5 t/ha for its yield. Average yield in Gezira State was 2.6 t/ha. The result was much improved in comparison with FY2013. In other 5 states, the difference between good and bad result was big. Basic operations such as land preparation, weed control, irrigation, fertilizer, etc., were not appropriately implemented in some fields. However one field which the farmer cultivated upland rice first time, achieved 1.9 t/ha in Gedaref State. It showed the improvement of appropriate upland rice cultivation technique of extensionists.

Regarding the activity 2.4 and 2.5, the Project introduced "New Production and Management System by utilizing Action Plan for Upland Rice Dissemination" to Gezira and Sennar State, and "Diary for Upland Rice Cultivation" to all 6 states since FY2014. The Project guided SMoAs to make action plan for each demo farm and monitored the implementation of action plan with recording of diary.

Regarding the activity 2.6 "To prepare a handbook on rice cultivation technique based on the

results of activities in 2.2 together with those in 2.3, 2.4 and 2.5", the Project revised a handbook based on results of activity in the season 2014.

At the end of the season 2014, the Project and concerned MoAs organized "Workshop for the season 2014 – 2015". Federal Minister, Ministers of SMoAs, DGs of FMoAI and SMoAs participated in the workshop. Six SMoAs, ARC and NRP presented their activity and the result in 2014 and action plan of 2015. After presentation, the participants discussed how FMoAI and SMoAs support their action plans.

1.6. Japanese Expert Assignment

Six Japanese experts on different expertise were assigned by JICA to implement project activities in FY2015. (Detailed Expert Assignment Plan / Result is attached as Annex 2.)

Table 1-2 Japanese Expert assigned to the Project and Man/Month

Assigned Area of Work	Name	Man Month
Chief Advisor / Rice Development Programme	Mr. Osamu NAKAGAKI	4.00 M/M
Deputy Chief Advisor / Rice Cultivation 1	Mr. Akio GOTO	7.00 M/M
Rice Cultivation 2	Mr. Takamasa ANDO	5.30 M/M
Rice Harvest & Post-Harvest Processing	Mr. Osamu TOKUMOTO	1.50 M/M
Cultivation Environment Analysis & Weed Control	Dr. Ryoichi IKEDA	0.50 M/M
Project Coordinator / Monitoring & Evaluation of Upland Rice Cultivation	Mr. Takeshi MATSUDA	4.40 M/M

1.7. Summary of the Activities in FY2015

The Project commenced the activities in the 6th year from May 2015. Japanese experts have been dispatched properly and they have implemented the Project activities effectively.

The Project conducted 3 kinds of experiment with Gezira SMoA and cooperated with ARC to develop appropriate upland rice technique. The Project and 6 targeted SMoAs promoted upland rice cultivation through demonstration field. In this year, they cultivated total 24 demonstration sites (54.5 feddans). The Project organized 1 advanced training course in Uganda and 3 training courses in Egypt for extensionists. Moreover, one observation programme for high officials and technical exchange for ARC researchers were conducted in Egypt. The Project invited Mr. Tsuboi from JICA Uganda PRiDe (Promotion of Rice Development) Project to follow up trainees. Egypt mission also came to Sudan to follow up its trainees.

Gezira, Sennar and Gedaref SMoAs conducted Field Day respectively in November. After the harvest and yield survey in all 6 states, the Project and C/Ps conducted a workshop for further development of upland rice production in Sudan in January 2016.

Activities in detail are described in Chapter 2. (Flowchart of Plan of Operation and PO are attached as Annex 3 and 4.)

1.8. Others

1.8.1. Equipment

In the year 2015, the Project procured 6 Stone Removers as equipment from Japan. From 2010 up to January 2016, the Project provided equipment in the proper place for implementation of

the project activities. (List of equipment is attached as Annex 5.)

1.8.2. Public Relations

Public relations activities of the Project were divided into 3 categories, such as through issuance of newsletter, through website, and through media. The Project issued 5 newsletters (No.16 to No. 20) and distributed to C/Ps and stakeholders in FY2015 (Newsletter No.16 to No. 20 are attached as Annex 6.). The Project updated 4 articles and uploaded newsletters in the website of JICA. Japanese nationals, Sudanese nationals and the development partners of all the world can easily search and access the information of the Project through the website. (http://www.jica.go.jp/project/sudan/001/index.html)
(http://www.jica.go.jp/project/english/sudan/001/index.html)

The Project cooperated with media for their interview and report. For example, when Japanese Ambassador participated in the Rice Field Day in Gedaref State in 2nd November 2015, a total of 9 media (5 TVs, 1 radio, 2 newspapers and 1 web) came to report. Gezira and Sennar State also conducted Rice Field Day and some media including national TV and radio came to report and broadcasted the event as news. In addition, when the Project conducted a workshop in January 2016, the activity was reported through TV and radio.

Chapter 2 Progress of the Project Activities

2.1. Activities to Achieve Output 2

The output 2 aims "to enhance Planning, implementation, monitoring & evaluation for promotion of rice production". As mentioned in Chapter 1, the Project worked on Activity 2.2, 2.4, 2.5 and 2.6 during the extension period in order to achieve Output 2.

Activity 2.2 "To develop appropriate upland rice cultivation technique"

2.2.1 To conduct field experiments (seed rate trial, irrigation interval trial, fertilizer trial, weed control trial, etc.) in Gezira

Based on the result of field experiments conducted until last year, more field experiments are conducted at the Horticulture Research Center in Gezira State in 2015. In concrete terms, the field experiments are ①Seed Rate × Plant Spacing Trial (Two-factor experiment), ② Nitrogen Source Trial and ③ Organic Fertilizer Trial (Nitrogen).

Field experiment information (common information for all trials)

- Variety: NERICA 4
- Interrow Space: 30cm (excluding Seed Rate×Plant Spacing Trial)
- Sowing Method: Drilling
- Seed Rate: 20kg/fed (excluding Seed Rate×Plant Spacing Trial)
- Trial Method: Randomized Complete Block Design, 3 replications
- Location: Horticultural Research Station in Gezira State
- Irrigation Facility: an electric pump and water pipes
- Supplementary Transplanting: 10-14days after sowing (excluding Seed Rate×Plant Spacing Trial)

The details of 3 trials are as follows;

1) Seed Rate×Plant Spacing Trial

(1) Objective

The tow-factor trial can identify an appropriate balance between seed rate and plant space with a consideration of the introduction of mechanical weeding for upland rice cultivation

(2) Cultivation Information

- Sowing Date: June 3
- Harvesting Date (Date of sampling survey): September 13～17
- The Period of Cultivation: 103～107 days
- Plot Area: 16m^2 (4m×4m)

(3) Contents of Treatment

T-1	24kg/ha (10 kg/fed) & Space 30 cm
T-2	24kg/ha (10 kg/fed) & Space 40 cm
T-3	24kg/ha (10 kg/fed) & Space 50 cm
T-4	48kg/ha (20 kg/fed) & Space 30 cm
T-5	48kg/ha (20 kg/fed) & Space 40cm
T-6	48kg/ha (20 kg/fed) & Space 50 cm
T-7	72kg/ha (30 kg/fed) & Space 30 cm

T-8	72kg/ha (30 kg/fed) & Space 40 cm
T-9	72kg/ha (30 kg/fed) & Space 50cm

(4) Result of Statistical Analysis:

4-1 The Result of Sampling Survey

Table 2-1 Result of Seed Rate × Plant Spacing Trial

			Yield (t/ha) Quadrat Sampling	Yield (t/ha)	Plant Height (cm)	Maturity Rate (%)	1000 grain-Wt	Panicle /m^2	Grain/ Panicle
R1	T	1	-	-	92.35	-	-	231.7	107.73
		2	4.81	5.37	98.29	85.79	27.09	177.5	130.16
		3	3.85	3.91	94.35	85.25	27.63	170.0	97.69
		4	4.87	4.85	91.38	78.63	29.67	238.3	87.22
		5	5.32	6.05	92.00	88.73	30.40	251.3	89.29
		6	3.94	4.48	87.80	84.28	28.85	217.0	85.01
		7	5.98	7.10	97.63	73.07	26.30	353.3	104.51
		8	4.26	5.17	95.89	80.02	27.45	290.0	81.20
		9	4.27	3.60	85.85	83.22	32.58	265.0	50.05
R2	T	1	4.47	6.27	89.95	84.29	28.05	273.3	97.09
		2	4.01	6.34	95.30	84.66	28.12	232.5	114.48
		3	4.94	6.55	93.60	88.55	29.09	253.0	100.47
		4	7.90	5.37	89.79	84.95	28.87	341.7	64.09
		5	4.50	5.87	85.50	82.67	29.52	277.5	86.74
		6	4.70	5.51	88.45	75.72	26.92	295.0	91.71
		7	6.31	5.21	88.05	85.87	29.02	280.0	74.73
		8	4.27	5.25	86.45	88.13	29.25	235.0	86.70
		9	4.22	4.82	87.15	78.12	30.95	309.0	64.44
R3	T	1	5.02	5.97	88.30	75.63	27.20	250.0	116.01
		2	4.75	6.72	94.37	86.28	31.78	280.0	87.49
		3	5.10	4.59	88.40	84.67	27.77	206.0	94.86
		4	7.07	6.94	100.70	87.31	28.09	276.7	102.30
		5	2.46	4.67	83.579	79.57	26.87	256.25	85.327
		6	5.39	4.75	92.50	83.09	27.42	275.0	75.729
		7	7.16	7.28	94.313	82.38	27.42	350.0	92.065
		8	3.84	6.16	89.60	82.52	27.64	307.5	87.794
		9	4.97	5.67	92.30	82.83	26.94	336.0	75.691

R1T1 had no yield data due to stunted growth

4-2 Yield (Yield from Yield Component)

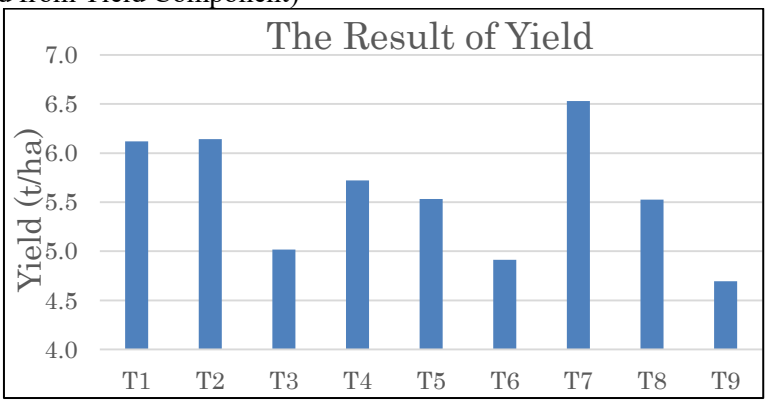


Figure 2-1 Result of Yield comparison of Seed Rate × Plant Spacing Trial

4-3 ANOVA (Analysis of Variance) (Yield from Yield Component)

Source of Variation	Df	Sum Sq	Mean Sq	F Value	P Value
Seed Rate	2	0.464	0.232	0.277	0.7613
Plant Space	2	7.231	3.616	4.318	0.0305 *
Interaction (Seed Rate X Plant Space)	4	1.234	0.309	0.368	0.8278
Within	17	14.236	0.837		

* : P＜0.05

- Significant difference detected on Plant Space: P=0.0305＜0.05
- No significant difference detected on Seed Rate: P=0.7613＞0.05
- No interaction between Seed Rate × Plant Space: P=0.8729＞0.05

Because of no interaction between seed rate and plant space, multiple comparison was conducted for only plant spacing in which significant difference was detected. The results of seed rate and plant space are below.

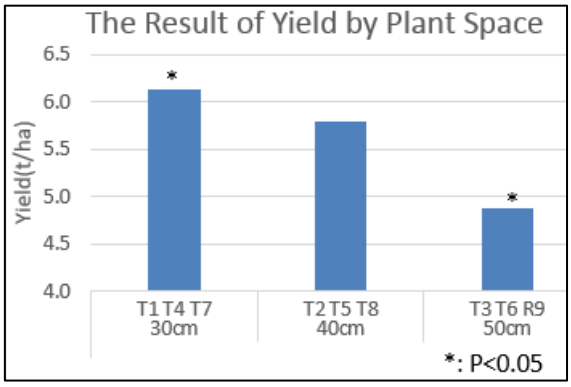


Figure 2-2 Result of Yield by Plant Space

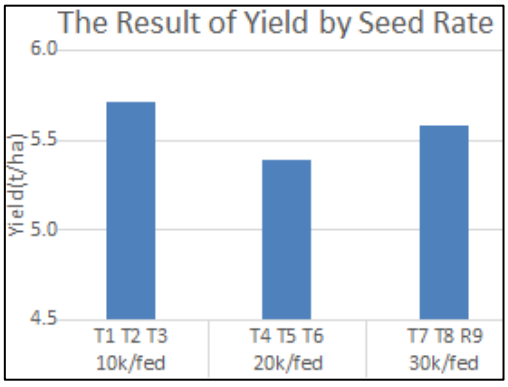


Figure 2-3 Result of Yield by Seed Rate

As plant space 30cm has a significant difference against plant space 50cm, plant space 30cm can maximize the yield. In case of mechanical weeding, plant space 40cm is affordable, because there is no significant difference between plant space 30cm and plant space 40cm. On the other hand, seed rate does not have significant difference between any two treatments. Therefore 10kg/fed should be optimum seed rate. Remarkable point is that more seed rate is not necessarily leading to more yield. This is because more seed rate can increase panicle/m^2 but decrease grain/panicle. This is shown in Figure 2-4.

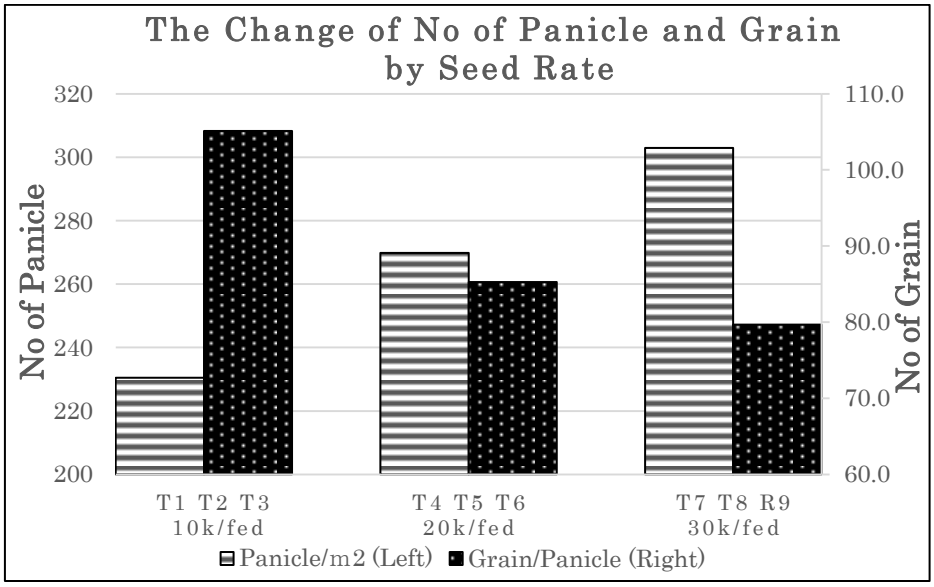


Figure 2-4 Change of No. of Panicle and Grain by Seed Rate

(5) Conclusion

As there is no interaction between seed rate and plant space, two factors can be separately considered. As a result of analysis, no significant difference was detected in seed rate. Therefore, 10kg/fed is most likely to be the best treatment. A remarkable point is that the increase of seed rate cannot lead to the increase of yield. This is because the increase of seed rate can enhance panicle/m^2 but inhibit grain/panicle. Some reasons are considered to be the water competition and growth competition among rice plants.

On the other hand, in terms of plant space, 30cm can make yield maximum, as 30cm has significant difference against 50cm. Thus, the best combination of seed rate and plant space should be 10kg/fed of seed rate and 30cm of plant space. In addition, in case of mechanical weeding, 40cm of plant space is affordable, because there is no significant difference between 30cm and 40cm.

2) Nitrogen Source Trial

(1) Objective: To identify a proper type and amount of Nitrogen fertilizer in the condition of sandy and alkaline soils and dry and heat climate in upland rice cultivation in Sudan.

(2) Cultivation Information

- Sowing Date: June 7
- Harvesting Date (Date of sampling survey): October 4～6
- The Period of Cultivation: 120～122 days
- Type of Fertilizer: Urea and Ammonium Sulphate (AS)
- Plot Area: 9m^2 (3m×3m)

(3) Contents of Treatment

Fertilization was conducted at three times of tillering stage, panicle initiation stage and maturity stage.

Table 2-2 Contents of Treatment for Nitrogen Source Trial

		Time of Fertilizing			1N=43.8kg/fed DAS: Days After Sowing
T	Kind of Fertilizer	Tillering Stage (21DAS)	Panicle Initiation Stage (55 DAS)	Maturity Stage (84 DAS)	Total of Applied Fertilizer
1	None	0 N kg/fed (0 N kg/ha)			0 N kg/fed (0 N kg/ha)
2	Urea	1N kg/fed (2.38 N kg/ha)	1N kg/fed (2.38 N kg/ha)	1N kg/fed (2.38 N kg/ha)	3 N kg/fed (7.14 N kg/ha)
3	Urea	1.5N kg/fed (3.57 N kg/ha)	1.5N kg/fed (3.57 N kg/ha)	1N kg/fed (2.38 N kg/ha)	4 N kg/fed (9.52 N kg/ha)
4	AS	1N kg/fed (2.38 N kg/ha)	1N kg/fed (2.38 N kg/ha)	1N kg/fed (2.38 N kg/ha)	3 N kg/fed (7.14 N kg/ha)
5	AS	1.5N kg/fed (3.57 N kg/ha)	1.5N kg/fed (3.57 N kg/ha)	1N kg/fed (2.38 N kg/ha)	4 N kg/fed (9.52 N kg/ha)

(4) Result of Statistic Analysis

4-1 Result of Sampling Survey

Table 2-3 Result of Nitrogen Source Trial

			Yield (t/ha) Quadrat Sampling	Yield (t/ha)	Plant Height (cm)	Maturity Rate (%)	1000 grain-Wt	Panicle/m^2	Grain/ Panicle
R1	T	1	1.32	1.27	70.42	74.08	27.76	170.0	36.31
		2	4.57	3.96	88.75	85.45	28.33	213.3	76.72
		3	4.34	5.37	89.30	84.97	29.84	253.3	83.67
		4	4.36	5.51	85.00	84.42	28.77	258.3	87.77
		5	6.78	5.22	94.90	86.06	28.39	248.3	86.11
R2	T	1	1.13	1.58	60.80	73.57	27.35	198.3	39.53
		2	2.76	3.93	86.92	76.18	29.03	223.3	79.52
		3	3.67	3.56	87.75	68.97	29.22	205.0	86.08
		4	7.69	7.21	94.00	82.18	28.27	308.3	100.69
		5	5.93	6.85	93.05	85.00	27.09	286.7	103.83
R3	T	1	0.63	0.84	60.11	65.97	25.56	136.7	36.34
		2	5.56	4.48	86.80	88.03	28.22	218.3	82.54
		3	3.74	3.42	79.30	79.92	29.34	195.0	74.69
		4	5.07	6.50	93.05	81.16	28.93	405.0	68.38
		5	6.92	7.69	95.3	83.52	27.65	343.3	97.07

4-2 Yield

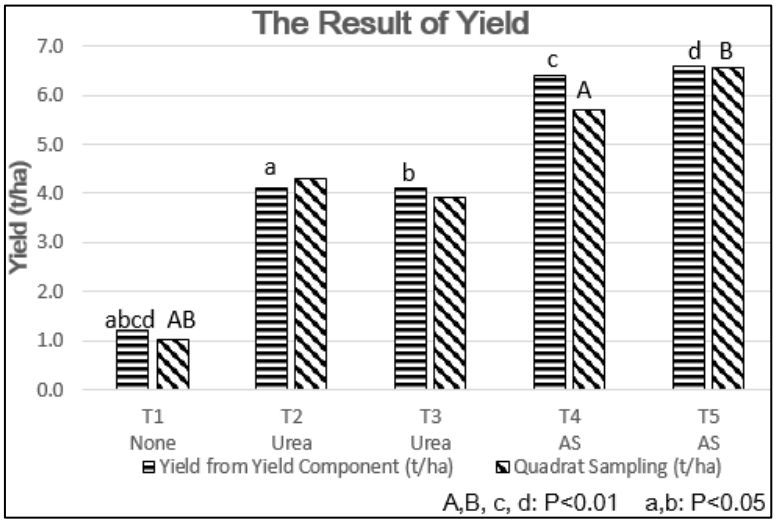


Figure 2-5 Result of Yield Comparison of Nitrogen Source Trial

Significant difference of 5% on the yield from yield component is detected between T1 and T2, and between T1 andT3. Significant difference of 1% on both quadrat sampling and the yield from yield component is detected between T1 and T4, and between T1 andT5. This shows Nitrogen fertilizer can promote the rice yield, particularly the effect of Ammonium Sulphate is the highest. As there is no significant difference between T4 and T5, lower amount of T4 could be optimum. Therefore, it is concluded that 3N of Ammonium Sulphate is the most effective.

4-3 The Result of Grain/Panicle, Panicle/m^2, Maturity Rate

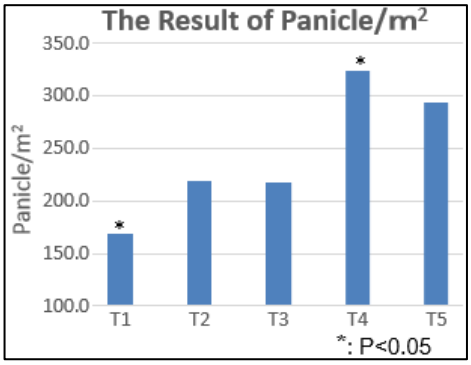


Figure 2-6 Result of Panicle/m^2

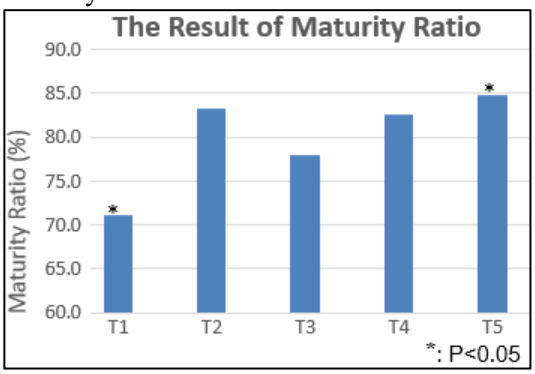


Figure 2-7 Result of Maturity Ratio

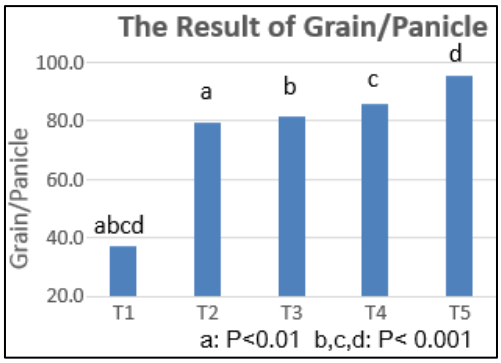


Figure 2-8 Result of Grain/Panicle

Significant difference of 5% is detected on panicle/m^2 and maturity ratio between AS (T4, T5) and T1. Nitrogen fertilizer both Urea and AS can increase grain/panicle.

4-4 The Change of Nitrogen Amount in Soil

Data and figure are shown below.

Table 2-4 Change of Nitrogen Amount in Soil

	June 4 (Sowing)	August 16 (Panicle Initiation Stage)	October 4 (Harvest)
T1	17.5	5.9	1.7
T2	17.5	4.0	1.9
T3	13.8	7.3	1.9
T4	12.1	6.7	2.5
T5	13.5	7.9	3.4

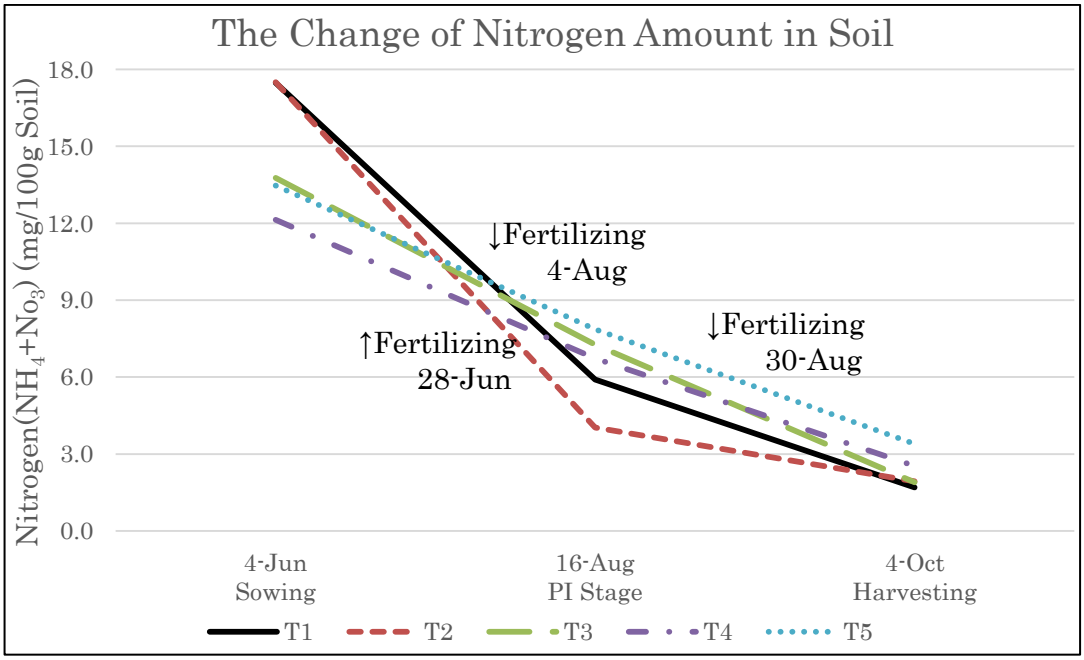
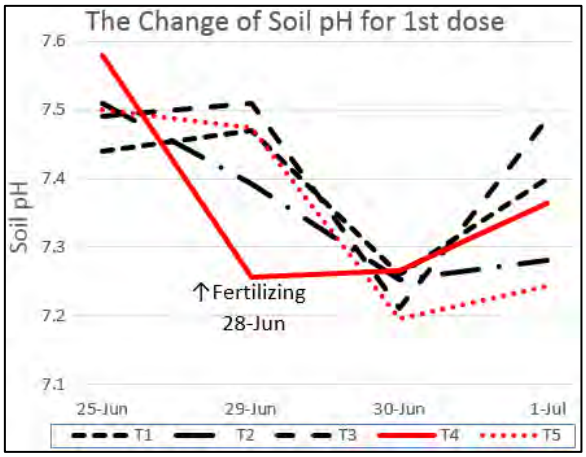


Figure 2-9 Change of Nitrogen Amount in Soil

In all treatments Nitrogen amount in soil is reduced, although fertilization is implemented three times. Even the treatment without fertilizer (T1) has same level of Nitrogen amount as treatments with fertilizer.

4-5 The Change of Soil pH

Soil pH before and after fertilization and Irrigation water pH are shown below.



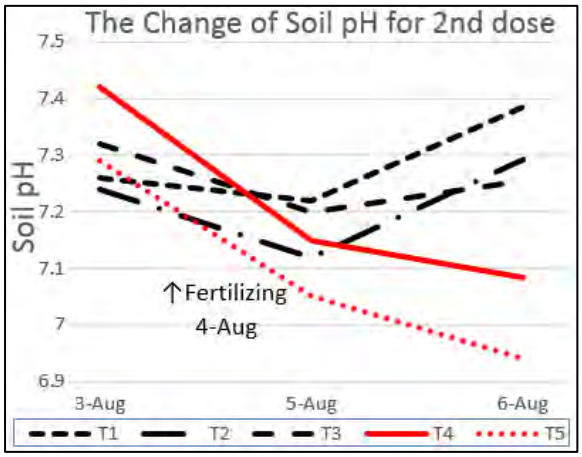


Figure 2-10 Change of Soil pH for 1st dose Figure 2-11 Change of Soil pH for 2nd dose

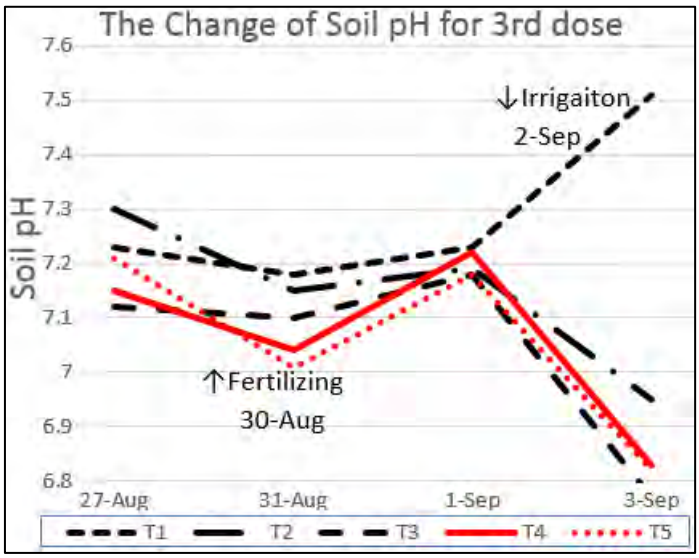


Figure 2-12 Change of Soil pH for 3rd dose

pH of Irrigation Water

	October 1	October 4
pH	7.25	7.75

The effectiveness of AS to yield statistically makes difference, but the effectiveness of soil pH is difficult to make a conclusion. Basically soil pH decreased (oxidization) after fertilization of both Urea and Ammonium Sulphate and increased (reduction) afterwards.

In fertilization for 2nd dose, the change of soil pH is relatively ideal. This is partly because pH in only AS plots (T4, T5) continuously decreased, and partly because T5 shows weak acid (less than pH7). As irrigation water is alkaline, it is understandable that soil pH increases after irrigation, but in 3rd dose soil pH decreased after irrigation. It seems that the decrease might be affected by acid rain.

Moreover, extensionists are required to obtain more skills to measure soil pH more accurately and to fertilize equally in a plot.

(5) Conclusion
This trial was conducted for the first time this year. As the result described above, it is concluded that optimum condition is 3N of AS. AS can significantly make difference in terms of panicle/m^2 and maturity ratio compared to no fertilization. On the other hand, regardless of the type of fertilizer, Nitrogen fertilizer can significantly promote grain/panicle.

It is found that Nitrogen amount in soil decreases regardless of the type of fertilizer applied. This is partly because Nitrogen is utilized for rice growth and partly because Nitrogen is evaporated. This trial confirms that AS is able to decrease soil pH and that soil shows acid.

Finally, as there is no statistic significant difference between AS and Urea, economic perspective in terms of fertilizer costs and profitability should be compared in the future. In October 2015, AS (21%N) and Urea (46%N) are both 245SDG/50kg.

3) Organic Fertilizer Trial

(1) Objective: In some cases, it is quite difficult to cultivate rice in sandy soil in Sudan. Manure is an effective tool for soil improvement. Thus, the objective of this trial is to identify a proper amount of organic fertilizer (manure).

(2) Cultivation Information
- Sowing Date: June 14
- Harvesting Date (Date of sampling survey): October 7
- The Period of Cultivation: 115 days
- Date for Urea application: July 7, August 15
  (Urea was applied with corresponding to Nitrogen amount 18.4 kg/fed in each day)
- Plot Area: 9m^2 (3m×3m)
- Basal-dressing: None (only manure)

(3) Contents of Treatment
Cattle manure is used as organic fertilizer.

T-1: 0 kg/plot (control)
T-2: 50kg/plot
T-3: 100kg/plot

(4) The Result of Statistic Analysis
4-1 The Result of Sampling Survey

Table 2-5 Result of Organic Fertilizer Trial

			Yield (t/ha) Quadrat Sampling	Yield (t/ha)	Plant Height (cm)	Maturity Rate (%)	1000 grain-Wt	Panicle /m^2	Grain/ Panicle
R1	T	1	2.71	3.14	67.60	77.85	28.03	215.0	66.98
		2	3.99	3.43	69.70	72.71	28.00	261.7	64.42
		3	6.61	6.47	88.95	81.46	27.69	308.3	92.98
R2	T	1	1.12	1.01	60.87	59.89	26.16	105.0	61.43
		2	4.79	3.27	69.85	66.63	26.76	263.3	69.68
		3	5.20	5.23	80.84	82.66	28.52	271.7	81.69
R3	T	1	0.22	0.42	61.44	31.39	25.49	81.7	63.82
		2	1.21	2.21	72.80	54.40	27.20	208.3	71.77
		3	3.83	2.71	79.68	59.69	27.36	198.3	83.62

4-2 Yield

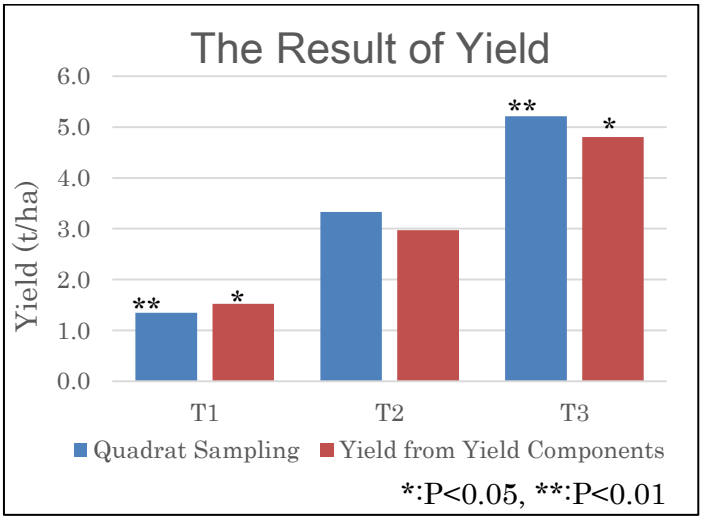


Figure 2-13 Result of Yield Comparison of Organic Fertilizer Trial

There is a significant difference between T3 and T1. Therefore T3, which is 100kg/plot of manure, can make the yield maximum.

4-3 The Result of Grain/Panicle, Panicle/m^2, Plant Height

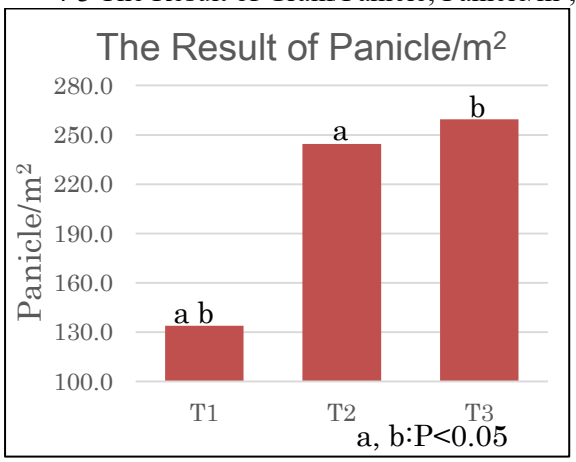


Figure 2-14 Result of Panicle/m^2

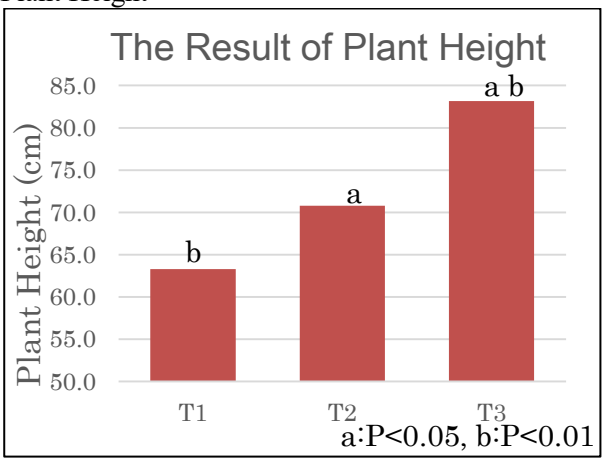


Figure 2-15 Result of Plant Height

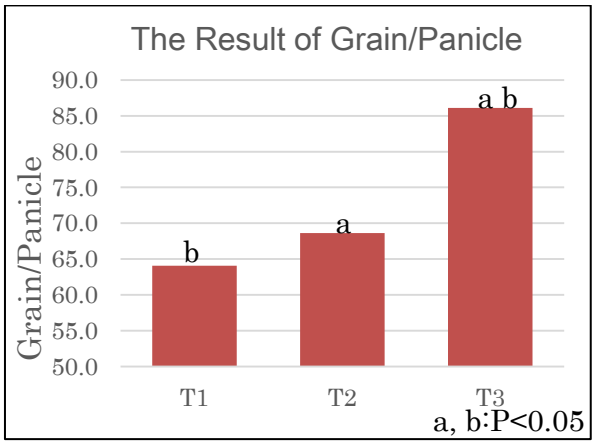
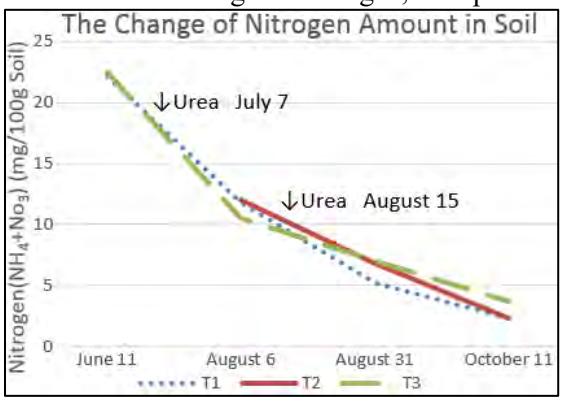


Figure 2-16 Result of Grain/Panicle

There are significant differences between T3 and T1 on plant height, grain/panicle and panicle/m^2. Organic fertilizer can effect to rice growth as well as yield.

4-4 The Change of Nitrogen, Phosphorus and Potassium Amount in Soil



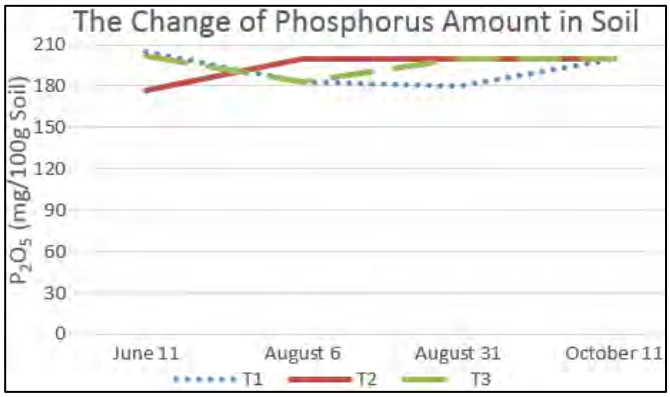


Figure 2-17 Change of Nitrogen Amount in Soil (left)

Figure 2-18 Change of Phosphorus Amount in Soil (right)

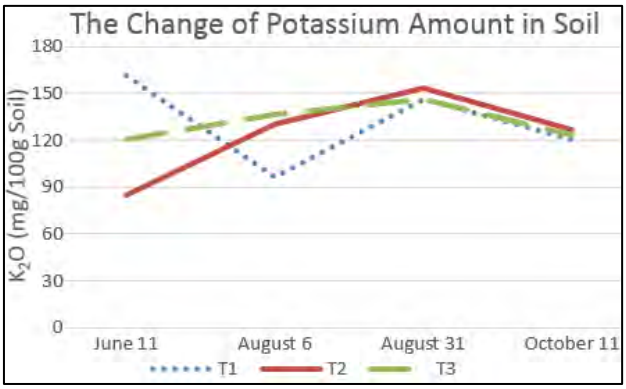


Figure 2-19 Change of Potassium Amount in Soil

Table 2-6 shows the requirement of NPK in 10a of rice field in Japan.

Table 2-6 Requirement of NPK in 10a of rice field in Japan

	Absorption in the yield of 100kg/10a		
	N	P_2O_5	K_2O
Paddy Rice	2.41 kg	0.87 kg	1.97 kg

Source: Agricultural Technique Handbook

Although it is impossible to compare NERICA 4 in Sudan with paddy rice in Japan with same criteria above, the requirement of NPK for NERICA 4 in Sudan was calculated, as a reference.

Basic condition is below.

- Target Yield (Brown Rice): 3.0t/ha (300kg/10a)
- Soil Depth: 10cm
- Absorption rate of NPK: N30%, P10%, K50%

Requirement of NPK for NERICA 4 in Sudan is shown in Table 2-7.

Table 2-7 Requirement of NPK for NERICA 4 in Sudan

Target Yield 300kg/10a	N	P_2O_5	K_2O
Requirement of NPK (mg/100g)	24.1	26.1	11.82

Nitrogen fertilizer is dissolved and absorbed (and evaporated) after application. The amount of Nitrogen in soil decreased in spite of Urea application twice. Phosphorus is applied as only basal dressing and exceeds 200kg/10a in some plots. It can be considered that Phosphorus applied for the last 4 years was accumulated in soil. Potassium fertilizer has not been applied. As a nature of Sudanese soil, Potassium can be covered with only natural supply. The analysis also shows this fact that enough amount of K_2O is included in soil from 90 mg/100g to 150 mg/100g.

(5) Conclusion
This trial was conducted for the first time in 2015 in the Project. In terms of yield, soil improvement by manure is the best treatment in T3 (100kg/plot). Significant differences between T3 and T1 can be detected not only in the yield but also in plant height, grain/panicle and panicle/m^2.

In terms of NPK fertilization, it seems that Nitrogen should be applied two or three times, Phosphorus does not evaporate and should be applied minimum requirement, unless natural supply is sufficient. Potassium can be covered by only natural supply. Therefore, priority should be put on the fertilizing for manure and Nitrogen rather than Phosphorus and Potassium when the rice cultivation is required in sandy soil. In case of seed production in which cultivation failure is not allowed, manure should be applied in advance.

Finally, like Nitrogen Source Trial, the effect of economic impacts to farm management by purchasing organic fertilizer should be taken into consideration by comparing the extra income from rice with extra expenditure to organic fertilizer.

2.2.2 To collaborate with Agriculture Research Corporation in developing rice cultivation technique such as weed control (herbicide trial)

1) Provision of equipment
The Project provided several equipment to support research and field experiment activities on rice cultivation by ARC. Hand-over ceremony for research equipment took place in Gezira State in June 4. Main equipment is soil analysis tool, water flow meter, dry chamber, microscope, electric weight scale and sprayer. At present, ARC is conducting the research on rice cultivation with the equipment. The details of the equipment are referred to Table 2-8.

Table 2-8 List of equipment and other goods handed over to ARC (June 2015)

	Name	Qty
Equipment	Drying chamber	1
	Tensiometer	1
	Electrical current-meter	1
	Soil nutrient tester	1
	Electric weight balance	3
Other goods	Microscope	2
	Soil moisture meter	2
	Electric sensitive balance	3
	Spring balance	4
	Knap-sack sprayer	2
	Boot	2

2) Dispatch of Japanese expert
From the end of August to the beginning of September, Japanese expert for Cultivation Environment Analysis & Weed Control was dispatched to provide technical advice on field experiment conducted by ARC the same as 2014. The expert visited Rahad Research Station in Gedaref State, Kosti Research Station in White Nile State and headquarters (HQ) of ARC located in Wad Medani in Gezira State and provided technical advice on field experiment including some pieces of advice on the importance of rogueing of off-type plants and weeding to ARC researchers. In ARC HQ, the expert made a lecture (presentation) about seed production methods in Africa (the presentation slide is attached as Annex 7). In concrete terms, participants were able to understand the type of seed, the mechanism of germination and pollination and seed production system in Japan. Visiting schedule to ARC HQ/Stations and field experiments which were observed were as follows,

31/08	Rahad Research Station	Discussion with Director, visiting demo farm of the Project
01/09	Kosti Research Station	Variety trial, Fertilizer trial, Weed control trial, etc.
02/09	ARC HQ	Sowing method trial, Fertilizer trial, Water management trial, etc.

3) Training in third country and the follow-up by Egyptian rice researchers
ARC researchers visited Egypt to participate “Technical Exchange for ARC Researchers” with Egyptian rice researcher in RRTC (Rice Research and Training Center). The details are referred to “2.4.2 To conduct training in third country/Japan to transfer appropriate technique on upland rice cultivation”.

After the Technical Exchange, the representative of EICA (Egyptian International Center for Agriculture), a RRTC researcher and a National staff in JICA Egypt office visited the ARC HQ in Gezira State. As a follow-up of the Technical Exchange, they made an interview to three ARC researchers who joined in the Technical Exchange and observed ARC trial fields.

4) The participation to Field Day and Project terminal evaluation
Since the first participation to the Field Day in 2011, ARC had not participated in Gezira State. But three ARC researchers participated the field day in 2015, because the active cooperation between our project and ARC has started since last year.

In addition, Prof. Ahmed Abdelgadir, who is the National Rice Research Coordinator and belongs to ARC, was selected as a member of the Joint Terminal Evaluation Team for the Project. He made some comments about agricultural research system in Sudan and project outcomes.

2.2.3 To identify issues of the current harvest & post-harvest process

1) Operation of Rice Milling Unit
The project and 6 SMoAs finished assembling 21 Rice Milling Units (RMUs) out of 22 RMUs by FY2014. However there had been 10 sites where the installation of power unit to run RMU had not finished yet. The Project requested to SMoAs many times to install the power unit such as three-phase electricity or engine as soon as possible, but it has not implemented yet. According to SMoAs, the budget was secured and they went to an electricity company but the company rejected the request of installing three-phase electricity because of lack of equipment in the company, etc.

After the confirmation of the progress on assembling and installation of 22 RMUs in each state, the Project ordered and purchased necessary parts which were newly manufactured (Husk ducts,

Large mesh of sieves, etc.), tools & equipment, cement and bolts & nuts, etc. The Project finished about 80% of work in Gezira State, before the Field day of Gezira State on 5th November 2015.
The remaining works were as follows;

(1) Husk duct assembling (from RMU to Husk yard)
(2) Bore the hole of the duct through the wall
(3) Assembling of safety cover (RMU & Motor)
(4) Test-run (if three-phase power is available, or diesel generator is available)

Regarding the cabling between the control panel and RMU, the Project held the training in 2014 and the responsible person of RMU and electrician of each SMoA are capable to do it. The Project completed the remaining works and it is available to hold RMU trainings anytime, after solution of electricity. The Project delivered large meshes of sieves to all RMU to eliminate large impurities.

The Project requested to each SMoA to decide the responsible person of RMU operation. The decision and progress of RMU installation and assembling are shown in Table 2-9. The Project revised and delivered reference of Instruction of RMU and Rice Quality Control to each SMoA. All RMUs can hold the training after the solving three-phase issue.

Table 2-9 Progress of RMU Installation & Assembling and Responsible person (as of 23rd November 2015)

No.	No. of RMU	Responsible Person of RMU	Location	State	Rehabilitation	Assembling	3 Phase Installation	Electric Connection	Test Run	Remarks
1	2	Mr. Mandor	Dongola	Northern	✔	✔	✔	×	✔	Under rehabilitation of Husk / paddy cleaning yard and electric connection (Cable and internal connection)
2	1	Mr. Aboobeida Ms. Hagir	Atbara	River Nile	✔	✔	✔	✔	✔	**Completed**
3	1		Damer		×	✔	×	×	×	Location under study Assembling completed
4	1	Mr. AbuAbeida	Shuwak	Gedaref	✔	✔	×	×	✔	Under 3 phase installation and electric connection (Cable and internal connection), Test run was done by generator
5	1	Mr. Khalid	Al Fau		✔	✔	×	×	✔	Under 3 phase installation and electric connection (Cable and internal connection), Test run was done by generator
6	1	Mr. Elmoghira	Kassab	Sennar	✔	✔	×	×	✔	Under 3 phase installation and electric connection (Cable and internal connection), Test run was done by diesel engine
7	1	Ms. Salma	Wad Hashim		✔	✔	×	×	✔	Under 3 phase installation and electric connection (Cable and internal connection), Test run was done by diesel engine
8	2	Ms. Aasha	Fadasi	Gezira	✔	✔	✔	✔	✔	**Completed**
9	2	Mr. Hussien Ms. Marwa	Hasahisa		✔	✔	✔	✔	✔	**Completed**
10	2	Mr. Siddig Mohammed	Hosh		✔	✔	✔	✔	✔	**Completed**
11	2	Mr. Abuobieda Ms. Manal	Hyabud alla		✔	✔	×	×	×	3 phase cost is expensive (need transformer because the location is far from the National Grid Line)
12	2	Mr. Akram Mr. Ayman	Rahad 44		✔	✔	×	×	×	Under 3 phase installation and electric connection (Cable and internal connection)
12	1	Mr. Tarig	UmBarona		✔	✔	×	×	×	Under 3 phase installation and electric connection (Cable and internal

										connection)
14	1	Mr. Mohammed Abdella	Furijab	White Nile	✔	✔	×	×	×	Under 3 phase installation and electric connection (Cable and internal connection)
15	1	Mr. Khalid	Kosti		✔	✔	✔	✔	✔	**Completed**
16	1	Mr. Osama	Duem		✔	✔	✔	✔	✔	**Completed**

Green: Available of training after electricity issue is solved
Orange: Issue of electricity

2) Condition of the moisture content of raw paddy harvested

As the Project pointed out from the last season (FY2014), the biggest issue of grain production in Sudan is over-dried grain. The moisture reduction of grain means "Weight Loss" and increasing deterioration of the quality. For rice, low moisture content causes cracks in the kernels and increase broken rice and decreasing head rice recovery. The target of moisture content at the harvest time was more than 20% in 2015. As a result, the paddy was harvested at 18% in average, in Gezira State. The understanding of optimum harvest time is progressed. The moisture content of paddy, i.e., 18%, became less than 13% within 3 days, and became less than 10% within a week.

According to the sampling of field paddy in Northern State, there are milky stage kernels, i.e., more than 30% of moisture content and over matured paddy, i.e., less than 13%. Un-even maturing stage of NERICA 4 is one of the issues together with difficult thresh-ability.

Table 2-10 shows a result of quality analysis of NERICA 4 (2013 –2015) in Gezira State.

Table 2-10 Result of Quality Analysis of NERICA 4 (2013 – 2015) in Gezira State

Result of Quality Analysis (Gezira) in Average

Year	Moisture Content	
	Nerica-4	
	Paddy	Brown Rice
2013	14.0%	10.4%
2014	13.2%	10.9%
2015	18.4%	12.1%

Year	Cracked Kernel (Brown Rice)	
	Nerica-4	Other Variety
2013	56.1%	-
2014	68.9%	-
2015	30.1%	-

Year	Hardness	
	Nerica-4	Other Variety
2013	87.1	-
2014	77.4	-
2015	72.1	-

Staff of rice quality analysis have grown up their technology in 3 years. At present, they can analyze sample of paddy and brown rice without JICA expert. The moisture content of paddy harvested in 2015 is 18.3% in average. The moisture content of paddy was decreased to less than 10% within a week, as mentioned above. The analysis of result on crack rice ratio in brown

rice is 56.1% in 2013 (Moisture content at harvest was 14.0%), 68.9% in 2014 (Moisture content at harvest was 13.2%) and 30.1% in 2015 (Moisture content at harvest was 18.4%). The drastic improvement has done by proper harvest time.

One of the issues of NERICA 4 is soft and easy to be broken. This issue would be solved in future. If the content of magnesium and calcium are low, rice becomes soft. At present, analysis of hardness is applied only for NERICA 4. In future, further chemical analysis in laboratory may be required.

3) Agricultural machinery for harvest and post-harvest
The Project held the test run of Seed cleaner. The width of NERICA 4 Seed (Paddy) is small (less than 2.0 mm width). Good seed is discharged from the 1st outlet and the 2nd outlet. The Project changed the outlets and set new divider between the 2nd outlet and the 3rd outlet. In future, the cylinder sieve of less than 2.0 mm is necessary.

Gezira SMoA operated 2 combine harvesters in 2015. The one is Japanese made and the other is Chinese made which the Project procured in 2012. The Project confirmed that threshing capability of Japanese one is much better than that of Chinese. Egyptian experts of third country training informed that Egyptian farmers use Japanese combine harvester and they do not have issue of much contamination of impurities.

2.2.4 To discuss and propose appropriate harvest & post-harvest technique

The Project and C/Ps organized a seminar to discuss and propose appropriate harvest & post-harvest technique in Gezira State on 26th November 2015. The contents of the seminar are as follows; (The presentation materials of the seminar are attached as Annex 8.)

a. Result of harvested rice quality analysis in 2013 and 2014 (Ms. Faiga & Ms. Sara)
b. Progress of remaining works of RMU and towards training of RMU (Mr. Fadlemola)
c. Issues of current post-harvest technique in Sudan and future prospect - Traditional underground storage system (Matmora Revival) (Mr. Tokumoto)

The study on materials of sack for rice and the storage system is required. The atmosphere condition in Sudan at harvest season is very hard for harvested grain. The relative humidity is about 30%, if keeping grain in this condition, the paddy becomes less than 10% of equilibrium moisture content, as mentioned before. The actual result shows that the moisture content of paddy seed produced in 2014 is less than 10% and they have cracks in the kernels and majority of milled rice become broken rice. As the commodity of rice, i.e., head rice is only commodity for trade.

Moreover, the moisture reduction means weight loss of marketable rice. In Sudan, the material of sack is made of breathe-well material. The non-breathe material of sacks is suitable for rice to protect from the moisture reduction. There is no crack of brown rice of 14 –15% moisture content at 75% of relative humidity in Japan. The government standard storage is equipped with air conditioner for brown rice.

Regarding the storage system, there is an excellent traditional storage system in Sudan, called “Matmora”. It is the under-ground storage. The former generation had protected weight-loss of grain.

The following is collected information of Matmora. Gedaref State carries out the Matmora system for large scale storage of traders and the state owns Russian Concrete Silo of 1,500 tons (27 bins x 2 blocks 1 million sacks of sorghum), 100,000 tons of French Steel Silo and common

stores. Those storage have same issue of moisture reduction during storage. Gedaref SMoA is trying large scale of Matmora system but there are no Matmora systems of farmers Level. The farmer's level Matmora system would be required to solve the issue because the moisture reduction starts from farmer's level.

The large scale Matmora of sorghum traders is 20 m of length x 5 m of width x 3 m of height. The floor is dug 2 m underground level. The floor, wall, ceiling are covered by plastic sheet and straws are used for buffer of air condition. The digging ground and soil covering is worked by power shovel.

A storage capacity of middle scale Matmora is 15,000 sacks (1,350 ton) and a storage capacity of large scale Matmora is 50,000 sacks (4,500 ton). These storages are managed by the state, and state bank. The investment cost and operation cost of Matmora is cheaper than other modern silo. However, if the moisture content of grain from previous traders and/or farmers is already low, the large system does not perform to hold appropriate moisture content.

Large Matmora facilities are applied to the traders. The smaller Matmora for farmers of just-harvested grain can protect the grain from moisture content reduction. The development of farmer's Matmora is required, as soon as possible. MoA in Sudan has power shovels for dredging the irrigation. The application of Japanese Pre-fabricated storage technology may be introduced.

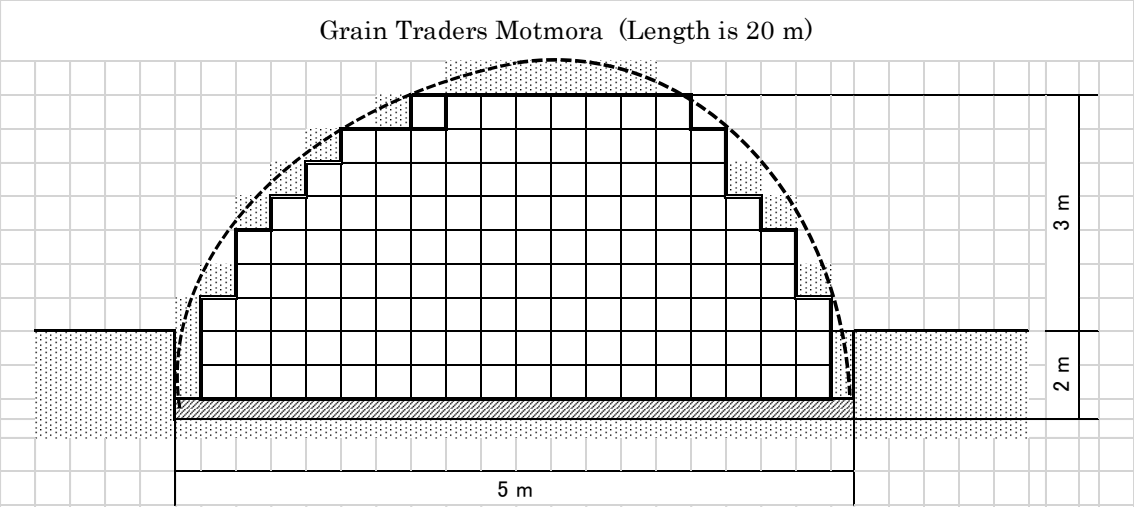


Figure 2-20 Structure and section of Matmora

Finally, in order to enhance better marketability of NERICA 4, the harder shattering of grain (paddy) should be managed properly. The 1st stage of technical transfer on cultivation of upland rice is successfully completed. More research for other variety is necessary for further development of upland rice in Sudan.

Activity 2.4 "To train agricultural extension workers to be trainers on appropriate upland rice cultivation"

2.4.1 To conduct TOT (in country) to transfer appropriate technique on upland rice cultivation

1) Training on appropriate upland rice cultivation technique in Sudan

(1) OJT on each operation at trial and demonstration field in Gezira State

Date: From May to January, 2016
Participants: Supervisors (extensionists) for field trial and demonstration farms including other extensionists (mainly Rice Promotion Unit member)
Contents: Key and important techniques (operations) on upland rice cultivation such as land preparation, sowing, water management, weed control, fertilization and harvesting including other several specific operations relevant to field trial such as data collection, data analysis, etc. (management based on experimental plan) were obtained by participants through this On the Job Training (OJT).

(2) OJT on each operation at demonstration (seed production) field in Sennar, Gedaref, River Nile, Northern and White Nile States
Date: From May to January, 2016
Participants: Supervisors (mainly Rice Promotion/Production Unit members) for demonstration farms including other extensionists
Contents: Key and important techniques (operations) on upland rice cultivation such as land preparation, sowing, water management, weed control, fertilization, removing off-type plants and harvesting were obtained by participants through this On the Job Training (OJT).

- Remarkable point on OJT

The objective of OJT is to nurture extensionists into capable trainers on appropriate upland rice cultivation techniques through implementing various operations in the experimental and demonstration fields with Japanese experts. The meaning of trainer is the person who has prompt/proper judgment and appropriate practical techniques on upland rice cultivation. It can be said that the trainers are able to judge/asses actual situation properly and to take prompt action appropriately to get good result. They can manage demonstration farm well by themselves and provide technical advice to farmers. To build extensionists into capable trainers, Japanese experts must encourage their sense of responsibility, initiative by listening to their opinions first through discussion with them in the field and then provide correct advice to them as needed. Through the monitoring activity in the field and at the monitoring meeting, experts can recognize the level of performance (knowledge, techniques, actions, etc.) of extensionists and provide advice to improve it. When the extensionists do not have proper knowledge and techniques, they need to try to accumulate them from Japanese experts before making own decision. OJT enables the extensionists to acquire proper judgment and practical techniques. Through this training (OJT), more than targeted number of extensionists in each state obtained proper judgment ability and appropriate/practical techniques on upland rice cultivation, and became capable trainers which can utilize them for implementing proper management of trial and demonstration fields as well as transferring the techniques to farmers in the field.

(3) Site visit, Discussion and Technical advice by Mr. Tsuboi (Expert of "Promotion of Rice Development Project" in Uganda)

Table 2-11 Schedule of Site visit and Discussion by Mr. Tsuboi

Date	Schedule
05/09/2015	Arrive to Khartoum, Meeting with project team
06/09/2015	Meeting at JICA Office →Gezira State, Discussion with Acting DG of SMoA, Visiting Trial field and Demonstration farms : Providing Technical advice to Supervisors (extensionists)
07/09/2015	Visiting Demonstration farms : Providing Technical advice to Supervisors (extensionists)
08/09/2015	Move to Gedaref State, Visiting Demonstration farms (Al Fau): Providing Technical advice to Supervisors (extensionists) →Gezira State, Visiting Demonstration farms : Providing Technical advice to Supervisors (extensionists)
09/09/2015	Move to Sennar State, Visiting Demonstration farms : Providing Technical advice to Supervisors (extensionists) →Gezira State
10/09/2015	Discussion with the Minister of SMoA, Giving lecture on Field experiment to Supervisors

	(extensionists) →Khartoum, Discussion with the Minister of FMoAF
11/09/2015	Move to River Nile State
12/09/2015	Visiting Demonstration farms: Providing Technical advice to Supervisors (extensionists) →Khartoum
13/09/2015	Discussion with project team
14/09/2015	Departure from Khartoum

The evaluation on performance of Extensionists by Mr. Tsuboi were as follows,
1. Prominent progress of cultivation and management techniques on both field experiment and demonstration farms by utilizing knowledge and skills provided through training in Uganda was recognized, but continuity of these field activities was necessary for upgrading the ability more and more with daily efforts.
2. As for field experiment, it is imperative to formulate experimental plan by supervisors themselves to reduce several mistakes and obtain the formulating skills surely. It must be kept in mind that field experiments were conducted to transfer the results into farmers' fields. Therefore, conducting valuable and useful experiments was required.
3. Regarding demonstration farms, supervisors acquired basic cultivation techniques such as land preparation, sowing, weed control, fertilization, water management, etc. The important point is that these operations must be completed thoroughly up to the end without laziness.

Main technical advice and suggestions from Mr. Tsuboi through the visit were as follows,
1. Each field operation must be done at proper time appropriately because even only one insufficient operation affected yield as result of all operations.
2. Nitrogen source and amount of trial needs to be conducted at same place continuously to observe pH value under high pH value condition in Sudan.
3. Introducing mechanical weeding such as hand tractor, rotary weeder (cultivator) must be considered.
4. Sowing at proper seeding rate was important to avoid poor growth by dense sowing. Actual seeding rate (30kg/fed) in consideration of occurring missing hills is understandable, but lower seeding rate such as 20kg/fed was regarded as optimum seeding rate to get higher yield.
5. In Sudan, high yield can be pursued on rice production by putting agricultural inputs due to the properly-maintained irrigation facilities.
6. Farmer can produce seeds themselves economically by utilizing their own filed. Removing off-type plants completely is difficult, so selecting the area for necessary amount of seeds for next season and removing off-type plats thoroughly in this limited area was practical and suitable for farmers.
7. After rainfall, red rice can be distinguished easily. Soaking panicle in water for several hours is also practical method to distinguish and removing red rice before harvesting and threshing.
8. When conducting organic fertilizer trial, to conducting inorganic fertilizer trial is important to compare both trials from the viewpoint of elemental and economical aspects.
9. Irrigation interval (frequency) in the field must follow to implement proper irrigation regardless of small amount of rainfall.
10. 'Grain rot' was observed in one demonstration farm and this disease is seed transmission disease. Therefore, harvested rice from this field should not be used as seed next season. If rice is used as seed from this field, damaged grains must be removed completely.
11. Dramatic change of soil moisture from dry to wet affected rice growth negatively. Therefore, avoiding it by executing proper irrigation and drainage is important for healthy growth.
12. The symptom like 'sulphur deficiency' was observed in one demonstration farm. Please apply urea and ammonium sulphate respectively at separate place to compare the growth.
13. Especially, seed production field in field trial site is very important field. To obtain high pure seeds by removing off-type and/or harvesting panicles of NERICA 4 is strongly recommended.
14. The same and most important advice as with last season: cultivating rice on one's own teaches a lot of things. The most important thing is to keep an attitude to learn things from rice

through cultivating it on one's own.

2.4.2 To conduct training in third country/Japan to transfer appropriate technique on upland rice cultivation

1) Third Country Training on Upland rice cultivation training in Uganda
The Project in collaboration with JICA's "Promotion of Rice Development (PRiDe) Project" in Uganda, conducted Advanced Training for Rice Cultivation (13 - 24 July, 2015). The objective is to heighten the ability, in terms of ways of seeding, fertilizer application, gauging yield component and judging optimum harvest time. The Project sent 12 extensionists to the training. They are from targeted 6 states (Gezira: 3, Sennar: 3, Gedaref: 2, River Nile: 1, Northern: 1, White Nile: 2). They are expected to be specialists on upland rice cultivation and to be capable of supervising others in the farms utilizing trained skills and knowledge as well as training their colleagues on sites. Moreover Mr. Goto (Deputy Chief Advisor of the Project) visited the PRiDe Project to observe the training and discussed with rice experts in Uganda the training and evaluation of Sudanese trainees.

PRiDe Project accepts trainees from other African countries. The collaboration with PRiDe Project began in 2010. Total 150 Sudanese participants were trained so far in Uganda. (See Annex 9 – List of Trainees to 3rd Country)

Table 2-12 Schedule of Advanced Training for Rice Cultivation

Day	Date	9:15 - 10:45	11:00-12:30	13:30 - 14:45	15:00 - 16:15
1	13/07/2015 (Mon)	KQ410 9:20 Arrive Entebbe		Entebbe → Kampala	Rest
2	14/07/2015 (Tue)	Opening, PRiDe Project and Pre-test	Field visit	Rice in general	Opening, PRiDe Project and Pre-test
3	15/07/2015 (Wed)	Upland Rice Cultivation	Lowland Rice Cultivation	Rice Insect and Disease	Upland Rice Cultivation
4	16/07/2015 (Thu)	Yield Survey, Yield Components	Field Practice (Yield survey)		
5	17/07/2015 (Fri)	Self Study			
6	18/07/2015 (Sat)				
7	19/07/2015 (Sun)				
8	20/07/2015 (Mon)	Kampala → Jinja	Visit Jinja Rice Mill		Jinja → Kampala
9	21/07/2015 (Tue)	Seed production	Field Practice: Sowing, Off-type rouging	Practice: Rice Mill	Seed production
10	22/07/2015 (Wed)	Water and rice	Seed and fertilizer calculation	Rice promotion activity in Uganda	Water and rice
11	23/07/2015 (Thu)	Rice Extension in Uganda	Statistics		Post-test
12	24/07/2015 (Fri)	Wrap-up	Closing	Namulonge → Airport KQ415 18:35	Wrap-up

2) Third Country Training in Egypt
The Project started trainings in Egypt since 2013. Egypt is a neighbor country to Sudan. The climate, environment and culture are similar to Sudan and the language is almost the same. Although Egypt mainly cultivates paddy rice, it is an advantage for Sudanese extensionists to

learn rice cultivation in Egypt.

The Project conducted 3 trainings (①Weed Control, ②Agricultural Machinery, ③Rice Post-Harvest & Processing) in 2013 and 4 trainings (①Observation Type of Training for High Officials, ②Irrigation & Water Management, ③Weed Control, ④Rice Post-Harvest & Processing) in 2014. In the season of 2015, the Project conducted same 3 trainings (Irrigation & Water Management, Weed Control and Rice Post-Harvest & Processing) as 2014 for extensionists, 1 observation programme for high officials and 1 technical exchange for ARC researchers. The details are described below.

(1) Observation Programme on Rice Cultivation for High Officials
The Project in collaboration with EICA (Egyptian International Center for Agriculture), RRTC (Rice Research and Training Center) and RTTC (Rice Technology Training Center), organized an observation programme on rice cultivation for 9 high officials. The participants were DGs (GMs: General Managers) of FMoAF and SMoAs, National Rice Coordinator of NRP, etc. It was held from 4 to 10 September 2015.

Table 2-13 Participants of Observation Programme on Rice Cultivation for High Officials

No	Name	Position
1	Dr. Adel Yosif Eltayib Babiker	DG, International Cooperation Directorate, Federal MoAF
2	Mr. Mohieldin Ali Mohamed	National Rice Coordinator, National Rice Project, Federal MoAF
3	Dr. Saifaldean Hassan Aboud	DG, Gezira State MoA
4	Mr. Elfadil Abdelmotalib Abdelkarim	DG, General Administration of Agriculture, Gezira State MoA
5	Mr. Abdelmunim Majzoub Elhasan	Head of Rice Promotion Unit, Gezira State MoA
6	Mr. Ahmed Mohamed Youssif Ahmed	GM, White Nile State MoA
7	Mr. Emadeldeen Mohammed Ali	GM, Northern State MoA
8	Mr. Abdelgadir Mohamed Ahmed	Director, Department of Technology Transfer and Extension, Sennar State MoA
9	Mr. Saleh Abdo Saeed Khilil	Director, Department of Technology Transfer and Extension, River Nile State MoA

The objective is to deepen the understanding of rice cultivation and rice promotion activity in Egypt and to learn Egyptian experience. Egypt is ranking as No.1 in the world in terms of rice yield (productivity). Egypt produces about 10 t/ha. In order to develop rice sector in Sudan, there are a lot of things to learn from Egypt.

The content of the programme was well considered to introduce Egyptian rice sector entirely within short period. High officials visited farmer's field to observe the harvest, exchanged views with EICA staff to train human resource on rice sector, observed experiment site and laboratory, visited rice milling company, etc. Through this programme, they are expected to acquire better understanding of Egyptian rice sector and to proceed the development of rice sector in Sudan.

Table 2-14 Schedule of Observation Programme on Rice Cultivation for High Officials

Day	Date	Topic
1	04/09 (Fri)	- Arrive to Cairo (Stay in Cairo)
2	05/09 (Sat)	- Meeting: EICA - Briefing on schedule and activities of EICA, etc. - Move to Tanta (Stay in Tanta)
3	06/09 (Sun)	- Meeting: RRTC (Rice Research & Training Center) - Explanation on RRTC activities - RRTC Tour

		- RRTC Research Farm (Stay in Tanta)
4	07/09 (Mon)	- Visit: Rice milling company (Milling process, Quality produced, Marketing procedure, Seed moisture content) (Stay in Tanta)
5	08/09 (Tue)	- Move to Alexandria - Meeting: RTTC (Rice Technology Training Center) - RTTC Tour (Post-harvest operation, Labs, Milling plant) - Move to Tanta (Stay in Tanta)
6	09/09 (Wed)	- Field Day in RRTC Demonstration Farmer's Field in relation to Hybrid programme - Move to Cairo (Stay in Cairo)
7	10/09 (Thu)	- Evaluation and Closing at EICA - Departure from Cairo

(2) Technical Exchange for ARC Researchers

The Project in collaboration with EICA, RRTC and RTTC, organized Technical Exchange for 8 ARC rice researchers including National Rice Research Coordinator. It was held from 4 to 10 September 2015.

It is very important for rice sector development in Sudan to develop also rice research activity. The objective of the exchange is to deepen the understanding of rice cultivation and research, to discuss how to conduct various researches on rice with Egyptian researchers, and to learn Egyptian experience how to integrate research and extension.

In this programme, researchers visited experiment sites and laboratories. They exchanged views on rice researches (breeding, agronomy, pathology, entomology, weed control, irrigation, etc.). They are expected to apply what they have learnt to their research in Sudan.

Table 2-15 Schedule of Technical Exchange for ARC Researchers

Day	Date	Topic
1	04/09 (Fri)	- Arrive to Cairo (Stay in Cairo)
2	05/09 (Sat)	- Meeting: EICA - Briefing on schedule and activities of EICA, etc. - Move to Tanta (Stay in Tanta)
3	06/09 (Sun)	- Meeting: RRTC (Rice Research & Training Center) - Explanation on RRTC activities - RRTC Tour - RRTC Research Farm (Stay in Tanta)
4	07/09 (Mon)	- Visit: RRTC - Breeding section (Presentation, Discussion with researchers, Field visit) - Agronomy section (Presentation, Discussion with researchers) (Stay in Tanta)
5	08/09 (Tue)	- Move to Alexandria - Meeting: RTTC (Rice Technology Training Center) - RTTC Tour (Post-harvest operation, Labs, Milling plant) - Move to Tanta (Stay in Tanta)
6	09/09 (Wed)	- Visit: RRTC - Crop protection (Field visit and discussion with scientists: Rice Pathology, Rice Entomology, Rice Weed Control) - Move to Cairo (Stay in Cairo)
7	10/09 (Thu)	- Evaluation and Closing at EICA - Departure from Cairo

(3) Training for Irrigation & Water Management

The Project in collaboration with EICA and RRTC, conducted a training for Irrigation & Water Management (22 August - 5 September, 2015). It was the second time to conduct the training. Six targeted SMoAs nominated total 15 extensionists who worked with the Project in this

season. (See Annex 9 – List of Trainees to 3rd Country)

Water management (irrigation and drainage) is one of the most important operations for upland rice cultivation. The objective of the training is to understand critical point of water management and, in particular, for water requirement in the shifting time from vegetative growth to reproductive growth and onward. The participants are expected to apply the knowledge and skills in their site.

Table 2-16 Schedule of Irrigation & Water Management Training

Day	Date	Topic	Place
1	22/08 (Sat)	- Arrive to Cairo - Registration - Introduction	EICA (Cairo)
2	23/08 (Sun)	- Questionnaire - Introduction to rice production - Cultural practices for rice crop	EICA (Cairo)
3	24/08 (Mon)	- Rice ecology - Aerobic rice	EICA (Cairo)
4	25/08 (Tue)	- Rice irrigation management	RRTC (Kafr el-Sheikh)
5	26/08 (Wed)	- Water management under salt affected soils	RRTC (Kafr el-Sheikh)
6	27/08 (Thu)	- Egyptian rice milling system	RRTC (Kafr el-Sheikh)
7	28/08 (Fri)	- Reporting	RRTC (Kafr el-Sheikh)
8	29/08 (Sat)	- Rice production under drought conditions	RRTC (Kafr el-Sheikh)
9	30/08 (Sun)	- Soil and water analysis	RRTC (Kafr el-Sheikh)
10	31/08 (Mon)	- Water management for SRI	RRTC (Kafr el-Sheikh)
11	01/09 (Tue)	- Farmer field trip “Improved irrigation technologies”	RRTC (Kafr el-Sheikh)
12	02/09 (Wed)	- Rice: nutrient disorders & nutrient management	RRTC (Kafr el-Sheikh)
13	03/09 (Thu)	- Participants Presentation	EICA (Cairo)
14	04/09 (Fri)	- Evaluation	EICA (Cairo)
15	05/09 (Sat)	- Closing - Departure from Cairo	EICA (Cairo)

(4) Training for Weed Control

The Project in collaboration with EICA and RRTC, conducted a training for Weed Control (22 August - 5 September, 2015). It was the third time to conduct this training since 2013. Six targeted SMoAs nominated 15 extensionists who worked with the Project in the season 2015 but 2 of them had to cancel due to unexpected emergency cause. Therefore 13 extensionists participated in the training. (See Annex 9 – List of Trainees to 3rd Country)

Weed control is indispensable for upland rice cultivation. The objective of the training is to understand weeding method with herbicide and mechanical intertillage. The participants are expected to utilize the knowledge and skills in their site.

Table 2-17 Schedule of Weed Control Training

Day	Date	Topic	Place
1	22/08 (Sat)	- Arrive to Cairo - Registration - Introduction	EICA (Cairo)
2	23/08 (Sun)	- Questionnaire - Introduction to rice production - Introduction to weed science	EICA (Cairo)
3	24/08 (Mon)	- Water and nutrient management & weed control	EICA (Cairo)
4	25/08 (Tue)	- Integrated weed management - Weed management under SRI	RRTC (Kafr el-Sheikh)
5	26/08 (Wed)	- Weed management under salt affected soils	RRTC (Kafr el-Sheikh)
6	27/08 (Thu)	- Egyptian rice milling system	RRTC (Kafr el-Sheikh)

7	28/08 (Fri)	- Reporting	RRTC (Kafr el-Sheikh)
8	29/08 (Sat)	- Cultural practices & weed control	RRTC (Kafr el-Sheikh)
9	30/08 (Sun)	- Herbicides: selectivity - mode of action	RRTC (Kafr el-Sheikh)
10	31/08 (Mon)	- Weed management in seed production systems	RRTC (Kafr el-Sheikh)
11	01/09 (Tue)	- Farmers fields: demonstration field trip	RRTC (Kafr el-Sheikh)
12	02/09 (Wed)	- Weed ecology - Weed biological characters	RRTC (Kafr el-Sheikh)
13	03/09 (Thu)	- Participants Presentation	EICA (Cairo)
14	04/09 (Fri)	- Evaluation	EICA (Cairo)
15	05/09 (Sat)	- Closing - Departure from Cairo	EICA (Cairo)

(5) Training for Rice Post-Harvest & Processing

The Project in cooperation with RTTC conducted a training for Rice Post-Harvest & Processing (22 August - 5 September, 2015). It was the third time to conduct since 2013. The Project sent 8 extensionists/agricultural engineers to the training. (See Annex 9 – List of Trainees to 3rd Country)

Post-harvest process and improvement of the technique are important for promotion of rice production in Sudan. The objective of the training is to understand and operate actual works about a whole range of post-harvest techniques such as the reduction of harvest loss, the installation and operation of RMU, the quality control of milled rice, appropriate rice packaging for sale and a proper method for rice storage. The participants will be expected to work on the post-harvest process in collaboration with previous participants.

Table 2-18 Schedule of Rice Post-Harvest & Processing Training

Day	Date	Topic	Place
1	22/08 (Sat)	- Registration - Reception - Accommodation	RTTC (Alexandria)
2	23/08 (Sun)	- Orientation RTTC facilities - The concept of Post-harvest rice processing - Rice milling operation	RTTC (Alexandria)
3	24/08 (Mon)	- Principal science of rice mill handling equipment - Principal science of rice receiving, cleaning & grading	RTTC (Alexandria)
4	25/08 (Tue)	- Rice paddy husking equipment & separation machines - Practical work: Receiving, husking and separation	RTTC (Alexandria)
5	26/08 (Wed)	- Drying principle techniques - Advantage and disadvantage of different storage methods	RTTC (Alexandria)
6	27/08 (Thu)	- Rice whitening and polishing - Rice colour sorting and packing	RTTC (Alexandria)
7	28/08 (Fri)	- Visit: Private sector rice mill	RTTC (Alexandria)
8	29/08 (Sat)	- Practical work: Whitening & polishing - Practical work: Colour sorting & packing	RTTC (Alexandria)
9	30/08 (Sun)	- Laboratory inspection (quality control) - Practical work: Determination moisture	RTTC (Alexandria)
10	31/08 (Mon)	- Practical work: Paddy inspection - Practical work: White rice inspection	RTTC (Alexandria)
11	01/09 (Tue)	- The factors leading to accuracy of broken rice - Management of stored rice insects diseases	RTTC (Alexandria)
12	02/09 (Wed)	- A tour in Alexandria city	RTTC (Alexandria)
13	03/09 (Thu)	- Practical work: One pass rice mill - Parboiling rice technique	RTTC (Alexandria)
14	04/09 (Fri)	- Work up: meeting course evaluation - Utilization of rice by-products	RTTC (Alexandria)
15	05/09 (Sat)	- Departure from Alexandria	RTTC (Alexandria)

(6) Follow-up visit from Egypt

The Project organized the first follow-up visit to Sudan from Egypt. Members of Egyptian mission were DG of EICA, a senior researcher of RRTC and the staff of JICA Egypt office. Their objectives were 1) to evaluate effectiveness of trainings for Sudanese extensionists, and 2) to understand the situations of upland rice cultivation and promotion in Sudan for programming more suitable training courses in future. The schedule of the mission in Sudan is shown in Table 2-19. The Project guided the mission to several site visits in Gezira and Gedaref State and arranged an interview to extensionists who participated in trainings in Egypt and meetings with Sudanese high officials and rice researchers.

As a result of the visit, the mission understood well the situations of upland rice cultivation and the research in Sudan, and collected information to re-programme training courses for Sudanese extensionists in future. Moreover the visit helped to make a connection between Egyptian side (EICA and RRTC) and MoA of Sudan. They got new information about productions of other crops besides rice and development of human resource in agricultural area. It was a fruitful visit for both Egyptian and Sudanese sides.

Table 2-19 Schedule of follow-up by Egyptian mission

Day	Date	Schedule
1	31/10 (Sat)	- Arrival at Khartoum Flight: MS855, Arrival Time: 19:30
2	01/11 (Sun)	- Meeting with JICA Project - Courtesy call to Undersecretary in FMoAF - Move to Wad Medani, Gezira State
3	02/11 (Mon)	- Move to Al Fau, Gedaref State - Rice Field Day in Gedaref State - Move to Wad Medani, Gezira State
4	03/11 (Tue)	- Visit to Gezira SMoA, Discussion with Minister and DG, Interview with extensionists who participated in training in Egypt - Visit to ARC research station, Discussion with ARC researchers - Move to Khartoum
5	04/11 (Wed)	- Courtesy call to JICA Sudan Office - Documentation - Dinner with FMoAF
6	05/11 (Thu)	- Move to Wad Medani, Gezira State - Rice Field Day in Gezira State - Move to Khartoum
7	06/11 (Fri)	- Departure from Khartoum Flight: MS858, Departure Time: 11:45

3) JICA Training courses in Japan for FY 2015

JICA Training courses in Japan for FY 2015 were offered in 7 topics with 8 participants within the framework of the Project. During their participations in the training programme, the trainees prepare action plan and upon their return to Sudan, they are expected to finalize action plan with their colleagues. They are also expected to train others to implement designed action plan with the cooperation by the Project team.

From the beginning of the Project until FY2013, the Project put extra emphasis on overseas training for extensionists from Gezira State. These overseas training contributed greatly to the relatively good achievement of upland rice cultivation in Gezira State. In 2014 and 2015, the Project shifted the target from extensionists in Gezira State to ones in other states.
(See Annex 10 – List of Trainees to Japan)

Activity 2.5 "To demonstrate rice cultivation to expose farmers to appropriate upland rice cultivation technique"

2.5.1 To grow upland rice in demonstration farms in Gezira, White Nile, Sennar, Gedaref, River Nile and Northern States

The activity of upland rice in demonstration farms commenced with Gezira and White Nile State in 2010 and expanded to Sennar, Gedaref, River Nile and Northern State in 2012.

Gezira SMoA established a rice production unit in 2011 and conducted 5 demonstration farms in 2011, 10 farms in 2012, 9 farms in 2013, and 8 farms in 2014. In the state 2 - 3 farms out of 9 – 10 demo farms achieved the yield of 3ton/ha in the year 2012 - 2013 and exceeded 5ton/ha (1 demo farm) in 2014. Even though there are still issues to tackle, the extensionists acquired appropriate skill through the cultivation and the technique level of farmers is also being steadily improved.

Sennar and Gedaref SMoA started with 2 demonstration farms in 2012. These SMoAs established a rice promotion unit in 2013. Sennar SMoA conducted 5 farms in 2014 as well as in 2013 and Gedaref SMoA started this activity in farmer's field in 2014. The 2 SMoAs have a strong will to expand upland rice and they made progress step by step in these 2 years.

River Nile SMoA conducted 3 demonstration farms in 2012 and 2 farms in 2013. There was internal and systematic problem such as lack of coordination, inappropriate arrangement, and inadequate supervision of the SMoA in 2012 but it was very much improved in 2013 and conducted 3 farms in 2014 under better situation.

Northern SMoA started 1 demonstration farm in 2012 and 2 farms in 2013. Damage by bird is remarkable in the state as well as River Nile State. However 1 site recorded the yield of 2.7 t/ha in 2013, and 2 sites were conducted in 2014 continuously.

White Nile SMoA started activity of demonstration farm in 2010 but the results were not satisfactory. The SMoA did not follow the advice of the Project every year. The change of structure on Rice promotion unit in 2015 is expected to improve the performance and activity in the field.

1) Demonstration farms in Gezira State

The list of demonstration farms in 2015 can be referred to the table below. Remarkable points which are different from last year's demonstration farms are as follows.

- The area of a demonstration farm is basically 2 feddans, because it enables to make irrigation management and weeding easily.
- In seed production sites, area was conventionally a large place. But in this year it was divided it into some sites with about 4 feddans/site and the seed production sites simultaneously bear the functions of demonstration farms.
- The rainfall has decreased this year, but irrigation water was able to be kept to some extent and no flood damage happened. Therefore, it seems that the growth of rice and its yield could be expected the highest since the project began.

Table 2-20 Demo Sites in Gezira State (1 feddan≒0.42 ha)

Demo Site	Locality	Area (Fed)	No. of Extensionist	Sowing Date	Sowing method	Sowing Space	Harvest Date
Wad Bahai	Hasahisa	2.0	3	11/07/2015	Seed Driller	25cm	10/11/2015

Shibairab	South Gezira	2.0	1	30/06/2015	Seed Driller	25cm	22/10/2015
Abdelrahman	Hasahisa	2.0	1	07/07/2015	Seed Driller	25cm	27/10/2015
Wad Alasha	South Gezira	2.0	1	25/06/2015	Seed Driller	25cm	25/10/2015
Frejab	Hasahisa	2.0	1	10/07/2015	Seed Driller	25cm	3/12/2015
Sowriba*	South Gezira	2.0	2	23/06/2015	Seed Driller	25cm	-
TOTAL		12.0	9				

*Sowriba was cancelled because most of the seeds were eaten by bird after sowing.

Table 2-21 Seed Production and Demonstration farm in Gezira State

Demo Site	Locality	Area (Fed)	No. of Extensionist	Sowing Date	Sowing method	Sowing Space	Harvest Date
Area 44, Block 9 (Rahad Scheme)	Um Algora	4.0	3	17-21/07 /2015	Seed Driller	30cm	5/11/2015
Wad Sawi	Hasahisa	4.5	2	03-04/07 /2015	Seed Driller	25cm	28-29/10 /2015
Frejab	Hasahisa	4.0	1	10/07/2015	Seed Driller	25cm	3/12/2015
Wad Al Naim	South Gezira	4.0	1	25/06/2015	Seed Driller	25cm	21-22/10 /2015
Wad Alasha	South Gezira	3.5	1	27/06/2015	Seed Driller	25cm	26-27/10 /2015
UmBarona*	Wad Medani	1.0	—	22/06/2015	Seed Driller	30cm	19-20/10 /2015
TOTAL		21.0	8				

*UmBarona is not demonstration farm.

Table 2-22 Yield Results of Demo Sites in Gezira State

Demo Site	Locality	Area (ha)	Area (fed)	Yield (crop cut) (kg/ha)	Yield (crop cut) (kg/fed)	Yield (whole area) (kg/ha)	Yield (whole area) (kg/fed)
Wad Bahai	Hasahisa	0.65	1.54	3244.3	1362.6	2337.1	981.6
Shibairab	South Gezira	0.73	1.74	3788.8	1591.3	2361.6	991.9
Abdelrahman	Hasahisa	0.69	1.65	4066.3	1707.8	3074.8	1291.4
Wad Alasha	South Gezira	0.62	1.47	6181.2	2596.1	7916.5	3324.9
Frejab	Hasahisa	0.68	1.62	412.8	173.4	470.1	197.4
TOTAL/Average		3.37	8.02	3538.7	1486.2	3232.0	1357.4

Note: Crop cut yield is the yield by sampling and whole area yield is the yield of whole area

Table 2-23 Yield Results of Seed Production and Demo Sites in Gezira State

Demo Site	Locality	Area (ha)	Area (fed)	Yield (crop cut) (kg/ha)	Yield (crop cut) (kg/fed)	Yield (whole area) (kg/ha)	Yield (whole area) (kg/fed)
Area 44, Block 9 (Rahad Scheme)	Um Algora	1.77	4.22	4793.1	2013.1	3468.2	1456.6

Wad Sawi	Hasahisa	1.47	3.5	5397.4	2266.9	4377.5	1838.5
Frejab	Hasahisa	1.25	2.98	372.2	156.3	830.6	348.9
Wad Al Naim	South Gezira	1.24	2.95	5409.2	2271.9	4586.1	1926.2
Wad Alasha	South Gezira	1.28	3.04	5711.6	2398.9	4488.7	1885.3
UmBarona*	Wad Medani	0.32	0.76	3180.9	1336.0	2717.8	1141.5
TOTAL/Average		7.33	17.45	4144.1	1740.5	3411.5	1432.8

*UmBarona is not demonstration farm.
(Area [ha] and Area [fed] are measured by GPS and exclude water courses and levee ridges.)
(The map of demonstration farms in Gezira State can be referred to Annex 11)

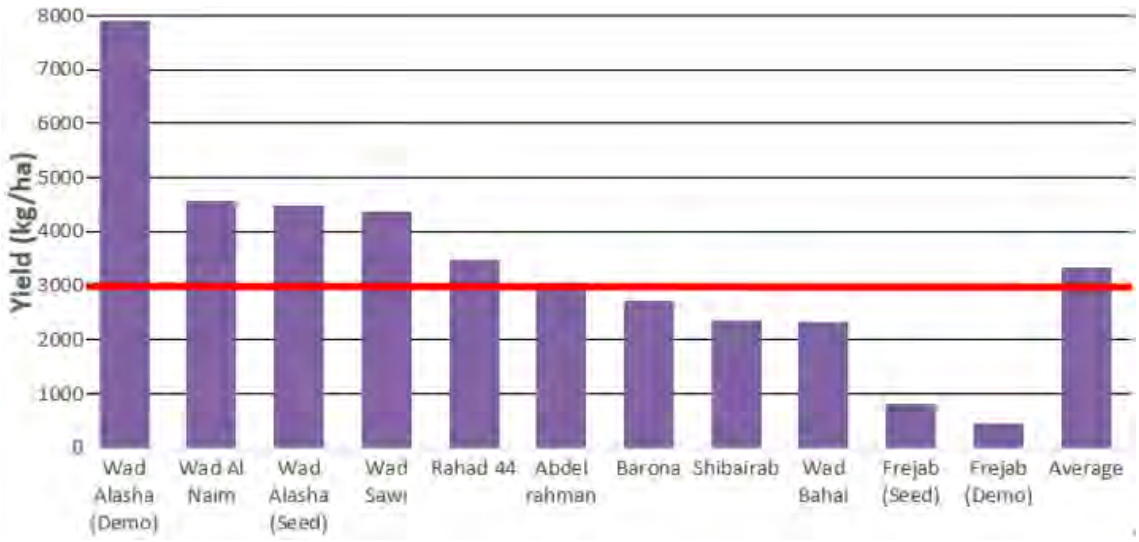


Figure 2-21 The Graph of the Yield in Demonstration Sites and Seed Production Sites in Gezira State

(1) Sowing
Year 2015, some main staff members in the Engineering Unit were transferred. Sometimes the coordination and communication with the Rice Unit had not been smooth. As it was anxious that land preparation and sowing might be delayed, the Rice Unit and the Engineering Unit made discussion how to improve the coordination. As a result, it was concluded that the Engineering Unit fulfilled the maintenance, the transportation and the operation of tractors and seed drillers at proper time with cooperation to the Rice Unit. Finally, sowing was completed at almost same timing as usual years. However, only Sowriba was forced to cancel rice cultivation. This was due to a lot of rice seeds eaten by small birds after sowing and even after re-sowing as well.

(2) Water Management
After sowing, water management activity was relatively positive in all demonstration farms. Farmers made irrigation about every 5 days at the first half of cultivation period. Some farmers changed irrigation frequency like every 3 days from the second half of cultivation period. But at some demonstration farms like Wad Bahai and Frejab, water was not fully supplied in June due to the reason of irrigation scheme maintenance, and land preparation and sowing were slightly delayed.

(3) Weed Control
Year 2015, weeding was actively implemented at almost all sites. Pre-watering conducted in all demonstration and seed production sites enabled initial weed emergence to be suppressed. Even farmers who grow rice for the first time this year like the one in Wad Alasha and Wad Sawi has high motivation for weed control. It is mainly due to the extensionists' proper, tenacious instruction and the high recognition of the importance of weeding. Wad Bahai where 4 feddans were cultivated and where the farmers struggled against weeding last year controls weeds properly by decreasing 2 feddans this year.

However, Frejab which is most remote area from Wad Medani has some weeds, although farmers are actively working. JICA expert gave extensionists in Frejab some pieces of advice to use herbicide more effectively and timely. The number of rice rogues decreased this year, but they became highly visible from the second half of maturity stage in some seed production sites. Thus, extensionists and farmers have been rogueing since September.

(4) Harvest
Harvest began with Barona in October 19 this year. Harvest was able to start earlier than last year. This is because the coordination between Rice Promotion Unit and Engineering Unit became smoother. At the time of sowing in 2015, the coordination between two Units was not positive. The two Units acquired the lessons on how to work efficiently. In 2015, two types of combine harvester were introduced. One is a Japanese combine harvester, and the other one is a Chinese combine harvester, which has conventionally been used. It seems that Japanese combine harvester is working much more effectively in terms of cutting and threshing.

As the result of harvest, 6 demonstration sites out of 11 sites achieved the yield of more than 3.0 t/ha, and 3 demonstration sites out of 11 sites had the yield more 2.0 t/ha and less than 3.0 t/ha. Average yield is more than 3.0 t/ha. This average yield is the highest for the last 6 years since our Project started. It could be obviously told that this result is a real fruit of our efforts. In addition, the highest yield in 2015 of 7.9 t/ha in Wad Alasha (demo site) is extraordinary. This yield is a good result enough to show the potential of rice production in Sudan. The points to increase yields are listed below.

- Sowing and harvesting were conducted at almost proper time
- Smooth coordination between the Engineering Unit and the Rice Unit enabled to harvest at proper time, although the coordination is not positive at the time of sowing.
- The skills of combine harvester operators were improving.
- No flood damage occurred this year because of less rainfall.
- As the highest yield of 7.9 t/ha in 2015 in Wad Alasha was able to update the highest yield record of 5.54 t/ha achieved in Rahad 44 in 2014, each extensionist has high motivation for his/her duties this year. In fact, strong seriousness of working attitude in getting high yield must be obtained was observed for most of the extensionists. Rather than technical matters, sincere attitude for his/her duties was able to lead to the positive outcome.

On the other hand, there were some issues found for harvest like as follows.

- Demonstration sites located at remote areas from Wad Medani, like Frejab, cannot usually achieve high yield. It required that the assignment of extensionists, the selection of farmers, water availability and access to demo sites should be improved.
- Some extensionists took leave at the time of sowing and harvesting. They are likely to have less responsibility and motivation for their duties.

(5) Others

- In 2015, an extensionist in Gezira State passed "African Business Education Initiative for the Youth", namely ABE Initiative and is studying in the University of Tottori same as the

case in 2014. The extensionist was in charge of the Seed production site, Area 44 Block 9. The realization of this overseas education is not just his career-up, but also the fruit of great effort for capacity building by project staff.

- In 5th November, Field Day was held in Rahad 44, Gezira State. Although Japanese Ambassador was not able to attend this Field Day, Minister of Gezira SMoA, the Egyptian delegate and ARC researchers attended. The contents of the Field Day are the demonstration of rice milling and harvesting with both a Japanese combine harvester and a Chinese combine harvester as well as the speech by main guests.
- In addition, the small-scale Field Day called "Extension Day" was held at Wad Bahai in 10th November. The contents of the Extension Day were not only the demonstration of harvesting with combine harvester, but also the explanation by extensionists to farmers on how to cultivate rice. The demonstration site in Wad Bahai in 2014 was not able to achieve high yield, due to a lot of weeding work at 4 feddans.

(See Annex 12 for more details on each site)

2) Demonstration farms in Sennar, Gedaref, River Nile, Northern and White Nile States
Chief Advisor and/or Deputy Chief Advisor of the Project visited the 5 states (31/05-22/06/2015) to check demonstration farms and to discuss with the Minister or DG (GM) on demonstration activity in 2015, and confirmed following points as project policy;

1. SMoA must assign at least 5 extensionists for each demonstration farm to implement proper management. The project will provide several types of training such as OJT, training in Uganda and Egypt to build up the capacity of extensionists. The new monitoring system will be tried to introduce to Sennar State and Gedaref State as well as Gezira State by the Project.

2. Principally, demonstration activity in 2015 will be conducted in the same site (farmer) of 2014 from the viewpoint of adding up the cultivation techniques, but the sites will be decided finally in consideration of farmer's motivation on upland rice cultivation, accessibility and water availability, etc.

3. In order to obtain 3t/ha as target yield through proper management, field size must be set 2.5 feddans at a maximum. But, field size must be set 1feddan in Northern and River Nile State from the viewpoint of easiness of transferring appropriate cultivation techniques and protecting rice from damage by birds.

4. Bearing with high yield potentiality of NERICA 4 in mind, seeding rate will be set 30kg/fed through taking measures to reduce missing hills and plant space will be set 30cm from the viewpoint of easiness of hand weeding. It is thought to contribute to obtaining high yield.

5. Herbicide" Pendimethalin (AI)" will be used as pre-emergence type in 2015 as with 2014, but it must be considered that first irrigation after spraying the herbicide need to be implemented as soon as possible to maximize the effectiveness. The dosage will be 1.5L/fed with same dosage of 2014.

6. Field selection, preparation of agricultural machineries and land preparation must be started as soon as possible to avoid damage by rainfall. In Northern State, late-sowing will be executed to avoid high temperature especially from panicle initiation to heading stage.

＜Remarkable points＞
1. Field selection and most of land preparation were implemented by SMoAs before the Japanese experts came to Sudan. Each field operation such as land preparation, sowing, weed

control, water management and termite control was implemented by staffs of SMoAs and farmers under instructions from experts and the operations was checked from the viewpoint of quality and timing in the field and at the Action Plan (Monitoring) Meeting. Sowing operation at most of the field was completed in June eventually as planned. The Project provided organic fertilizer to Gezira, Sennar and Gedaref States to improve soil fertility. New seed drillers were utilized in several demo sites in Gezira and demo site in White Nile States this season.

At most of fields (even seed production fields), off-type plants were observed in this year as with 2014 due to insufficient removing operation and poor harvest operation of only NERICA 4 as seeds. Therefore, obtaining of pure seeds must be considered and concrete measures such as thorough roguing operation at selected area and/or panicle reaping of NERICA 4, etc. need to be taken in each state based on suggestion by Mr. Tsuboi and Dr. Ikeda.

2. Observation Programme on Rice Cultivation for High Officials in Egypt was conducted in 2015 like 2014 and it was valuable opportunities for all participants to see high yield rice farmer's field with their own eyes and to understand establishment of linkage system between research and extension in neighboring country with similar natural environmental condition. Participation for the training has allowed participants to enhance their motivation on cultivating upland rice and expanding it in each state. After this training, participants implemented concrete activity for supporting upland rice cultivation such as visiting and discussion with the extensionists in the field. The significant effectiveness and importance of this kind of training were recognized.

Table 2-24 Outline of Demo Sites in Other 5 States

State	Site	Area (fed)	No. of Extensionist	Sowing	Sowing method	Sowing Space	Harvest Date
Sennar	Maiurno South	2.5	14	27/06/2015	Seed Driller	30cm	15/11/2015
	Almahlaj	2.5	7	22/06/2015	Seed Driller	30cm	27-30/11/2015
	Almergani	2.5	6	21/06/2015	Seed Driller	30cm	15/11/2015
Gedaref	Al Fau (ARC)	2.0	5	18/06/2015	Seed Driller	30cm	01/11/2015
	Al Fau (Farmer) 1	2.0		02/07/2015	Seed Driller	30cm	26-29/11/2015
	Al Fau (Farmer) 2	2.0		25/06/2015	Seed Driller	30cm	02/11/2015
	Shuwak (Ministry)	2.0	4	14-16/06/ 2015	Hand	30cm	12-15/10/2015
River Nile	Atbara 1	1.0	4	15/06/2015	Seed Driller	30cm	06-10/11/2015
	Atbara 2	1.0	4	15/06/2015	Seed Driller	30cm	04-08/11/2015
	Kanour	1.0	5	16/06/2015	Seed Driller	30cm	-
Northern	Dongola Island	1.0	9	26/07/2015	Seed Driller	24cm	25/11-09/12 2015
	Zawrat	1.0		26/07/2015	Seed Driller	24cm	26/11-05/12 2015
White Nile	Elfardos 1	2.0	7	24/06/2015	Seed Driller	30cm	12-22/11/2015
	Elfardos 2	2.0	7	24/06/2015	Seed Driller	30cm	12-22/11/2015
TOTAL		24.5	72				

(The Map of Demo [Seed Production] Sites in Other States 2015 is attached as Annex 13.)

(1) Demonstration farms in Sennar State

After visiting and checking the candidate sites by SMoA, 4 farms (2.5 feddans at each site, total 10.0 feddans) were selected and land preparation operation was started in these 4 farms. The

number of sites and the area of each site were suitable for proper management from the viewpoints of assignment of extensionists to the sites. However, it must be said that farm selection and land preparation were delayed, especially, selection of the site was not appropriate. SMoA made a mistake on site selection last year in terms of accessibility to the field among the criteria which was confirmed between the Project and SMoA. The accessibility was improved on site selection, but water availability was not considered seriously when selecting the sites. It precluded executing of pre-watering operation as an effective method to control weeds at several sites and affected other operations. One site was abandoned after finishing levelling because of difficulty of obtaining irrigation water. To perform thorough survey on the sites from various aspects was required for implementing future demonstration activity.

Generally, supervisors (extensionists) implemented each operation properly and they started to show their will on implementing operation timely as concrete actions in the field due to new monitoring system. The performance and attitude of them must be highly appreciated. Under the leadership of unit manager and each team leader, extensionists had implemented each management operation seriously in spite of change of the State Minister during the season. At one site, expected growth was not realized although organic fertilizer was applied with proper management. First sown seed did not germinate and several re-sowing operations were conducted at second site. Poor growth and lodging caused by dense sowing were observed widely at third site. In addition, off-type plants were observed widely as with last season in all sites. There were several issues to be tackled by SMoA from technical aspects, but it was true that the number of extensionists who have appropriate knowledge and techniques on upland rice cultivation increased year by year surely by keeping high motivation for high yield through attending some types of training such as OJT, in Uganda, in Egypt and in Japan. SMoA has institutional issues to be solved such as timely budget disburse for field management on land preparation, weeding and harvesting. The most important point for conducting demonstration farm activities successfully is that SMoA need to have own main agricultural machineries such as tractors with several attachments and own operators/engineers who operate machineries and conduct maintenance of machineries. SMoA had no option to hire machineries for important operations from private sector or from Gezira State. It impeded to implement each operation at proper time, keep quality of operation and save the cost although there were extensionists who have high motivation to work in the field timely. This point must be considered to be solved by SMoA and FMoAF. Implementing appropriate operation at proper time is key point for realizing high yield and expanding upland rice cultivation into farmers' fields in future. Field Day event was held in Maiurno area at first time since the Project started the activities in 2012. Yield results (sampling and whole area) of demonstration farms such as Maiurno South, Almahlaj and Almergani are shown in Table 2-25 below.
(See Annex 12 for more details on each site)

Table 2-25 Yield Results in Demo Sites in Sennar State

State	Site	Area (ha)	Area (fed)	Yield (crop cut) (kg/ha)	Yield (crop cut) (kg/fed)	Yield (whole area) (kg/ha)	Yield (whole area) (kg/fed)
Sennar	Maiurno South	1.05	2.5	3305	1388	602	253
	Almahlaj	1.05	2.5	3332	1399	735	309
	Almergani	1.05	2.5	4325	1817	1891	794
TOTAL/Average		3.15	7.5	3654.0	1534.7	1076.0	452.0

(2) Demonstration farms in Gedaref State

After visiting and checking the candidate sites by SMoA, 4 farms (2.0 feddans at each site, total 8.0 feddans) were selected and land preparation operation was started in these 4 farms. At Al Fau area, one site was selected in ARC Rahad Research Station and 2 farmer's fields were selected, and Shuwak site (field of Ministry) was selected at Atbara area. Field of Ministry at Al Fau area was abandoned this season due to low soil fertility and difficulty of drainage. In 2014, first Field Day event in this state was conducted at one site of these two farmers' fields. As for Shuwak site, to realize uniform growth is required to obtain high yield. Each site has own characteristics and environment. Therefore, cultivation management on each site has been conducted in consideration of these aspects. Generally, rice growth was good in ARC field and one farmer's field, but it was very poor in other farmer's field because of difficulty of water availability and especially, low motivation of farmer on upland rice cultivation. It means that Gedaref State made same mistake on site (farmer) selection like Sennar State. Shuwak site faced problem to realize uniform growth due to uneven soil fertility of the field and damage by termites.

The most serious issue to be solved in regard to demonstration farm activity in this state was assignment and number of extensionists to the sites. Some extensionists worked well in the field as core persons, but number of extensionists was absolutely insufficient for number of the sites. SMoA should understand that it is indispensable to increase the number of skilled extensionists and assign them to the sites for implementing proper management at demonstration farms. SMoA has shown the strong motivation on upland rice cultivation such as visiting the sites by the Minister and/or DG at several times since 2012, but SMoA needs to recognize the importance of increasing number of extensionists while building up their skills from the wide viewpoint of 'nurture of skilled extensionists' for the future expanding upland rice cultivation activity into the farmers' fields. There was a change of the State Minister in this state as with other states in the mid of season. The new Minister understood the importance and increased the number of extensionists at Al Fau area. Core extensionist at Atbara area (Shuwak) who had attended long term training in Japan returned to Sudan in November, so it can be said that human resources' aspect as an organization was improved for future cultivation. Gedaref State has large scale of land. SMoA located in Gedaref city. Although it takes little over an hour to Atbara area and little over two hours to Al Fau area from SMoA (Gedaref city), both sites were regarded as main target area for expanding upland rice cultivation in this state by SMoA. Under this situation, proper management system for each area including other area must be considered and introduced by SMoA. It must be recognized that it is imperative for realizing expected result on upland rice cultivation to implement each operation at proper time with acceptable quality. SMoA has a key to get success in its hand. Field Day event was held in the field of same farmer at Al Fau area with as last season. Yield results (sampling and whole area) of demonstration farms such as Al Fau (ARC), Al Fau (Farmer) 1, Al Fau (Farmer) 2 and Shuwak (Ministry) are shown in Table 2-26 below.
(See Annex 12 for more details on each site)

Table 2-26 Yield Results in Demo Sites in Gedaref State

State	Site	Area (ha)	Area (fed)	Yield (crop cut) (kg/ha)	Yield (crop cut) (kg/fed)	Yield (whole area) (kg/ha)	Yield (whole area) (kg/fed)
Gedaref	Al Fau (ARC)	0.84	2.0	4876	2048	1889	793
	Al Fau (Farmer) 1	0.84	2.0	4423	1858	1053	442
	Al Fau	0.84	2.0	5609	2356	3996	1678

	(Farmer) 2						
	Shuwak (Ministry)	0.84	2.0	3523	1479	777	326
TOTAL/Average		3.36	8.0	4607.8	1935.3	1928.8	809.8

(3) Demonstration farms in River Nile State

After visiting and checking the candidate sites by SMoA, 3 farms (1.0 feddans at each site, total 3.0 feddans) were selected and land preparation operation was started in these 3 farms. It was mentioned as project policy that field size was set 1.0 feddan from the viewpoint of easiness of transferring appropriate cultivation techniques and protecting rice from bird damage by covering the field. One farmer has 3 year-experiences on upland rice cultivation since 2012 and this is the first season for two farmers on cultivating it. The most serious issue regarding upland rice cultivation in this state is tremendous damage by birds and proper water management was required because of high temperature condition. Extensionists confirmed these points by experts just after starting season 2015. Rice production unit was composed of mainly female extensionists and they have implemented proper cultivation management generally by following the instructions from experts. Sowing operation was implemented at planed time. Rice growth of two sites was good through proper management such as weeding, water management and fertilization, but at other one site, seedling emergence was very poor because of deep sowing and re-sowing operation was implemented several times. Rice was kept good condition until panicle initiation stage by appropriate management and set-up method of bird net was explained by experts. Rice entered panicle initiation stage under high temperature condition and it is imperative for avoiding occurrence of empty grains to conduct appropriate water management (to keep water in the field). Extensionists already understood the importance of water at this stage. Therefore, they irrigated water almost every day, but they did not keep water in the field under high temperature. It caused occurrence of a lot of empty grains at all sites. Especially, at Kanour site, the extensionists and farmer implemented proper operation such as land preparation, sowing, weeding, etc. and the field was kept good condition. All persons concerned expected high yield. Rice started formulating young panicle under high temperature condition. Extensionists regarded frequent irrigation as proper water management without keeping water under this condition and irrigation canal had not enough water some time at this important time. It impeded to realize appropriate water management in response to actual situation. Therefore, almost every grains became empty (white head) and the farmer had no choice but to abandon the cultivation. Practical training as OJT must be continued to enable the extensionists to understand true meaning of 'proper management (operation)' in response to actual situation.

After change of the State Minister, the Project confirmed though discussion with DG that SMoA has intension to continue to cultivate upland rice under limited budget and has will to improve human resources' aspects by supervising the activities of extensionists in the fields. Yield results (sampling and whole area) of demonstration farms such as Atbara 1 and Atbara 2 are shown in Table 2-27 below.
(See Annex 12 for more details on each site)

Table 2-27 Yield Results in Demo Sites in River Nile State

State	Site	Area (ha)	Area (fed)	Yield (crop cut) (kg/ha)	Yield (crop cut) (kg/fed)	Yield (whole area) (kg/ha)	Yield (whole area) (kg/fed)
River Nile	Atbara 1	0.42	1.0	2448	1028	1912	803

	Atbara 2	0.42	1.0	2098	881	1189	500
	Kanour	0.42	1.0	N/A	N/A	N/A	N/A
TOTAL/Average		1.26	3.0	2273.0	954.5	1550.5	651.5

(4) Demonstration farms in Northern State

After visiting and checking the candidate sites by SMoA, 3 farms (1.0 feddans at each site, total 3.0 feddans) were selected and land preparation operation was started in these 3 farms. Two farms were located in Dongola Island area and one farm was located in other area. This is the first season for all three farmers to cultivate upland rice. Technical important points were the same as other states, but this state must take special measurement on high temperature and damage by birds like River Nile State. Based on the result of last season, extensionists suggested implementing sowing operation at the end of July to avoid high temperature from panicle initiation to heading stage. This state is low-rainfall area, so sowing operation in July was not affected by rainfall. One farmer in Dongola Island area decided to stop upland rice cultivation because sowing in July affected cultivation of fava bean which was main cash crop of this area in winter season. Therefore, number of site became two eventually. After sowing in July, management operation such as re-sowing, weeding, water management and fertilization was implemented. Especially, Dongola Island area has high soil fertility and weeds grow rapidly rather than rice, so implementing weeding at early stage was important. To avoid lodging of rice also was important to get high yield.

New Minister of SMoA mentioned that upland rice is one of promising crops for summer season in this state. He requested the Project to increase the number of demonstration farms to expand it in other areas. Due to personal change, member (all members are men) of rice production unit was changed, but new members also worked well in the field as with original members. Although cultivated area was small, high unit yield was expected. Under leadership of head of rice promotion unit, extensionists implemented each operation at each site. As already mentioned, Dongola Island area has fertile soil and weeds grow rapidly than rice plants. After sowing, extensionists and farmer focused on weeding at this site, but most of weeds are perennial grass, so extensionists had to conduct hand weeding because they were not be able to utilize post-emergence type of herbicide (2,4-D) which was effective against annual grass. Although weeding was conducted, weeds grew widely and affected rice yield eventually. Water management, which is key operation for good result in this state with high temperature condition, was conducted well, but improper set-up of birds net caused damage by birds and also affected yield. At Zawrat site, there was less perennial grass than Dongola Island site and intensive weeding at proper time by farmer prevented weeds from growing widely. Implementing appropriate water management limited occurrence of empty grains under high temperature condition. Setting up of birds net properly minimized damage by birds. These aspects affected rice yield positively. Realizing a certain level of yield under proper management showed the potentiality on upland rice cultivation in this state actually. If sowing was conducted in July to avoid high temperature from panicle initiation to heading stage, harvesting time will be in November which was suitable sowing time of fava bean as main winter crop. SMoA must consider balance between upland rice as summer crop and fava bean and/or wheat as winter crop to promote upland rice cultivation into farmers' fields in future. Yield results (sampling and whole area) of demonstration farms such as Dongola Island and Zawrat are shown in Table 2-28 below.
(See Annex 12 for more details on each site)

Table 2-28 Yield Results in Demo Sites in Northern State

State	Site	Area (fed)	Area (ha)	Yield (crop cut) (kg/ha)	Yield (crop cut) (kg/ha)	Yield (whole area) (kg/ha)	Yield (whole area) (kg/ha)
Northern	Dongola Island	0.42	1.0	4861	2042	1949	819
	Zawrat	0.42	1.0	4608	1935	2481	1042
TOTAL/Average		0.84	2.0	4734.5	1988.5	2215.0	930.5

(5) Demonstration farms in White Nile State

After visiting and checking the candidate sites by SMoA, 2 farms (2.0 feddans at each site, total 4.0 feddans) were selected and land preparation operation was started in these 2 farms. SMoA was not able to get satisfactory results on implementing demonstration farm activity every season since 2010 because of lack of recognition on actual situation of SMoA. Therefore, the Project stressed repeatedly the important points to get success on upland rice cultivation, which should be based on the learning from the previous year's unsatisfactory results. These advices were such as formulating a realistic cultivation plan, implementing demo farm in 2.5feddans at maximum, assignment of extensionists at least 5 to each farm, conducting sufficient levelling, executing proper weed control and taking measures on off-type plants. New manager of Rice Production Unit was assigned and new extensionists were selected as members of the unit before starting 2015 season. SMoA implemented field trial and seed multiplication activity in 2011 at other site but in the same area and SMoA failed to get acceptable result completely due to improper management caused by accessibility (far from SMoA), insufficient water caused by lack of water in irrigation canal and especially poor growth caused by soil characteristics (high pH value, etc.). Therefore, as for selected 2 sites (different sites but at same area in 2011), the Project confirmed SMoA on accessibility for proper management, water availability for appropriate water management, soil characteristics for good growth before starting cultivation. The answer from SMoA was no problem at all, and then each operation for cultivation was started. Under leadership of new unit manager, extensionists with new extensionists had implemented proper management generally such as land preparation, sowing by new seed driller, weeding, fertilization and water management. It was the first time for new staffs to cultivate upland rice, so they were not be able to conduct each operation perfectly, but their motivation for getting good yield was so high and followed instructions from experts well. Experts provided OJT to the staffs whenever they visited the sites. This kind of seriousness on demonstration farm activity was the most important point to obtain certain level of success on this activity. Personal change was done and GM was changed during the mid of this season. He visited demonstration farms at several time followed by the Project and it enhanced motivation of the extensionists for working in the field. The State Minister also was changed and he expressed the strong will to cultivate/expand upland rice in the state in cooperation with JICA during discussion with Chief Advisor of the Project. The fields were kept good condition generally under management such as re-sowing, weeding, etc. by extensionists. As for site selection, there was no serious problem on accessibility (proper management) and good growth (soil characteristics) except for water availability. The sites sometimes suffered from water shortage due to lack of water in main irrigation canal and it impeded the extensionists to conduct proper water management. Insufficient management due to lack of cultivation experience of extensionists and especially shortage of water affected yield in spite of the efforts by extensionists. However, it was not so serious problem. Because if the staff try to acquire knowledge and techniques on appropriate upland rice cultivation through working in the field, they can accumulate their knowledge and skills with experience and they can utilize them for

realizing good result. The most serious problem is lack of pure seed of NERICA 4 in the state. The fields of this season were covered by off-type plants because SMoA did not implement removing off-type plants properly last season and used mixed seeds in this season. Under this situation, panicle reaping of NERICA 4 was required to secure pure seeds. Experts instructed extensionists to utilize the harvested pure seeds for multiplication activity instead of demonstration activity. Even if the amount was small at first time, they can increase pure seeds by multiplication under special care. The Minister, GM, Unit manager and most of extensionists regarding to upland rice were changed under high motivation and strong will on expanding upland rice cultivation. It must be the time to start 'new season' by SMoA for realizing satisfactory results. Yield results (sampling and whole area) of demonstration farms such as Elfardos 1 and Elfardos 2 are shown in Table 2-29 below.
(See Annex 12 for more details on each site)

Table 2-29 Yield Results in Demo Sites in White Nile State

State	Site	Area (ha)	Area (fed)	Yield (crop cut) (kg/ha)	Yield (crop cut) (kg/fed)	Yield (whole area) (kg/ha)	Yield (whole area) (kg/fed)
White Nile	Elfardos 1	0.84	2.0	3778	1587	918	385
	Elfardos 2	0.84	2.0	3286	1380	976	410
TOTAL/Average		1.68	4.0	3532.0	1483.5	947.0	397.5

2.5.2 To transfer appropriate upland rice cultivation technique to farmers through cultivation in demonstration farms

Farmers acquired techniques and accumulated the experience on appropriate upland rice cultivation through practicing the cultivation by themselves with extensionists and receiving needed advice on appropriate techniques such as land preparation, sowing, cultivation management (weed control, fertilization, water management, etc.) and harvesting from JICA experts as OJT in demonstration farms.

To develop upland rice cultivation technique of agricultural extension workers and farmers through monitoring activity in demonstration farms and its acquisition, regarding Activity 2.4 and 2.5

Since FY2014, the Project introduced "New Production and Management System by utilizing Action Plan for Upland Rice Dissemination" and "Diary for Upland Rice Cultivation". This is for extensionists to acquire practical technique for executing each field operation timely. Firstly, extensionists set a target yield for each site and make action plan to attain the target. After the season starts, they implement their action plan with recording the diary. At the end of season, they review the season and evaluate themselves to improve for next season.

The Project introduced the management system in Gezira and Sennar SMoAs in 2014 and added Gedaref SMoA in 2015. The Project gave technical advice how to conduct monitoring activity and how to implement cultivation management along with action plan in these 3 SMoAs monthly. However the Project also conducted a session how to make action plan in other 3 SMoAs (River Nile, Northern and White Nile) to let them understand a concept of "New Production and Management System by utilizing Action Plan for Upland Rice Dissemination".

One of the main lessons learnt from FY2014 is the setting target yield. They set thoughtlessly ideal target, not realistic one. Because of this, most of targets were not achieved, even if extensionists managed rice cultivation properly. It caused the difficulty of analyzing the problem in attaining the target. Therefore in FY2015, the Project strongly proposed that they prepare action plan with practical target yield. The Project gave all 6 SMoAs technical advice to make action plan before the beginning of the season 2015 through National Consultant of the Project on monitoring & evaluation.

After the beginning of the season 2015, the Project and SMoAs conducted Action Plan meeting from the end of May to the middle of June. The national consultant visited 3 SMoAs (Gezira, Sennar and Gedaref) monthly during cultivation season to monitor the implementation of action plan with head of rice unit and each team leader, and conducted monitoring meeting. Since August, the national consultant shared the monitoring sheet with SMoAs and guided extensionists to monitor properly their activity by themselves for the sustainability of the management system. The national consultant also visited other 3 SMoAs (River Nile, Northern and White Nile) at the beginning and middle of the cultivation season to give advice their monitoring activity.

At the end of the season, the Project conducted the evaluation meeting in each SMoA. The Project and each SMoA discussed its result of season 2015 (Refer to "Workshop for the further development of upland rice production in Sudan" in P.46 for the details of the evaluation meeting.). The schedule of monitoring activity in season 2015 is shown in Table 2-30 and the target yield and achieved yield of all sites are shown in Table 2-31. In comparison with the season 2014 (only one site achieved its target yield), a total of 7 sites (5 sites in Gezira State, 1 site in Gedaref and Northern State) achieved its target yield in the season 2015.

Table 2-30 Schedule of Monitoring Activity in season 2015

	Gezira SMoA	Sennar SMoA	Gedaref SMoA	River Nile SMoA	Northern SMoA	White Nile SMoA
Formulating Action Plan	19, 20 Apr.	11, 12 Feb. 6, 7 Apr. 20 Apr.	10, 11 Mar. 6, May	23, 24 Feb. 27 Apr.	25 Feb. 28 Apr.	15-17 Feb. 22 Apr.
Presentation of Action Plan	28 May	1 Jun.	3 Jun.	14 Jun.	15 Jun.	22 Jun.
Monitoring Activity	26, 27 May 23-25 Jun. 28-30 Jul. 27 Aug. 5-8 Oct.	31 May 28, 29 Jun. 5 Aug. 31 Aug. 11, 12 Oct.	2 Jun. 30 Jun. 1 Jul. 3 Aug. 15, 16 Sep. 13, 14 Oct.	13 Jun. 10 Aug.	15 Jun. 11 Aug.	21 Jun. 6 Aug.
Evaluation	24 Nov.	6 Dec.	7 Dec.	22 Nov.	23 Dec.	9 Dec.

Table 2-31 Target yield and achieved yield of all sites in season 2015

State	Site	Area (fed)	Target Yield (t/fed)	Achieved Yield (t/fed)
Gezira	Wad Bahai	2.0	1.5	0.982
	Shibairab	2.0	1	0.992
	Abdelrahman	2.0	1	**1.291**
	Wad Alasha (demo)	2.0	1.5	**3.325**
	Frejab (demo)	2.0	1	0.197
	Area 44	4.0	1.3	**1.457**

	Wad Sawi	4.5	2	1.839
	Frejab (seed/demo)	4.0	1	0.349
	Wad Al Naim	4.0	1.3	**1.926**
	Wad Alasha (seed/demo)	3.5	1.2	**1.885**
Sennar	Maiurno South	2.5	0.8	0.253
	Almahlaj	2.5	0.75	0.309
	Almergani	2.5	0.8	0.794
Gedaref	Al Fau (ARC)	2.0	1.25	0.793
	Al Fau (Farmer) 1	2.0	1.25	0.442
	Al Fau (Farmer) 2	2.0	1.25	**1.678**
	Shuwak (Ministry)	2.0	1.25	0.326
River Nile	Atbara 1	1.0	1	0.803
	Atbara 2	1.0	1	0.500
	Kanour	1.0	1	N/A
Northern	Dongola Island	1.0	1	0.819
	Zawrat	1.0	1	**1.042**
White Nile	Elfardos 1	2.0	1	0.385
	Elfardos 2	2.0	1	0.410

* Bold means the site achieved its target yield.

The Project analysed promoting/hampering factors to/not to achieve the target yield of each site especially in 3 SMoAs (Gezira, Sennar and Gedaref) which conducted monthly monitoring meeting. The result of analysis is shown in Table 2-32.

In Gezira State, extensionists have got used to monitoring of their cultivation management along with action plan. However monitoring activity was limited in certain sites due to lack of transportation and far distance. It led weak communication and collaboration with farmers and unsatisfied results in certain sites.

In Sennar State, good efforts of extensionists and farmers were observed but unfortunately the main hampering factor (short of water in canal) came from outside of their cultivation management. In order to avoid this kind of outside factors, the coordination between the SMoA and related organizations (sugar company, electricity company, etc.) is important.

In Gedaref State, coordination with farmer is one of main lessons learned in the season 2015. For example, there was a big gap between the yield of Al Fau (farmer) 1 (0.442 t/fed = 1.1 t/ha) and Al Fau (farmer) 2 (1.678 t/fed = 4.0 t/ha) even though exactly a same team (same members of extensionists) managed and monitored the cultivation in these 2 sites.

Table 2-32 Promoting/hampering factors to/not to achieve the target yield

State	Promoting factors	Hampering factors
Gezira	・Proper cultivation management along with action plan ・Sharing agricultural operation among team ・Teamwork and sharing information among team ・Initiative and leadership of team leader ・Proper recording of field and operation (Diary for upland rice cultivation)	・Lack of coordination between the rice unit (SMoA) and irrigation scheme (e.g. Gezira Scheme) led short of water (Wad Bahai and Frejab). ・Inappropriate transferring technique from extensionist to farmer (Frejab). When the farmer employed workers for weeding, they could not distinguish weed and rice and they

	・Applying skill and technique gained from training course by extensionists in the field ・Transferring skill and technique from extensionist to farmer ・Farmers' following extensionist's advice ・Good cooperation and coordination between extensionist and farmer ・Regular monitoring by the head of rice unit and monitoring team of the Project	removed weeds and rice together. ・Improper setting of high target yield and big cultivation area (Wad Sawi). The cultivation area was 4.5 feddans and the target yield was too high even though it was the first time for the farmer to cultivate rice. The Project suggested the team leader to reconsider the target and the area but they were not changed. As a result, the site failed to achieve the target even though its result was very good (1.839 t/fed = 4.4 t/ha). However, the impressive result was brought because of the effort to achieve the high target yield. The effort was admirable.
Sennar	・Proper cultivation management along with action plan ・Sharing agricultural operation among team ・Regular visit by extensionist (every day) and advice ・Proper recording of field and operation (Diary for upland rice cultivation) ・Applying skill and technique gained from training course by extensionists in the field ・Transferring skill and technique from extensionist to farmer ・Farmers' following of extensionist's advice ・Good cooperation and coordination between extensionist and farmer ・Regular monitoring by the head of rice unit and monitoring team of the Project	・Problem of electricity cut at germination stage led short of water and extremely low germination rate (less than 5% in Almahlaj). ・Limited payment of SMoA for water charge to sugar company (water supplier) led a problem of water during all agricultural operations (Maiurno South).
Gedaref	・Proper cultivation management along with action plan ・Sharing agricultural operation among team ・Teamwork and sharing information among team ・Initiative and leadership of team leader ・Regular visit by team (Shuwak, twice a day) ・Proper recording of field and operation (Diary for upland rice cultivation) ・Applying skill and technique gained from training course by extensionists in the field ・Farmers following of extensionist's advice (Al Fau [Farmer] 2) ・Good cooperation and coordination between extensionist and farmer (Al Fau [Farmer] 2)	・Lack of cooperation and coordination between extensionist and farmer (Al Fau [Farmer] 1). The farmer did not visit the field regularly because of his other business. He did not follow the advice of extensionists. He brought unskilled rental workers for agricultural operation.

	・Regular monitoring by the head of rice unit and monitoring team of the Project	

Activity 2.6 “To prepare a handbook on rice cultivation technique based on the results of activities in 2.2 together with those in 2.3, 2.4 and 2.5”

“Handbook on Upland Rice Cultivation” which was prepared by JICA expert in English and translated to Arabic by the counterparts in February, 2014 needs to be upgraded to incorporate remaining technical issues. This handbook has been revised by the expert based on the field trial activity, demonstration activity and training activity as needed through 2014 season and 1st revised draft version was formulated at the end of 5th year of the Project (1st year of extension period). The Handbook was finalized at the end of the Project based on the Project activity in 2015, etc. (The handbook is attached as Annex 14.)

Workshop for Further Development of Upland Rice Production in Sudan

After obtaining the yield results of the season 2015, the Project and each SMoA conducted “Evaluation Meeting” to review the activities, to clarify the issues and to formulate Action Plan for the season 2016 based on the outcome of activities in 2015.

- Evaluation Meeting in 6 States

(1) Contents

1. Evaluation on the result of season 2015
2. Discussion on the plan of season 2016
3. Technical Test on Rice Cultivation by extensionists who belong to Rice Promotion or Production Unit
4. Assessment of the extensionists from the viewpoint of performance and ability on the appropriate upland rice cultivation by Head of Unit, JICA Experts and Monitoring Team
5. Self-Assessment by the extensionists

(2) Date and State

1. River Nile: 22/11/2015
2. Gezira : 24/11/2015
3. Sennar: 06/12/2015
4. Gedaref : 07/12/2015
5. White Nile: 09/12/2015
6. Northern: Collecting yield result and explanation on assessment of the extensionists were conducted by Dr. Hassan (National consultant of the Project). Deputy Chief Advisor of the Project discussed with SMoA by phone on the progress, several issues to be solved in season 2015 and cultivation plan for season 2016.

(The result of evaluation of extensionists in the season 2015 is attached as Annex 15.)

- Workshop

After the evaluation meeting in each SMoA, the Project and C/Ps prepared to conduct the final workshop of the Project. The “Workshop for further development of upland rice production in Sudan” was held on 19th January 2016 in Khartoum.

1) Purpose of the workshop

(1) To review the upland rice production activities in season 2015 and plan for 2016
(2) To share the achievement of the Project among FMoAF, SMoAs and concerned organizations
(3) To discuss the further development of upland rice production in Sudan

2) Date and Time: 11:30 to 16:00 on 19th January 2016

3) Place: Grand Holiday Villa (Churchill Ballroom)

4) Participants
<Sudanese Side>
Undersecretary of FMoAF, Ministers of 3 SMoAs (Sennar, Gedaref, White Nile), National Rice Research Coordinator of ARC, National Rice Coordinator of NRP, DGs of FMoAF (IC, TTE, PPD, NRD, Irrigated Sector), DG of National Wheat Project, DGs of 4 SMoAs (Gezira, Gedaref, River Nile, White Nile), Managers of Rice Promotion Unit of 6 SMoAs, Ministry of International Cooperation, Private sector (Managers of CTC group), etc.
<Japanese Side>
Ambassador of Japan, Resident Representative of JICA Sudan Office, etc.
A total number of participants is 76 persons. (See Annex 16 – Participants list of "Workshop for further development of upland rice production in Sudan" for more details of participants)

5) Programme
Programme of the Workshop is shown in Table 2-33.

Table 2-33 Schedule of workshop for Further Development of Upland Rice Production in Sudan

Time	Item	Notes
11:00	Registration	
11:30	[Workshop : Session 1] Opening - Resident Representative from JICA Sudan Office - Ambassador of Japan - Minister of Gedaref SMoA - Undersecretary of FMoAF	Chairperson: Mr. Elamien Hassan (DG, PAE, FMoAF)
12:30	Presentations - Achievement of the Project (by Experts of the Project) - Summary of the Activity (ARC and NRP)	
13:10	Result of season 2015 and Action Plan for Season 2016 (1) Gezira State MoA (2) Sennar State MoA	(10 minutes for each state's presentation)
13:30	Break	(Prayer Time)
14:00	(3) Gedaref State MoA (4) River Nile State MoA (5) Northern State MoA (6) White Nile State MoA	
14:40	[Workshop : Session 2] Presentation - Facts & Prospect on Upland Rice Development (by Chief Advisor of the Project) Open Discussion on Further Development of Upland Rice Production in Sudan	Chairperson: Mr. Mohieldin Ali (National Rice Coordinator, NRP)
15:50	Closing - Director General of PAE	

6) Summary of the workshop
As the programme shown in Table 2-33, the workshop started with opening remarks of 4 VIPs. The Resident Representative of JICA Sudan Office and Ambassador of Japan praised the effort of Sudanese C/Ps for 6 years. From the Project, Dr. Abdalla Suliman, Minister of Gedaref SMoA remarked on behalf of 6 SMoAs. Remarkable points are as follows;

- Rice is promising crop for Sudan as a cash and food crop.
- Market of rice is available locally and neighboring countries.

- Gedaref State has long term plan to expand upland rice production more than Rahad Scheme.
- Gedaref State thanks Japanese experts for their efforts to start and promote upland rice in Gedaref State and in Sudan.

After his remark, Undersecretary of FMoAF, Eng. Ali Gadoom, remarked on behalf of the Minister of FMoAF. Even though Eng. Ali Gadoom is new Undersecretary since December 2015, he is very well aware of the project activity and a situation of upland rice production in Sudan because he was a core member of working group for "Rice Sector Development Forum" to tackle 8 bottleneck issues[1] in FY2013. His remarkable points are as follows;

- The theme of the workshop is very important for FMoAF because upland rice is one of promising strategic crop.
- FMoAF appreciated the support of Japanese government to agricultural sector especially to upland rice cultivation.
- FMoAF also appreciated the effort of JICA and the Project to enhance capacity building in agricultural sector and promote upland rice in Sudan.
- FMoAF also appreciated the effort of Sudanese staff to promote upland rice especially in Gezira State.
- The "Handbook on Upland Rice Cultivation" produced by the Project will be used and applied by farmers.
- FMoAF hopes the cooperation with JICA will continue for the benefit of Japanese and Sudanese people.

After opening remarks, Mr. Ando (Rice Cultivation Expert) and Mr. Goto (Deputy Chief Advisor / Rice Cultivation Expert) presented the "Achievement of the Project". Some plots of trials site in Gezira State achieved 10 t/ha as yield. It showed the potential of upland rice in Sudan. In the activity of demonstration farms, all 6 SMoAs improved their yield year by year. The result is shown in Table 2-34. As for training aspect, the Project provided opportunities of training abroad (Uganda, Egypt and Japan) for 378 C/Ps (330 extensionists/staff of MoA, 34 high officials, 14 researchers).

Table 2-34 Result of average yield from 2012 to 2015 in 6 states (t/ha)

	2012	2013	2014	2015
Gezira State	2.3	1.4	2.6	3.6
Sennar State	0.4	0.5	1.0	1.1
Gedaref State	0.1	0.6	1.7	1.9
River Nile State	0.2	0.4	0.9	1.6
Northern State	0.0	1.4	0.8	2.2
White Nile State	0.0	1.2	0.5	0.9

Following their presentations, National Rice Research Coordinator of ARC and National Rice Coordinator of NRP presented the summary activity of each organization. ARC conducted 10 trials in 6 categories (crop improvement, mechanization, agronomy, water management, plant nutrition, weed control) from 2014 to 2015. Some results are expected to be reported to the technical husbandry committee in June 2016. NRP stressed that human resource is important and appreciated the Project to build capacity development. NRP has a plan to cultivate NERICA 4 for **2,210 feddans** (about 526 ha) in Gezira and other states in 2016 season.

[1] After the 1st Forum in February 2013, the bottleneck issue working group was formulated and the working group identified eight bottleneck issues; (1) research, (2) training, (3) extension, (4) cultivation (seed, machineries, irrigation management, weed control), (5) agricultural inputs, (6) post-harvest, (7) marketing and (8) agricultural organization.

Then, 6 SMoAs (DG of Gezira SMoA, 5 Heads of rice unit of other 5 SMoAs) reported the results of their activities in 2015 and explained their action plans for 2016 based on the results of 2015.

In the session 2, Mr. Nakagaki (Chief Advisor of the Project) presented the "Facts & Prospect on Upland Rice Development". He pointed out that NRDS should be revised and he suggested some points to revise it. Moreover he presented some notes for further upland rice development such as **systematic approach**, outstanding technical points including the importance of **pure good seed**, etc.
(Eleven (11) presentation slides are attached as Annex 17.)

Following his presentation, 11 participants on the floor delivered their opinions for further development of upland rice production in Sudan. Main points of opinions are listed in Table 2-35.

Table 2-35 Main points for further development of upland rice production in Sudan

Categories	Main points
Financial aspect	・Limited transportation for supervision to sites. ・Lack of machine for harvest (combine harvester) and for milling. ・Coordination between FMoAF & SMoAs (financial support).
Approach	・**Approach should be Systematic.** ・Revising NRDS ・Activation of NRC
Extension	・Collaboration between research and extension (Egypt case: RRTC has 500 feddans demo sites).
Technical Issues	・**Securing seed purity.** ・Proper seed rate. ・Proper weeding ・Harvest time (with proper moisture content)
Marketing	・Milling method and system should be developed. ・How to cope with private sector and foreign investor
Training for Extensionists	・Capacity building should be continued.
Others	・Gezira SMoA is ready to provide any support to other states for more farmers to cultivate rice.

7) Reaction and after the workshop

Ashorooq TV broadcasted the workshop on the same day and the following day as well and Sudan TV and Sudan Radio also reported the workshop as national news from next day.

After the workshop, the President of Sudan visited Gezira State on 24th January and he declared that rice will be cultivated as important crop in Gezira Scheme. The declaration was reported as front-page news in some newspapers on the next day. On 25th January, Vice President, Minister of FMoAF, Minister of Finance, President of Bank of Sudan, Governor of Gezira State, Minister of Gezira SMoA, DG of Gezira Scheme, etc. assembled and confirmed that rice will be cultivated in several thousand feddans and the special budget. On 27th January, the Project met Minister of FMoAF, Undersecretary, National Rice Research Coordinator, National Rice Coordinator, DG of IC, etc. to report the workshop and discussed the next action for further development of upland rice cultivation. Minister said that he had already discussed rice cultivation with the President of Sudan and Governors of concerned

States and they approved it. The Minister instructed Undersecretary to formulate a team to revise NRDS. The Minister also stated that the Ministry will use the technique which the Project developed, as much as possible for upland rice cultivation in next season. The meeting was reported by Sudan TV on the same day and by Ashorooq TV on the next day.

2.2. Achievement Measured by Indicators

Achievement is shown in Table 2-36.

Table 2-36 Objectively Verifiable Indicators and the Achievement (as of February 2016)

Objectively Verifiable Indicators	Achievement by indicators
Overall Goal *The quality of public services provided by the Ministry of Agriculture and the organizations concerned are improved through their capacity development.*	
50% of relevant agricultural parties (Production coop, Investors, Agricultural product vendors etc.) recognized increases in quality of the public agricultural services.	Yet to be verified.
Project Purpose *Human and organizational capacity of the Ministry of Agriculture and the organizations concerned is strengthened to materialize "The Executive Programme for the Agricultural Revival."*	
By the end of the project period, 60% of the staff of the Federal Ministry of Agriculture, and core staff of State Ministries of Agriculture and other organizations concerned, involved in the Project Activities, demonstrate improvements in action planning, implementation, monitoring & evaluation relating to the "Executive Programme for the Agricultural Revival".	Achieved for staff of the FMoAF (involved in activities of Output 1) by February 2014. Extensionists in 6 SMoAs improved their capacity of planning, implementation and monitoring evaluation. Sixty-nine point two (69.2) % of all extensionists marked the target level.
By the end of the project period, 80% of the staff of the Federal Ministry of Agriculture, and core staff of State Ministries of Agriculture and other organizations concerned, who received training, show improvement in the score of the self capacity evaluation.	Achieved for staff of the FMoAF (involved in activities of Output 1) by February 2014. Self capacity evaluation for extensionists in 6 SMoAs was carried out twice in January 2015 and January 2016. All extensionists (100%) showed improvement in the score of the self capacity evaluation.
Output 1 *Through the experimental activities of the Project, a model system of human resource development and organizational capacity development of the Ministry of Agriculture has been developed.*	
The appropriateness of the experimental management system is verified.	Achieved by February 2014.
The appropriateness of a series of procedures from CA and NA to the completion of training is verified.	Achieved by February 2014.
An implementation manual is compiled including verified management system and procedures from CA and NA to the completion of training.	Achieved by February 2014.
Output 2 *Planning, implementation, monitoring & evaluation for promotion of rice production are enhanced.*	
The NRDS draft is formulated.	Achieved by February 2014.
A structure to implement and review (monitoring and evaluating progress and	Achieved by February 2014.

reflecting evaluation results to the next plan) the NRDS is recommended.	
Annual action plans for rice development (analysis, planning, monitoring & evaluation, technical development, seed production, and extension) is formulated.	Achieved by February 2014.
A practical/technical handbook on upland rice cultivation is prepared.	"Handbook on Upland Rice Cultivation" which was prepared by JICA expert in English and translated to Arabic by the counterparts in February, 2014 needs to be upgraded to incorporate remaining technical issues. First revised draft version was formulated at the end of 5th year of the Project (1st year of extension period). The Handbook was finalized at the end of the Project based on the Project activity in 2015, etc.
Quality of rice seed is improved.	Achieved by February 2014.
More than 80% of training participants in Gezira State, and two of trained participants respectively in five States excluding Gezira State, are qualified as trainers on appropriate rice cultivation technique.	After harvest in 2015 season, the assessment on extensionists as trainers on appropriate rice cultivation techniques was conducted by JICA experts and C/Ps in 6 states. 88% of extensionists are qualified in Gezira State. In other 5 states, more than 2 extensionists in each state are qualified as trainers on appropriate rice cultivation technique.
More than 60% of farmers who grew upland rice in demonstration farms show a willingness to grow rice again.	Achieved by February 2014.

2.2.1. Achievement of Output

Output 1 was achieved as of February 2014. Output 2 has 7 indicators and 5 out of 7 indicators had been satisfied as of February 2014.

Indicator 2.4: A practical/technical handbook on upland rice cultivation is prepared.

"Handbook on Upland Rice Cultivation" which was prepared by JICA expert in English and translated to Arabic by the counterparts in February, 2014 needs to be upgraded to incorporate remaining technical issues. First revised draft version was formulated at the end of 5th year of the Project (1st year of extension period). The Handbook was finalized at the end of the Project based on the Project activity in 2015, etc. (The handbook is attached as Annex 14.)

Indicator 2.6: More than 80% of training participants in Gezira State, and two of trained participants respectively in five States excluding Gezira State, are qualified as trainers on appropriate rice cultivation technique.

After harvest in 2015 season, the assessment on extensionists as trainers on appropriate rice cultivation techniques was conducted by JICA experts and C/Ps in 6 States from the viewpoints of indispensable ability and capacity for trainers. Extensionists, who got more than 70 points in the 100 points scale, were qualified as trainers through assessing comprehensively in consideration of several aspects such as degree of obtaining basic upland rice cultivation

techniques, yield result of field managed by them in 2015 season, objective evaluation on ability and capacity as trainer (See Annex 15). Eighty eight % of extensionists (22) were qualified in Gezira State and in other 5 States, more than 2 extensionists in each State were qualified as trainers on appropriate rice cultivation technique such as Sennar (16), Gedaref (7), River Nile (3), Northern (7) and Whit Nile (7) States. These figures indicated significantly that the number of extensionists who were qualified as trainers was improved in all States in comparison with the number of season 2014.

2.2.2. Achievement of the Project Purpose

Indicator 1: By the end of the project period, 60% of the staff of the Federal Ministry of Agriculture, and core staff of State Ministries of Agriculture and other organizations concerned, involved in the Project Activities, demonstrate improvements in action planning, implementation, monitoring & evaluation relating to the "Executive Programme for the Agricultural Revival".

The Project carried out the capacity assessment of extensionists who participated in the project activity in 6 SMoAs in January 2015 and January 2016 (after the cultivation season). This is to assess extensionists as trainers on appropriate rice cultivation techniques and Japanese experts, each Head of rice unit in 6 SMoAs and a monitoring team of the Project evaluated capacity of each extensionist. There are 7 categories to assess. The Project extracted 4 out of 7 categories to demonstrate improvement of extensionists' capacity in action planning, implementation, monitoring and evaluation as follows;

- Formulation Ability of Action Plan (including experimental plan)
- Management and Working Ability
- Emergence Response Ability in Field
- Monitoring (including utilizing the Diary) and Evaluation Ability

The Table 2-37 shows their average scores of all 6 SMoAs' extensionists in 4 categories. Each category has maximum 5 points and 20 points is maximum score in total. All SMoAs improved their scores from the previous year. More than 60% of all extensionists (actually 83 out of 120 extensionists: 69.2%) marked the target score (12.0). It is concluded that the Indicator 1 is satisfied. (Refer to Annex 15 for concrete scores of each extensionist)

Table 2-37 Result of capacity assessment of extensionists on action planning, implementation, monitoring and evaluation

State	Year	Action Planning	Implementation		Monitoring and Evaluation	Total score (max 20 points)	% more than the target score
		Formulation Ability of Action Plan (including experimental plan)	Management and Working Ability	Emergence Response Ability in Field	Monitoring (including utilizing the Diary) and Evaluation Ability		
Gezira	2015	2.68	3.21	3.12	2.88	11.90	53.1%
	2016	***3.22***	***3.76***	***3.64***	***3.28***	***13.90***	***79.4%***
Sennar	2015	2.99	2.69	2.58	2.13	10.38	33.3%
	2016	***4.14***	***3.72***	***3.50***	***3.78***	***15.14***	***96.3%***

Gedaref	2015	2.58	3.14	2.50	1.41	9.62	27.3%
	2016	***3.64***	***3.55***	***3.18***	***3.08***	***13.44***	***81.8%***
River Nile	2015	1.00	1.96	2.08	1.65	6.69	0%
	2016	***1.56***	***2.16***	***2.13***	***2.02***	***7.86***	***18.8%***
Northern	2015	1.00	3.39	3.39	2.61	10.39	11.1%
	2016	***2.59***	***3.94***	***3.94***	***3.39***	***13.87***	***66.7%***
White Nile	2015	1.00	3.28	2.65	1.87	8.66	0%
	2016	***2.38***	***3.33***	***3.04***	***2.82***	***11.57***	***52.2%***
6 SMoAs	2015	Average score and % (more than 12 points) of all extensionists				10.01	26.9%
	2016	Average score and % (more than 12 points) of all extensionists				***12.88***	***69.2%***

Indicator 2: By the end of the project period, 80% of the staff of the Federal Ministry of Agriculture, and core staff of State Ministries of Agriculture and other organizations concerned, who received training, show improvement in the score of the self capacity evaluation.

The Project carried out self capacity evaluation for extensionists who participated in the project activities in 6 SMoAs. A total of 91 extensionists evaluated themselves. There are 5 capacities to do self-evaluation as follows;

- Formulation Ability of Action Plan (including experimental plan)
- Management and Working Ability (Implementation ability of each operation)
- Identifying and Solving Ability on Technical Problem
- Emergence Response Ability in Field
- Monitoring (including utilizing the Diary) and Evaluation Ability on Field Activities

One capacity has maximum 5 points and a total of 25 points is highest score. As a result, all 73 extensionists who conducted self capacity evaluation after the season 2014 improved their score in comparison with the ones when they participated in the Project activity. All 18 extensionists who conducted it after the season 2015 also improved it. Therefore all 91 extensionists showed improvement in the score of the self capacity evaluation. The average score of all extensionists, when they joined the project activity, was 7.2 and the latest average score was 17.3. It is concluded that the Indicator 2 is satisfied.

Table 2-38 Result of Self Capacity Evaluation after the Season of 2014

State	Number of extensionists who conducted self capacity evaluation	Number of extensionists who improved their score	Score when extensionists participated in the Project	Score after the season of 2014
Gezira	25	25	7.8	16.6
Sennar	16	16	6.9	18.0
Gedaref	9	9	6.1	16.2
River Nile	7	7	7.9	16.4
Northern	7	7	6.9	17.7

White Nile	9	9	6.9	13.3

Table 2-39 Result of Self Capacity Evaluation after the Season of 2015

State	Number of extensionists who conducted self capacity evaluation	Number of extensionists who improved their score	Score when extensionists participated in the Project	Score after the season of 2014
Gezira	3	3	9.0	23.7
Sennar	8	8	7.0	22.5
Gedaref	1	1	8.0	19.0
River Nile	2	2	5.5	13.5
Northern*	0	0	-	-
White Nile	4	4	6.5	18.3

*The self capacity assessment was not conducted in Northern State in 2015 because all targeted extensionists conducted it in 2014.

2.2.3. Conclusion

In this extension period from March 2014 to March 2016, the Project focused on capacity development of staff of 6 SMoAs, namely extensionists, through various trainings and farming activity (demo and experimental sites). As a result of the project activity for 2 years, Output 2 was achieved and both Indicator 1 and 2 for the Project Purpose were satisfied as of January 2016. In conclusion, the Project Purpose has been achieved by the end of the Project.

Chapter 3 Terminate Evaluation

Joint Terminal Evaluation was conducted from 4th to 27th October 2015 by the Japanese terminal evaluation team and Sudanese terminal evaluation team.

3.1. Results of Review

The evaluation was conducted based on 5 evaluation criteria, such as Relevance, Effectiveness, Efficiency, Impact, and Sustainability.

1) Relevance
Relevance of the Project was evaluated as high. The Project is relevant to the needs for improving quality of public services provided by FMoAF and SMoA and needs for promoting rice cultivation. The Project is also consistent with national development plan such as EPAR and 5 years plan (2012-2016), other related plan of Sudan (building NRP) and ODA (Official Development Assistance) policy of Japan who supports the domain of agriculture as one of main domains to contribute the diminution of poverty and food security. Moreover the project approach is evaluated as appropriate in general.

2) Effectiveness
Effectiveness of the Project was evaluated as high during extension period. The Project has been properly implemented without any serious obstacles and the Project Purpose is expected to be achieved.

3) Efficiency
Efficiency of the Project was evaluated as relatively high. Inputs by Japanese side (Japanese experts, equipment, providing trainings for C/Ps, local cost, etc.) are very appropriate in general. Inputs by Sudanese side (a large number of staff, a substantial amount of local cost, etc.) are also appropriate but sometimes SMoAs failed to make timely arrangement of farm machinery and to provide transportation means for extensionists.

4) Impact
It is difficult to prospect achievability of the Overall Goal in 3-5 years because there was no quantitative data to judge the achievability at the time of the terminal evaluation for extension period.

Several positive impacts are observed such as exchanging visit of the relevant SMoA extensionists (extensionists of Sennar visited the trial field and demonstration farms in Gezira State), increasing of number of farmers who are interested in rice cultivation, Public Relationship through media, etc. No negative impact is observed.

5) Sustainability
Sustainability of the Project was evaluated as moderate. Policy and organizational sustainability will be secured. Financial sustainability might be secured because SMoAs actively contributed their local component for the project activity and FMoAF also supported the securement of budget. With regard to technical aspect, the Project successfully developed basic technique of upland rice cultivation for introductory stage but continuous assistance from outside of the country seems to be necessary to promote more rice production in Sudan.

3.2. Recommendations

1) Recommendations by the end of the Project

For Japanese experts and counterpart organizations

(1) Prepare the latest Technical Handbook on Upland Rice Cultivation.
(2) Complete the capacity assessment of the extensionist of 6 SMoAs.

For FMoAF and SMoAs

(3) Approve plans and budgets of promote rice production for next year(s) by FMoAF and respective SMoAs.

2) Recommendations for sustaining the Project achievements after the end of the Project

For FMoAF

(1) Reactive the Rice Sector Development Forum or any other form of stakeholder meeting to discuss bottleneck issues (refer to the footnote in P.48) and suggest solutions and responsible parties for promoting rice production in Sudan.

For FMoAF and SMoAs

(2) Provide necessary and adequate technical support for the rice production activities of the private sector, particularly Arab Sudanese Seed Company who started seed multiplication activity in cooperation with the Project.
(3) Allocate and disburse sufficient budget for annual planning, implementation, monitoring and evaluation of rice promotion in respective states with monitoring/supervision from FMoAF.

For FMoAF and ARC

(4) Conduct research, and draft, authorize and release official Technical Handbook for distribution to farmers.
(5) Test and approve herbicides having selective effect on weeds in rice field as soon as possible.

For SMoAs

(6) Fully utilize the rice milling machines provided in the Project.
(7) Train seed-producing farmers throughly to keep purity of rice seeds by making the utmost effort every year to rogue.
(8) Conduct in-country training, including refresh training of extensionists by the most competent leader extensionists capacitated in the Project.
(9) Encourage all extensionists to continue refining their knowledge and skills by self-learning and self-reflection through the usage of the field record diary.

For FMoAF

(10) Review the procedures, especially the “Learning by Doing” practices and the management system proposed by the Project for human resource development and organizational capacity development and re-adopt them where possible and applicable.

3) Recommendations for further promotion of rice production

For FMoAF

(1) Strengthen the capacity of National Rice Project in FMoAF to lead the national initiative in close cooperation with states.
(2) Encourage the private sector to be involved more actively, not only for rice production but also for supply of agricultural inputs and machineries, seed production, post-harvest processing, storage and distribution, through preferential policies such as subsidies and tax exemptions.

For FMoAF and SMoAs

(3) Train rice cultivation farmers and open commercial trade opportunities and channels for rice producers both in the domestic market and for exporting.
(4) Forming farmer cooperatives specialized in rice can help them provide sufficient quantity, keep quality standards, negotiate better price for their produce, procure inputs at favourable terms, and receive financing.
(5) Ensure that proper storage and post-harvest processing services with appropriate facilities, equipment and operations, either by public agencies or private operators, are available for rice producers.

For ARC

(6) Conduct research and development on rice in all targeted states, including verifying and developing new varieties with a broader range of traits adaptable to different conditions in various parts of Sudan, post-harvest processing and socio-economic aspects.

For ARC, FMoAF and SMoAs

(7) Strengthen the existing systems for maintaining varieties and propagating pure rice seeds. Encourage private sector players to produce pure rice seeds.

For FMoAF and SMoAs

(8) Continue searching, testing and introducing agricultural machineries suitable to rice farming in Sudan, for preparing land, sowing, applying fertilizer and pesticides, weeding mechanically, harvesting and post-harvest processing.
(9) Strengthen the existing system for technology transfer and extension by establishing a Center of Excellence to accumulate and refine practical rice production technologies for cultivation and post-harvest processing, and transfer these technologies from master trainers to extensionists, farmers, research technicians and machine operators through training, refresh training and technical advisory.
(10) Expand/revive the extension network to serve the need of more farmers interested in rice cultivation.

Chapter 4 JCC

4.1. 11th JCC

Eleventh JCC meeting was conducted on 27th October 2015, chaired by Ms. Igbal, Acting DG of IC, FMoAF. There were 29 participants from FMoAF, ARC, NRP, SMoAs, JICA and Japan Embassy.

4.1.1. Report of the Progress and Plan of Project Activities

The progress of the Project activities of first half of FY2015 and the plan of the latter half of FY2015 were reported by the Project and C/P (ARC).

After presentation, JCC members discussed integration and coordination of the result of experimental site in Gezira and ARC research. ARC and FMoAF agreed that results of both trials will be combined and integrated.

Sennar SMoA showed appreciation for introducing the monitoring system. Gezira SMoA also showed appreciation for the effort of the Project and will of continuing and sustaining rice cultivation activity.

4.1.2. Terminal Evaluation Report

Members of Joint Terminal Evaluation Team presented the result of the Terminal Evaluation. They showed the confirmation of achievement of Output and Project Purpose. Then, they explained the evaluation by 5 criteria and recommendations.

After the presentation, JCC members discussed handling of Technical Handbook on Upland Rice Cultivation because members of Joint Terminal Evaluation Team explained in their recommendation that it should be distributed to only extensionists and ARC researchers, not to farmers. Japanese members of Joint Terminal Evaluation Team insisted that an approval of Technology Committee is necessary before distribute the handbook to farmers and this is the conclusion of the Evaluation. All Sudanese C/Ps disagreed with the conclusion. They explained that Technology Committee is concerned only with ARC scientific aspect and there is no limitation in Sudan to use any technique for anybody without approval of Technology Committee.

In conclusion, this JCC meeting agreed to use handbook for farmers without approval by Technology Committee. In addition, FMoAF sent an official letter to JICA in November to accept the technology developed by the Project and to use it to farmers.

4.1.3. Outstanding Issues & Others

Chief Advisor of the Project raised 2 outstanding issues which the Project raised such as 1) Coordination between FMoAF (NRP) & SMoAs, and 2) Development of Upland Rice (Activity on National Rice Council [NRC], etc.). NRP is not properly managed and NRC is not yet functioning. NRC has almost the same structure as “Rice Sector Development Forum” which

the Project held in February 2013 and January 2014. However, it is necessary to assign certain personnel so that such large standing committee functions well. The personnel (for example, National Rice Coordinator) has not been officially assigned yet. Therefore NRC is not yet functioning.

The Chief Advisor raised another issue on disbursement of budget from FMoAF to SMoAs. FMoAF requested SMoAs to make rice development plan and 6 SMoAs provided 1 year plan and 5 year plan. Then FMoAF was allocated budget from Ministry of Finance. However, no budget was allocated from FMoAF to SMoAs. FMoAF explained that this is the issue of coordination between federal and states. FMoAF committed to clarify the issue and to mobilize the coordination. In addition, FMoAF (Minister) stated that FMoAF will expand upland rice cultivation in their agricultural development plan for 5 years (2016-2020) and allocate the budget for upland rice cultivation to concerned States.

After discussion of these issues, chairwoman summarized all discussion of the meeting and closed the meeting. (See Annex 18 - Minutes of 11h JCC meeting, for more details of the discussion in the meeting.)

4.2. 12th JCC

Twelfth JCC meeting was conducted on 19th January 2016, chaired by Dr. Adel, DG of IC, FMoAF. There were 40 participants from FMoAF, ARC, NRP, SMoAs, Ministry of International Cooperation, JICA and Japan Embassy.

4.2.1. Report of the Progress and Achievement of the Project Purpose

The progress of the Project activities of the latter half of FY2015 and the achievement of the Project Purpose were reported by the Project. The Project reported that the Project Purpose is achieved.

After the presentation, JCC members discussed some remaining issues for more promotion of upland rice such as securing pure seeds, extension method, marketing, climate differences between south and north area, linkage between the effort of the Project to next stage of rice production, coordination between FMoAF and SMoAs (no allocation budget from FMoAF to 6 SMoAs in 2015), etc.

4.2.2. Recommendations and others

The Chief Advisor of the Project raised 2 points for sustainability of upland rice promotion and development such as activation of NRC and more close coordination between FMoAF and SMoAs. As for NRC, JCC members agreed the necessity of having task team to revise NRDS and committee in NRC for checking all value chain of upland rice production. As for the coordination, JCC members confirmed that ownership of SMoAs is also indispensable.

MoAF recognized that rice is the second strategic crop and more technology from outside is necessary to develop more the rice sector in Sudan.

(See Annex 19 - Minutes of 12h JCC meeting, for more details of the discussion in the meeting.)

Chapter 5 Problems, Ideas and Lessons Learnt on Project Implementation

5.1. Project Management – Issues, Countermeasures, Lessons & Learns

5.1.1. Lack of systematic approach for the development on upland rice production

Rice has been stipulated as 2nd strategic crop to wheat in Sudan. However the stance toward handling rice has been somewhat inconsistent and real systematic approach (Concerning upland rice production: utilize NRDS=National Rice Development Strategy, coordination between FMoAF and SMoA, collaboration between ARC=Agricultural Research Corporation and NRP=National Rice Project) has not been in place. This has been the biggest bottle neck for promoting rice production activities.
For example, 1) NRDS had been formulated, however, it was not fully utilized in the actual rice production activities. 2) There was no responsible person within NRP for about 1 year due mainly to the assignment shift of core person to wheat project in Northern State. 3) There had not been active involvement by ARC to the Project until 2013, partly because ARC was attached to The Ministry of Higher Education and Science in the beginning of the Project in 2010. 4) In addition, there has not been proper budget specific to rice production although it is stipulated as 2nd strategic crop.

In 2014, then the Minister of FMoAF recognized the importance of securing budget, specific for rice production. Then he asked to the Project Chief Advisor to prepare some 5 –year rice development plan which can be used as the basic document for the submission of yearly budget.

Against the backdrops of the above situation, the Project was extended for 2 more years, in which this duration should focus on upland rice production development. Regarding NRDS, instead of handling “Stakeholders Meeting” which is stipulated in NRDS, the Project conducted “Rice Sector Development Forum” 2 times in January, 2013 and February, 2014. As the result of this Forum, it provided good opportunity for stakeholders of informing a lot of upland rice development chances. At the same time, this Forum categorized 8 bottleneck issues with respect to upland rice production in Sudan. As the Project has been suggesting to the FMoAF the importance of systematic approach for rice sector development and the necessity of Forum continuation, the Minister of FMoAF understood the importance of continuing the similar function of Forum and systematic approach for rice sector development. In line with his good understanding, he set up National Rice Council (NRC) in order to tackle rice development. NRC composes of rice sector stakeholders.

The Project Chief Advisor repeatedly explain how important to assign core personnel (who is Mr. Mohieldin: former National Rice Coordinator and at the same time was responsible person for NRP who is the most conversant with rice production and its policy in Sudan) to NRP. He is finally reappointed to NRP as core person to handle rice development in 2015.

ARC is actively involved in the project activities from 2014, since Prof. Ahmed became a core member of the Forum (steering committee member). He has newly appointed as National Rice

Research Coordinator in late 2013 and actively coordinating with the Project and among ARC researchers since then.

5.1.2. Coordination between FMoAF and SMoA regarding Upland Rice Production

It is being much improved with respect to the coordination between FMoAF and SMoA due to the change of DG of International Cooperation and Investment Directorate. However, there are many more issues to be improved regarding the coordination between FMoAF and SMoA. For example, in the year of 2015, upland rice concerned SMoA had submitted 1 year and 5-year upland rice development plan, responding to the request of FMoAF. As the result FMoAF was able to get fairly good amount of budget for upland rice production for the year of 2015. However, no budget had been allocated to the concerned SMoA in 2015 season.

Another important point is that Mr. Mohieldin of National Rice Project should play more role as coordinator between FMoAF and SMoA. Mr. Mohieldin himself is very well aware of this role and its importance.

5.2. Various Issues Arising from Actual Upland Rice Production

5.2.1. Technical Issues and its Countermeasures

The cultivation of upland rice has begun in two states; Gezira State and White Nile State in 2010. It was the start up from nearly scratch. Considering the situation of lack of technical knowhow of the extensionists, the Project has started training program for the concerned extensionists with the cooperation of JICA's Rice Promotion Project in Uganda from 2010 to 2015 every year. In the same context, the Project had started technical training on upland rice production with EICA (Egyptian International Center for Agriculture) in Egypt from 2013 to 2015. Together with these training in Uganda and Egypt, the Project organized technical training program with JICA in Japan for the purpose of nurturing the outstanding extensionists who can provide technical knowhow to other extensionists. The training program covered around 10 technical fields every year. These training programs are playing a great role to induce incentives of the extensionist.

On the other hand, inside Sudan the Project conducted on the job training to the extensionists on actual farmer’s demonstration sites so as with farmers as Farmers Field School.

5.2.2. Dissemination of Technical Knowhow, Issues and Countermeasures

1) Farmer’s Demonstration Sites
The Project considers the farmer’s demonstration as not only demonstration to other farmers but also actual learning places for extensionists. From this point of view, the Project handled the farmer’s demonstration fields accordingly. As the basic idea, it is recommended to assign 5 extensionists at one demonstration farmer including one leader extensionist. This is intended to learn through actual upland rice cultivation from the points of both technical and managerial aspects including inputs cost etc.

2) Monitoring & Evaluation (M&E) Activities on the Farmers Demonstration Field
In order to improve the capability of the extensionists, farmers and the rice unit managers, the Project introduced monitoring and evaluation system for upland rice production. The M&E

activities were carried out every month by concerned personnel of famer's demonstration farms. JICA experts, the Project consultant, extensionists, rice unit manager and farmers were the main personnel of the activities. Prior to the M&E activities, the Project provided so called "Agriculture Diary" to all concerned extensionists in order to get proper information based on actual situation and performance. By recording what they had done in a day by the extensionist, it can avoid uncertain opinion or excuse without evidence in the meeting of M&E. This system of daily recording can provide the extensionists the good habit of their work performance. It will provide them to check their work based on the actual evidence and to apply them to their next work. It will guide them to improve their daily work activities by checking their record. State's Government is appreciating very much of introducing M&E system that it also provides initiating stronger sense of ownership of the project by the staff of the SMoA is being recognized.

3) The Project has continued experiment for field application with NERICA 4 although ARC had been involved in the Project activities since the beginning of the 2014. In future, ARC should shoulder real main role of experiment on rice production. For the time being, however, alongside with ARC research activities, extensionists carried out experiment on the acute issues of upland rice cultivation arising from the farmers' field and this approach intended to improve their technical knowhow on upland rice cultivation as well in the early stage of upland rice development, in Gezira State.

5.2.3. Coordination with ARC (Agriculture Research Corporation)

1) It was one of the important issues of the Project how to incorporate ARC to the Project activities. In the beginning stage of the Project, ARC belonged to the Ministry of Higher Education and Science and so it created a kind of distance between the Project and ARC although later ARC came back to the Ministry of Agriculture and Forestry. It was since Prof. Ahmed had been assigned as National Rice Research Coordinator and then actual involvement of ARC had taken place with the Project.

2) Since ARC became one of the important players in the Project, the Project had organized researcher's exchange program with the JICA Rice Promotion Project of Uganda in 2014 and with RRTC (Rice Research and Training Center) through EICA of Egypt in 2015. These programs played important role for providing Sudanese researchers with how to handle rice and how to implement research activities on upland rice.

5.2.4. Improving Awareness of High Ranking Government Officers on Upland Rice

As it is stipulated that rice is 2nd strategic crop to wheat, however, concerned parties, in particular, high ranking government officials in the FMoAF and SMoA are not very well aware of the high productivity and high potential of rice. The Project recognized the importance of improving these unfavorable situations of awareness regarding rice. Therefore, the Project organized observation type of training to Egypt in order to provide necessary and good information by sending them to Egypt. So that they can get important information about how Egypt become No.1 of rice productivity in the world which is equivalent to 10 t/ha and how was their effort to achieve the high target on rice productivity. This program had implemented twice in 2014 and 2015.

After completing these program, those who had participated with this program; namely

Undersecretary of FMoAF and DG of FMoAF and other DG of SMoAs really astonished by the reality in Egypt and learned a lot from this program. The most important point from this program is that all the participating high ranking officers who are in the position of handling policy, had to change their awareness and mindset toward upland rice production. Thus the aim of this program brought successful result as aimed.

Chapter 6 Suggestion toward Achieving Overall Goal

The overall goal of the Project is aimed to improve the government's agriculture service. There were 3 categories of the Project activities in the very beginning stage of the Project in 2010, namely 1) formulation of agro-pastoral development plan in Kassala, 2) human resource development and organizational strength in FMoAF & SMoA, 3) introduction of upland rice and its development. On the other hand, it was focused on upland rice development during the Project extension period during the fiscal year (Japan) 2014 ~ 2015. In this period, the main purpose of upland rice development is set to strengthen 2 points of technical aspects in developing upland rice production. These are 1) improving the technical knowhow of the extensionists and 2) tackling outstanding technical issues concerning upland rice production.

Against these backdrops, there had not been any change of the project overall goal from that of the beginning. As of now the technical indicator to measure the degree of achievement of overall goal, it indicates that 50 % of agriculture related personnel (stakeholders) recognize the improvement of the administrative service in agriculture. This Project has different kinds of activities such as development study & technical cooperation, and the difference of implementation time & places. It entails some difficulties to set indicator of the Project by getting information from concerned so many stake holders within the project framework. Against these back ground, the Project can suggest as follows.

The most important target of this Project can be considered as "to what extent the service had been provided to the farmers" through the Project activities of human resource development and organizational capacity strengthen in the FMoAF and concerned SMoA. The quintessence is related to the side of farmers in the first place and how other stakeholders were able to support farmers in upland rice production activities. If we consider in line with this context, the bottom line of the concrete final indicator should be the degree of improvement of upland rice productivities and income of the concerned farmers through the Project activities. The other important point is that "how many farmers had shown their interesting in growing upland rice and how many of them are actually cultivating upland rice". Accordingly toward achieving these goals, it is important to improve productivity of upland rice and to expand its production. In order to realize high productivity and better income of farmers, it is indispensable to tackle outstanding issues on upland rice production in a systematic approach by the initiative of the FMoAF and SMoA including the help of other stakeholders. As part of this systematic approach, the Project had initiated twice the "Rice Sector Development Forum in Sudan" in 2013 and 2014, gathering all stakeholders relevant to upland rice. In line with the same context, "National Rice Council" (same function as with the Rice Sector Development Forum) is being organized by FMoAF, in the middle of 2015, however, its real function is yet to come in. Therefore it is very necessary to activate NRC. It can also be pointed out that there will be always new issues with respect to upland rice production. Therefore, it is imperative to strengthen the research activities of ARC and the technical capability of the extensionists. Furthermore it is evident that with the commencement of upland rice development, private sector's role will become wider and bigger than as has been in the whole range of upland rice value chain. In addition there are some parties interested in investing upland rice production. It is also advised to cope with them properly. It is strongly recommended to share relevant information on upland rice production development with among all stakeholders and any further efforts for upland rice development should be initiated by FMoAF and SMoA by systematic ways. In continuing these efforts, necessary information concerning the development of upland rice should be shared by all stakeholders.

P H O T O S

Photos

< May >

Development of Appropriate Upland Rice Cultivation Technique

Land preparation on the trail site in Gezira SMoA.

Mr. Ando and extensionists discussed next operations in the same site.

Demonstration Farms and Monitoring Activity

Dr. Hassan (National Consultant) and extensionists checked the field. (Shibairab, Gezira)

Land preparation. (Wad Alasha, demo, Gezira)

Mr. Goto checked the operation of land preparation and gave technical advice to extensionists. (Maiurno South, Sennar)

The field is near canal and road. (Almergani, Sennar)

The seeds are mixed with off type. It should be rogued. (Sennar)

A meeting for Action Plan presentation. (Gezira)

After the meeting, Mr. Nakagaki made a comment.

Dr. Hassan and Mr. Matsuda gave technical advice to extensionists on monitoring. (Almahlaj, Sennar)

Meeting with Ministry of Agriculture, Others

Mr. Nakagaki discussed with the Minister of FMoAI on 24th May.

Mr. Nakagaki discussed with DG of Gezira SMoA on 28th May.

< June >

Development of Appropriate Upland Rice Cultivation Technique

pH of soil is measured by extensionists. (Trial Site, Gezira)

Soil analysis by extensionists. (Gezira)

Ceremony to hand over equipment to ARC. Prof. Ahmed (ARC), Mr. Nakagaki, Mr. Mohieldin (NRP), Mr. Ando, etc.

Preparation for Third Country Training in Egypt

DG of EICA (Eng. Yehia, the right), Mr. Nakagaki (the middle) and Ms. Hala (JICA Egypt Office) in front of EICA.

Mr. Nakagaki and Dr. Doaa (DG of RTTC) agreed a contract of training.

Mr. Nakagaki and Dr. Tamer (Researcher in RRTC) in the field of RRTC.

Demonstration Farms and Monitoring Activity

Pre-irrigation. (Wad Bahai, Gezira)

Herbicide was sprayed. (Area44, Gezira)

Sowing. (UmBarona, Seed production, Gezira)

Mr. Nakagaki gave advice to Head of Rice Unit and extensionists . (Sennar)

Making canal by tractor. (Maiurno South, Sennar)

Mr. Mohieldin (NRP) and Mr. Nakagaki exchanged views on agricultural operations with Head of Rice Unit and extensionists. (Almahlaj, Sennar)

Mr. Nakagaki exchanged views with Minister of Gedaref SMoA (2nd from the left) in the site.

After sowing and 1st irrigation. (Al Fau: ARC, Gedaref)

After germination. Seed rate is too high. It is necessary to be thinned. (Shuwak: Ministry, Gedaref)

After 2nd irrigation. (Atbara 2, River Nile)

After 4th irrigation. (Kanour, River Nile)

Sowing machine made in Italy. It is easy to move and adjust. (River Nile)

After plowing. (Dongola Island, Northern)

It should be treated the weed (especially perennial grass). (Northern)

Elfardos 1 (lest side, 1 feddan) and 2 (right side, 3 feddans). Another canal will be created in Elfardos 2 and make 2 feddans both of them. (White Nile)

Dr. Hassan and Mr. Matsuda attended the Action Plan meeting on 1st June. (Sennar)

The Action Plan meeting on 3rd June. (Gedaref)

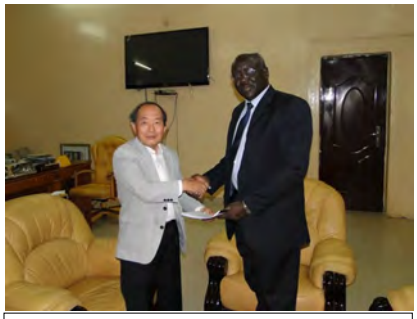
Dr. Hassan explained in the Action Plan meeting on 14th June. (River Nile)

The Action Plan meeting on 15th June. (Northern)

The Action Plan meeting on 22nd June. (White Nile)

The monitoring meeting on 25th June. Director of Agricultural Machinery Department also attended it. (Gezira)

Meeting with Ministry of Agriculture, Others



Mr. Nakagaki handed Work Plan 2015 to Mr. Baha Eldin. (Undersecretary of FMoAF, at the time)

Mr. Nakagaki explained the plan of 2015 to Dr. Adel. (DG of IC, FMoAF)

Mr. Nakagaki discussed the activity in 2015 with Prof. Ahmed (ARC, the left) and Mr. Mohieldin (NRP, the middle).

< July >

Development of Appropriate Upland Rice Cultivation Technique

Seed Rate × Plant Spacing Trial. (Trial Site, Gezira)

Same on the left. The difference of growth is gradually appeared.

Nitrogen Source Trial. (Trial Site, Gezira)

Nitrogen Source Trial. The difference of growth is gradually appeared. (Trial site, Gezira)

Organic Fertilizer Trial. (Trial site, Gezira)

Same on the left. The difference of growth is gradually appeared. Insecticide for termite was sprayed.

Third Country Training in Uganda (Advanced Training for Rice cultivation)

Dr. Yagi (PRiDe Project) explained procedure of rice polishing.

Explanation and practice of rice milling machine.

Practice of calculation with PC by Mr. Tsuboi.

Demonstration Farms and Monitoring Activity

Plots were well divided for appropriate irrigation and weeding. (Abdelrahman, Gezira)

Good growth. Weeding is more necessary. (Wad Alasha, demo, Gezira)

Weeding by farmers. (Wad Al Naim, Seed production/demo, Gezira)

Yellowish is appeared. It should be observed continuously. (Wad Alasha, Seed production/demo, Gezira)

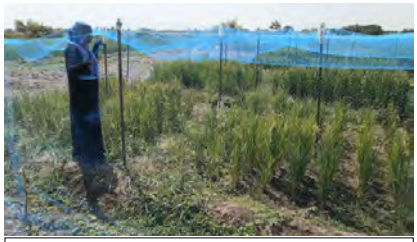
The Monitoring meeting. The Project called Director of Agricultural Machinery Department for smooth collaboration. (Gezira)

After the meeting, the Project discussed with DG, Director of Financial Department, etc. (Gezira)

〈 August 〉

Development of Appropriate Upland Rice Cultivation Technique

Seed Rate × Plant Spacing Trial. (Trial Site, Gezira)



Nitrogen Source Trial and extensionist. (Trial Site, Gezira)

Mr. Nakagaki and Dr. Ikeda discussed with Director of Rahad Research Station (ARC). (Gedaref)

Third Country Training in Egypt (Irrigation & Water Management)

Lecture on rice irrigation management in RRTC.

Trial site of RRTC (5 feddans). There are 14 varieties and 3 kinds of irrigation frequency (every day, every 6 days, every 12 days).

Same as on the left. Field practice: Rice irrigation management.

Third Country Training in Egypt (Weed Control)

Lecture on integrated weed management in RRTC.

Trial site under salt affected soil in Damietta. Main variety is GIZA178.

Same as on the left. Professor explained the weed.

Third Country Training in Egypt (Rice Post-Harvest & Processing)

Lecture on handling equipment. Participant asks question to lecturer.

Visiting rice milling facilities in RTTC.

DG of RTTC (the left), Mr. Matsuda (the 4th from the left behind), Former DG of RTTC (the 4th from the right behind) with participants.

Demonstration Farms and Monitoring Activity

After irrigation. (Wad Bahai, Gezira)

Mr. Nakagaki, Dr. Ikeda and monitoring team visited the site. (Abdelrahman, Gezira)

Seed were eaten by birds. (Sowriba, Gezira)

Monitoring team, extensionist and farmer. (Wad Sawi, Seed production/ demo, Gezira)

Weeding by farmers. (Frejab, Seed production/demo, Gezira)

2nd application of Urea. (UmBarona, Seed production, Gezira)

Mr. Nakagaki and Dr. Ikeda visited the site with Head of Rice Unit and extensionists. (Maiurno South, Sennar)

Mr. Nakagaki and Dr. Ikeda discussed bad germination with Head of Rice Unit and extensionists. (Almahlaj, Sennar)

After re-sowing, the growth are uniform. (Almergani, Sennar)

Because of bad leveling, water control is difficult. Low place has always water and no germination. High place has a lot of weeds. (Al Fau: Farmer 1, Gedaref)

Good rice cultivation management. Dr. Ikeda and Mr. Nakagaki gave technical advice to extensionists. (Al Fau: farmer 2, Gedaref)

Rice growth is not uniform. (Shuwak: Ministry, Gedaref)

Rice growth is generally good. The farmer (the left) exchanged views with a farmer of Atbara 1. (Kanour, River Nile)

Same on the left. The symptom of shortage of water appeared. Mr. Goto gave advice to extensionists to irrigate carefully.

Good germination. (Dongola Island, Northern)

Good plotting like a trail site. (Zawrat, Northern)

Good weeding. (Elfardos 1 and 2, White Nile)

Same on the left. Damage by termite.

The monitoring meeting. DG (the right) also attended. (Gedaref)

The monitoring meeting. (Sennar)

GM (the 2nd from the right) made a comment in the monitoring meeting. (White Nile)

Leaders of each site presented in the monitoring meeting. (River Nile)

Leaders of each site presented in the monitoring meeting. (Northern)

DG attended the monitoring meeting and discussed the issues on transportation for extensionists and each site. (Gezira)

Meeting with Ministry of Agriculture, Others

Seed production site of Arab Sudanese Seed Co., Ltd. (invested by AAAID). The Project advised. (5 varieties, 10 feddans)

Mr. Nakagaki explained project activity to new Minister of FMoAF.

Mr. Nakagaki discussed with new DG of Gezira SMoA.

< September >

Development of Appropriate Upland Rice Cultivation Technique

Dr. Ikeda gave technical advice to extensionists. (Trial site, Gezira)

Researchers explained their trial site to Dr. Ikeda and Mr. Nakagaki. (ARC Kosti research station, White Nile)

Dr. Ikeda and Mr. Nakagaki discussed with researchers in the trial site. (ARC HQ, Gezira)

Dr. Ikeda conducted a lecture for researchers. (ARC HQ, Gezira)

Site visit, Technical advice and Evaluation by Mr. Tsuboi (Expert in Uganda)

Mr. Tsuboi gave technical advice to extensionists. (Trial Site, Gezira)

Lecture from Mr. Tsuboi about planning of experiment. (Gezira SMoA)

Mr. Tsuboi and Mr. Nakagaki visited Minister of Gezira SMoA and exchanged views.

Mr. Tsuboi gave technical advice on pure seed to extensionists. (Al Fau: ARC, Gezira)

Mr. Tsuboi gave technical advice on appropriate seed rate to extensionists. (Almergani, Sennar)

Mr. Tsuboi gave technical advice to extensionists. (Atbara 1, River Nile)

Third Country Training in Egypt (Observation Programme on Rice Cultivation for High Officials & Technical Exchange for ARC Researchers)

High officials exchanged views in rice milling company.

High officials and researchers visited lab of RTTC.

High officials and researchers visited a trial site of RRTC.

Demonstration Farms and Monitoring Activity

Wad Bahai, Gezira.

Extensionist of Abdelrahman, Gezira.

Extensionist of Wad Alasha (demo), Gezira.

Wad Al Naim (Seed production/demo), Gezira.

It should be thinned because of too much seed rate. (Almergani, Sennar)

Same as on the left. Extensionists and farmers started thinning.

Extensionist gave technical advice to farmers. (Al Fau: Farmer 1, Gedaref)

Farmer of "Al Fau: Farmer 1" visited "Al Fau: Farmer 2" to observe good rice growth and management.

NERICA 4 is already ripened and off-type is not. Mr. Goto advised to harvest only NERICA 4 for pure seeds of next season. (Shuwak: Ministry, Gedaref)

Dr. Hassan and Head of rice unit monitored the agricultural operation. (Shuwak: Ministry, Gedaref)

Need more water in heading state but the soil was just wet. (Atbara 1, River Nile)

There was symptom of lack of water and a lot of empty grains were observed. (Atbara 2, River Nile)

All of them are empty grains. (Kanour, River Nile)

Weeding by farmer. (Dongola Island, Northern)

Good growth generally but uneven growth. (Elfardos 1 [left] and 2 [right], White Nile)

Meeting with Ministry of Agriculture, Others

A meeting with Minister of FMoAF. Mr. Tsuboi, Mr. Nakagaki and Minister from the left.

Extensionists of Sennar SMoA visited a Trial site in Gezira SMoA.

Extensionists of Sennar SMoA also visited Seed production/demo site in Wad Alasha, Gezira.

〈 October 〉

Development of Appropriate Upland Rice Cultivation Technique and Demonstration Farms Activity in Gezira State

Sampling in the trial site.

Threshing for crop cut survey in demo farm.

Demonstration Farms and Monitoring Activity in Other 5 States

Good cultivation but uneven growth. (Maiurno South, Sennar)

Re-sown rice is going to mature. (Almahlaj, Sennar)

NERICA 4 (this side) is already mature but off type is not. (Almergani, Sennar)

The field of Al Fau: ARC, Gedaref.

A lot of weed and damage by termite because of insufficient management. (Al Fau: Farmer 1, Gedaref)

Higher yield then last season is expected. (Al Fau: Farmer 2, Gedaref)

Although paid attention to management including fertilizer, ears of rice are falling down. (Shuwak: Ministry, Gedaref)

Extensionists are drying harvested seeds for next season. (Gedaref)

No water in the field and uneven growth. (Atbara 1, River Nile)

Uneven growth with off-type. (Atbara 2, River Nile)

A lot of weed are observed. (Dongola Island, Northern)

Good cultivation management. (Zawrat, Northern)

There are some missing hills and uneven growth. (Elfardos 1 and 2, White Nile)

Same as on the left. Uneven growth even though at the same sowing date.

Mr. Goto gave advice on cultivation and monitoring to extensionists, farmer and the head of rice unit. (Wad Alasha, Gezira)

Dr. Hassan (the middle) taught how to do monitoring to the head of rice unit, leader of the field and extensionists after monitoring visit. (Almahlaj, Sennar)

Dr. Hassan taught how to write monitoring sheet to extensionists after monitoring visit. (Gedaref)

Terminal Evaluation, JCC meeting, Meeting with Ministry of Agriculture

Evaluation Team conducted interview with AAAID and Mr. Nakagaki accompanied the team.

Joint Terminal Evaluation Team met with the Minister and DG of Gezira SMoA. Experts accompanied the team.

Joint Terminal Evaluation Team asked questions to the Minister of Sennar SMoA. Experts accompanied the team.

Joint Terminal Evaluation Team visited the field of Al Fau: Farmer 2 in Gedaref. Experts accompanied the team.

Joint Terminal Evaluation Team visited the field of Elfardos 1 and 2 in White Nile. Experts accompanied the team.

Joint Terminal Evaluation Team asked questions to DG of River Nile SMoA. Experts accompanied the team.

Joint Terminal Evaluation Team visited the field of Zawrat in Northern. Experts accompanied the team.

The 11th JCC meeting on 27th October.

Meeting with the Federal Minister on the next day of the 11th JCC meeting.

〈 November 〉

Rice Harvest and Post-Harvest Processing

The middle scale Matmora in Gedaref (1500 ton).

Assembling husk duct and safety cover. (Hy-abudalla, Gezira)

Adaptation of fan of RMU. (Shuwak, Gedaref)

Installing safety cover to RMU in River Nile.

Boring a hole of the duct through the wall. (Northern)

Installing safety cover to RMU in White Nile.

Seminar for post-harvest technique in Gezira on 26th November. There were participants from Sennar.

The same as on the left. Presentation of operation and maintenance of RMU.

C/Ps presented on the seminar.

Follow-up Visit from Egypt

Egypt mission met with Undersecretary of FMoAF.

Egypt mission (the left side) interviewed with extensionists who participated the trainings in Egypt.

Egypt mission participated the Rice Field Day in Gezira State.

Demonstration Farms Activity

NERICA 4 was harvested in Sennar.

NERICA 4 is ready to harvest but off-type is not. (Almahlaj, Sennar)

Crop cutting by extensionists. (Al Fau: Farmer 1, Gedaref)

Rice Field Day

Governor, Ambassador of Japan, Minister of Gedaref SMoA, etc. on 2nd November. (Gedaref)

The venue of the Rice Field Day in Gedaref.

Speech by Mr. Nakagaki at the Rice Field Day.

Speech by Ambassador of Japan at the Rice Field Day.

Speech by Minister of Gedaref SMoA at the Rice Field Day.

Speech by Governor of Gedaref State at the Rice Field Day.

The Ambassador, the Governor and the Minister watched the demonstration of RMU at the Rice Field Day.

Demonstration by Combine Harvest which JICA procured in Rice Field Day on 5th November. (Gezira)

Demonstration by Japanese made Combine Harvester which Gezira SMoA procured, in the Rice Field Day.

The exhibition of rice and machinery in the Rice Field Day.

The venue of the Rice Field Day.

Speech by Mr. Nakagaki at the Rice Field Day.

Gezira State MoA showed gratitude for the Project.

Speech by Minister of Gezira SMoA at the Rice Field Day.

Governor of Sennar State and Ambassador of Japan operated Combine Harvester at Rice Field Day on 15th November. (Sennar)

The venue of the Rice Field Day.

Speech by Senior Representative of JICA Sudan Office at the Rice Field Day.

Speech by Ambassador of Japan at the Rice Field Day.

Speech by Minister of Sennar SMoA at the Rice Field Day.

Small Rice Field Event for farmers. (Wad Bahai, Gezira)

Farmers saw the harvested rice at the event.

Evaluation Meeting

Dr. Hassan explained the outline of the evaluation meeting. (River Nile SMoA)

Evaluation meeting in Gezira SMoA.

〈 December 〉

Evaluation Meeting

Evaluation meeting in Sennar SMoA.

Evaluation meeting in Gedaref SMoA.

Dr. Hassan explained how to do self capacity assessment to extensionist after the evaluation meeting. (White Nile SMoA)

〈 January 〉

JCC Meeting, Workshop, Meeting with Ministry of Agriculture

The 12th JCC meeting on 19th January.

"Workshop for further development of upland rice production in Sudan" was held after the JCC meeting.

Undersecretary of FMoAF, Ambassador of Japan and Chief Representative of JICA Sudan Office from the left.

Presentation by Mr. Ando at the Workshop.

Presentation by Mr. Goto at the Workshop.

Presentation by Mr. Nakagaki at the Workshop.

DG of Gedaref SMoA delivered her opinion at the discussion session.

After the Workshop. DG of Gezira, DG of PAE, National Rice Research Coordinator, extensionists, Japanese experts, project staff, etc.

Mr. Nakagaki discussed with Acting DG, Rice Advisor, Head of Rice Unit, etc. on 25th January. (Gezira SMoA)

Mr. Nakagaki explained the importance of continuing upland rice cultivation to extensionists, etc. after the meeting with Minister and Head of Rice Unit on 26th January. (Sennar SMoA)

After discussion with Minister. Photo with Minister, DG, Head of Rice Unit, extensionists, etc. on 26th January. (White Nile SMoA)

After the meeting on rice sector development on 27th January at Minister's office. DG of IC, Mr. Nakagaki, Minister of FMoAF, National Rice Research Coordinator, Dr. Hassan, National Rice Coordinator, Staff of IC. (from the left)

ANNEXES

Project Design Matrix (PDM) [Ver. 5.0] (for extended duration)

Annex 1

Project Title: Capacity Building Project for the Implementation of "The Executive Programme for the Agricultural Revival"
Project Period: March 2014 – March 2016 (two-year extension on top of the original duration from March 2010 to March 2014)

Narrative Summary	Objectively Verifiable Indicators (Baseline in 2010 and Target in 2013)	Means of Verification	Progress at Feb 2014	Important Assumptions
Overall Goal: The quality of public services provided by the Ministry of Agriculture and the organizations concerned are improved through their capacity development.	1. 50% of relevant agricultural parties (Production coop, Investors, Agricultural product vendors etc.) recognized increases in quality of the public agricultural services.	Questionnaire survey to stakeholders	Yet to be verified	Political stability, economic policy stability
Project Purpose: Human and organizational capacity of the Ministry of Agriculture and the organizations concerned is strengthened to materialize "The Executive Programme for the Agricultural Revival."	1. By the end of the project period, 60% of the staff members of the Federal Ministry of Agriculture, and core staff of State Ministries of Agriculture and other organizations concerned, involved in the Project Activities, demonstrate improvements in action planning, implementation, monitoring & evaluation relating to the "Executive Programme for the Agricultural Revival".	Result of capacity assessment by JICA Experts and counterpart managers	Achieved for Output 1, but not achieved for Output 2	
	2. By the end of the project period, 80% of the staff of the Federal Ministry of Agriculture, and core staff of State Ministries of Agriculture and other organizations concerned, who received training, show improvement in the score of the self capacity evaluation.	Result of self-assessment survey of counterpart staff	Achieved for Output 1, but not achieved for Output 2	
Outputs: 1. Through the experimental activities of the Project, a model system of human resource development and organizational capacity development of the Ministry of Agriculture has been developed. Development of a model system should include recommendation on the following issues. ✓ An appropriate implementation system ✓ Procedures of the capacity assessment (CA) and needs analysis (NA) ✓ Procedures of making an annual training plan based on the CA and NA (including theme selection and design of training content). ✓ An appropriate preparation for trainings ✓ Procedures of training implementation ✓ Appropriate methods of supervision and monitoring during training ✓ An appropriate evaluation method of trainings is recommended (including the analysis method of feedback sheets from the participants)	1.1 The appropriateness of the experimental management system is verified.	✓ Mandate and member list of the Working Group for human resource development and organizational capacity development ✓ Attendance rates of the Working Group members at regular meetings ✓ Attendance rates of trainees who the Working Group selected ✓ Feedback sheets which trainees filled in	Achieved	Training policy of the Federal Ministry of Agriculture is sustained [PRECONDITION] Sudanese counterparts of the Project are not shifted frequently. Participants of the trainings provided by the Project continue taking charge of the present work Delivery of the equipment procured by the Project is not delayed much
	1.2 The appropriateness of a series of procedures from CA and NA to the completion of training is verified.	Feedback sheets which trainees filled in	Achieved	
	1.3 An implementation manual is compiled including verified management system and procedures from CA and NA to the completion of training	Implementation manual	Achieved	
2. Planning, implementation, monitoring & evaluation for promotion of rice production are enhanced. (*) Qualifications of the "trainer" in Indicator 2.6 are measured based on: 1) Degree of mastering basic rice cultivation techniques 2) Ability to respond properly when problems on rice cultivation happen in field by utilizing basic rice cultivation techniques 3) Persons who recorded higher yield of rice 4) Effort and working attitude on rice cultivation activity 5) Relationship of mutual trust between extension officer and farmer	2.1 The NRDS draft is formulated	Draft NRDS	Achieved	
	2.2 A structure to implement and review (monitoring and evaluating progress and reflecting evaluation results to the next plan) the NRDS is recommended.	Document on recommendation	Achieved	
	2.3 Annual action plans for rice development (analysis, planning, monitoring & evaluation, technical development, seed production, and extension) is formulated.	Annual action plans in annual reports	Achieved	
	2.4 A practical/technical handbook on upland rice cultivation is prepared	Practical/technical manual	Some issues remain	
	2.5 Quality of rice seed is improved.	Inspection record(s) of rice seed cultivated in rice production fields	Achieved	
	2.6 More than 80% of training participants in Gezira State, and two of trained participants respectively in five States excluding Gezira State, are qualified as trainers(*) on appropriate rice cultivation technique.	Evaluation by JICA experts and Sudanese counterparts	Not achieved	
	2.7 More than 60% of farmers who grew upland rice in demonstration farms show a willingness to grow rice again.	Result of questionnaire survey	Achieved	

Narrative Summary	Status at February 2014	Input from Sudanese Side	Input from Japanese Side	Important Assumptions
Activities: **<u>Human resource & organizational development</u>** 1.1 To develop a model system of human resource development for the Ministry of Agriculture	Completed and to be continued by the counterparts or Sudanese side			
1.1.1 To conduct training needs assessment based on the mandate of each directorate of the Ministry of Agriculture				
1.1.2 To design trainings based on the assessment results				
1.1.3 To conduct trainings based on the training plans formulated through 1.1.1 and 1.1.2				
1.1.4 To prepare an implementation manual in which experiences and lessons learnt are compiled				
1.2 To develop a model system of organizational capacity development of the Ministry of Agriculture	Completed and to be continued by the counterparts or Sudanese side			
1.2.1 To establish Task Teams composed of staff of the target directorates/units which formulate and implement action plans				
1.2.2 To set up criteria to select Task Team members				
1.2.3 To conduct workshops to enhance the understanding of the Task Teams about their activities				
1.2.4 To assist the Task Teams to formulate action plans (PDM and PO)				
1.2.5 To assist the Task Teams to implement planned actions in respective directorates/units				
1.2.6 To monitor the progress of Task Team activities				
1.2.7 To support the arrangement of presentation by the Task Teams conducted at the end of their activities				
1.2.8 To formulate an action plan to improve overall information management & infrastructure management in the Ministry of Agriculture				
1.3 To establish a monitoring and evaluation (M&E) and management system of capacity development activities	Completed, and to be continued by the counterparts or Sudanese side			
1.3.1 To organize a working group (WG) for capacity development composed of representatives from target directorates/units				
1.3.2 To formulate TOR and regulations of the WG				
1.3.3 To set up agenda and hold meetings regularly				
1.3.4 To establish a M&E framework				
1.3.5 To enhance the commitment of working group members to Task Team activities				
1.3.6 To enhance the WG's capacity to supervise, monitor and evaluate all capacity development activities				
1.4 To prepare annual reports compiling review of Activities in 1.1, 1.2 and 1.3 and recommendation for plans in next year on human resource development, organizational capacity development, and the M& E and management system	Completed and to be continued by the counterparts or Sudanese side			

Narrative Summary	Status at February 2014	Input from Sudanese Side	Input from Japanese Side	Important Assumptions
Rice development 2.1. To carry out planning, monitoring and evaluation for promotion of rice production in Sudan 2.1.1 To collect and analyze information on rice cultivation development (review of rice cultivation development, data collection and analysis on current regulations and environment, and market analysis [value chain analysis]) 2.1.2 To assist the Federal Ministry of Agriculture to formulate the National Rice Development Strategy (incl. holding workshops on the NRDS formulation process)	Completed and to be continued by the counterparts or Sudanese side	As specified in the Record of Discussions between JICA and Ministry of Agriculture and Irrigation as of XX February 2014.	As specified in the Record of Discussions between JICA and Ministry of Agriculture and Irrigation as of XX February 2014.	
2.2. To develop appropriate upland rice cultivation technique 2.2.1 To conduct field experiments (seed rate trial, irrigation interval trial, fertilizer trial, weed control trial, etc.) in Gezira 2.2.2 To collaborate with Agricultural Research Corporation in developing rice cultivation technique such as weed control (herbicide trial) 2.2.3 To identify issues of the current harvest & post-harvest process 2.2.4 To discuss and propose appropriate harvest & post-harvest technique	Some issues remain to be addressed			
2.3 To improve upland rice seed production technique 2.3.1 To provide technical advices on seed production for Ministry of Agriculture and Irrigation and State Ministries of Agriculture 2.3.2 To conduct model cultivation on seed production at demonstration farms in Gezira	Completed and to be continued by the counterparts or Sudanese side			
2.4 To train agricultural extension workers to be trainers on appropriate upland rice cultivation 2.4.1 To conduct TOT (in country) to transfer appropriate technique on upland rice cultivation 2.4.2 To conduct training in third country/Japan to transfer appropriate technique on upland rice cultivation	Not fully completed			
2.5 To demonstrate rice cultivation to expose farmers to appropriate upland rice cultivation technique 2.5.1 To grow upland rice in demonstration farms in Gezira, White Nile, Sennar, Gedaref, River Nile and Northern States 2.5.2 To transfer appropriate upland rice cultivation technique to farmers through cultivation in demonstration farms	To be continued by utilizing the results of 2.2 and 2.3			
2.5.3 To hold Farmers Field Schools to transfer appropriate upland rice cultivation technique 2.5.4 To conduct Rice Field Day events to raise awareness of farmers and the private sector, etc. on upland rice cultivation and marketing	Completed and to be continued by the counterparts or Sudanese side			
2.6 To prepare a handbook on rice cultivation technique based on results of activities in 2.2 together with those in 2.3, 2.4 and 2.5.	To be revised based on the results of 2.2 and 2.3			
2.7 To conduct planning, monitoring and evaluation of rice development on a regular basis 2.7.1 To prepare annual reports on rice cultivation development which present plans and progress/results on various issues (analysis, planning, monitoring & evaluation, technical development, seed production, and extension) 2.7.2 To hold wrap-up workshops to present results of the year, lessons learnt and plans for the next year 2.7.3 To hold forums for national rice promotion to share information on rice cultivation development	Completed and to be continued by the counterparts or Sudanese side			

Expert Assignment Plan / Result

Project Title: Capacity Building Project for the Implementation of the Executive Programme for the Agricultural Revival

1. Assigned in Sudan

Name (Assigned Area of Work)		FY2015 2015 5	6	7	8	9	10	11	12	2016 1	2	Days (Total)	Man-Month (Total)
Mr. Osamu NAKAGAKI (Chief Advisor / Rice Development Programme)	Plan		(33)			(22)	(43)			(22)		120	4.00
	Result	5/22	6/13 (23)		8/20	9/16 (28)	10/5	11/7 11/15 (34) (8)	11/22	1/5	1/31 (27)	120	4.00
Mr. Akio GOTO (Deputy Chief Advisor / Rice Cultivation 1)	Plan		(48)		(63)			(72)		(27)		210	7.00
	Result	5/18	7/4 (48)	7/18		9/18 (63)	10/1	(73)	12/12	1/6	1/31 (26)	210	7.00
Mr. Takamasa ANDO (Rice Cultivation 2)	Plan		(44)			(30)		(60)		(25)		159	5.30
	Result	5/18	6/30 (44)		8/18	9/18 (32)	9/28 (60)	11/26		1/8	1/30 (23)	159	5.30
Mr. Osamu TOKUMOTO (Rice Harvest & Post-Harvest Processing)	Plan							(45)				45	1.50
	Result						10/16	11/29 (45)				45	1.50
Dr. Ryoichi IKEDA (Cultivation Environment Analysis & Weed Control)	Plan				(15)							15	0.50
	Result				8/21 (15)	9/4						15	0.50
Mr. Takeshi MATSUDA (Project Coordinator / Monitoring & Evaluation of Upland Rice Cultivation)	Plan		(26)			(32)	(41)			(33)		132	4.40
	Result	5/18	6/9 (23)		8/14	9/16 (34)	10/2 (42)	11/12		1/8	2/9 (33)	132	4.40
									Subtotal in Sudan		Plan	681	22.70
											Result	681	22.70

Annex 2

2. Assigned in Japan

Name (Assigned Area of Work)		FY2015										Days (Total)	Man-Month (Total)
		2015								2016			
		5	6	7	8	9	10	11	12	1	2		
Mr. Osamu NAKAGAKI (Chief Advisor / Rice Development Programme)	Plan	(2)									(4)	6	0.30
	Result	5/11 5/12 (2)									2/1 2/4 (4)	6	0.30
Mr. Akio GOTO (Deputy Chief Advisor / Rice Cultivation 1)	Plan	(2)									(2)	4	0.20
	Result	5/11 5/12 (2)									2/1 2/2 (2)	4	0.20
Mr. Takamasa ANDO (Rice Cultivation 2)	Plan	(2)									(2)	4	0.20
	Result	5/11 5/12 (2)									2/1 2/2 (2)	4	0.20
Mr. Osamu TOKUMOTO (Rice Harvest & Post-Harvest Processing)	Plan											0	0.00
	Result											0	0.00
Dr. Ryoichi IKEDA (Cultivation Environment Analysis & Weed Control)	Plan											0	0.00
	Result											0	0.00
Mr. Takeshi MATSUDA (Project Coordinator / Monitoring & Evaluation of Upland Rice Cultivation)	Plan	(2)									(4)	6	0.30
	Result	5/11 5/12 (2)									2/15 2/18 (4)	6	0.30
									Subtotal in Japan		Plan	20	1.00
											Result	20	1.00

Explanatory Note: Result Plan

Total		
	Plan	23.70
	Result	23.70

Flowchart of Plan of Operation

Fiscal Year	1st Year												2nd Year											
Year	2014									2015			2015									2016		
Month	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
JCC							●JCC			●JCC									●JCC			●JCC		
Reports			▲Work Plan				▲Progress Report (No.1)				▲Progress Report (No.2)				▲Work Plan (2nd year)				▲Progress Report (No.3)					▲Final Report
Products																						■Handbook on Upland Rice Cultivation		
Evaluation																			◆Terminal Evaluation					

Project Activities (Upland Rice Cultivation) Output 2

2.1 Planning, M & E for Promotion of Rice Cultivation

Advice to C/P | Advice to C/P

2.2 Appropriate Upland Rice Cultivation Techniques

Advice on Trial (Irrigation Interval Trial, Plant Spacing Trial, Seed Rate Trial, Fertilizer Trial) | Advice on Analysis of trial | Technical Advice on Weed Control

Collaboration with ARC

Advice on Trial (Seed Rate+ Plant Spacing, The source of Nitrogen fertilizer, Organic Fertilizer) | Advice on Analysis of trial | Technical Advice on Weed Control

Collaboration with ARC

※ Rice Harvest & Post-Harvest Processing

Follow up for installation of RMU by Rice Cultivation Experts | Techinical Advice on Harvest & Post-Harvest

Follow up for installation of RMU by Rice Cultivation Experts | Techinical Advice on Harvest & Post-Harvest

2.3 Improving Seed Production Techniques

Advice to C/P | Advice to C/P

2.4 Training for Agricultural Extension Workers

Technical Advice in Trial Site and Demo Site by Rice Cultivation Experts

Training in Japan and Follow up after the Training

Advanced Training (Uganda) | Observation Training (Egypt) | Post-Harvest (Egypt) | Water Management, Weed Control (Egypt) | Technical Advice from Uganda (Rice Cultivation, Machinery)

Technical Advice in Trial Site and Demo Site by Rice Cultivation Experts

Training in Japan and Follow up after the Training

Advanced Training (Uganda) | Water Management, Weed Control, Post-Harvest (Egypt) | Observation, Technical Exchange (Egypt) | Technical Advice and Evaluation from Uganda | Follow-up Visit from Egypt

Annex 3

Fiscal Year		1st Year												2nd Year											
Year		2014									2015			2015									2016		
Month		4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
t i e s	～	2.5 Expansion of Farmer's Demonstration Farm																							
		Preparing Field		Technical Advice on Sowing	Technical Advice on Irrigation, Weed Control			Techinical Advice on Sampling & Harvest		Technical Advice on Yield Survey				Preparing Field		Technical Advice to Sowing	Technical Advice to Irrigation, Weed Control			Techinical Advice on Sampling & Harvest		Technical Advice on Yield Survey			
		Planning of Action Plan (AP)		Monitoring and Guiding of AP						Presentation Result of AP				Planning of AP		Monitoring and Guiding of AP						Presentation Result of AP			
		2.6 Preparation of a Handbook on Rice Cultivation Technique									1st Draft												Final Draft		
		2.7 Planning, Monitoring and Evaluation of Rice Development on a Regular Basis																							
		Advice to C/P												Advice to C/P											
	O t h e r s	Seminar and Workshop on Project Activities for Top-Level Management (such as Minister, Undersecretary, Director General, etc.)																							
										Workshop for Summarization													Workshop for Summarization		
		Equipment																							
					Procurement of Equipment												Procurement of Equipment								
		Public Relations																							
				Pamphlet, Flyer, Website update, Disseminate infomation through Media, etc.												Pamphlet, Flyer, Website update, Disseminate infomation through Media, etc.									

Capacity Building Project for the implementation of the Executive Programme for Agricultural Revival - Plans of Operation

OUTPUT 2 - Rice Production Component - YEAR 6 ←--→ Monitoring/Trial by the Project Planned Completed (as of February 2016)

Activities	Implementing party	2015 Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	2016 Jan	Feb	Mar	Remarks
2.1 To carry out planning, monitoring and evaluation for promotion of rice production in Sudan														
2.1.1 To collect and analyze information on rice cultivation development (review of rice cultivation development, data collection and analysis on current regulations and environment, and market analysis [value chain analysis])														
2.1.2 To assist the Federal Ministry of Agriculture to formulate the National Rice Development Strategy (incl. holding workshops on the NRDS formulation process)														
2.2 To develop appropriate upland rice cultivation technique														
2.2.1 To conduct field experiments (seed rate trial, irrigation interval trial, fertilizer trial, weed control trial, etc.) in Gezira	Project, Gezira SMoA	←											→	
- Formulation of Planning on annual activities														
- Purchase of Input														
- Summer Season (Trial Field)		Land Preparation		Sowing and Management, Sampling				Harvest						
- Collection data and analysis														
2.2.2 To collaborate with Agriculture Research Corporation in developing rice cultivation technique such as weed control (herbicide trial)	Project, ARC	←											→	
2.2.3 To identify issues of the current harvest & post-harvest process	Project													
2.2.4 To discuss and propose appropriate harvest & post-harvest technique	Project													
2.3 To improve upland rice seed production technique														
2.3.1 To provide technical advices on seed production for Ministry of Agriculture and Irrigation and State Ministries of Agriculture														
- Formulation of Planning on annual activities														
- Providing Technical Advise on Seed Production														
2.3.2 To conduct model cultivation on seed production at demonstration farms in Gezira														
- Model cultivation on seed production at the demonstration farms in Gezira														
- Collection data and analysis														

Completed and to be continued by the counterparts or Sudanese

Completed and to be continued by the counterparts or Sudanese

Annex 4

Capacity Building Project for the implementation of the Executive Programme for Agricultural Revival - Plans of Operation

OUTPUT 2 - Rice Production Component - YEAR 6 ←--→ Monitoring/Trial by the Project Planned Completed (as of February 2016)

Activities	Implementing party	2015									2016			Remarks
		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	
2.4 To train agricultural extension workers to be trainers on appropriate upland rice cultivation														
2.4.1 To conduct TOT (in country) to transfer appropriate technique on upland rice cultivation	Project	←---	---	---	---	---	---	---	---	---	---	---	---→	
- Formulation of Planning on annual activities		■	■											
- Training for Extension Workers as OJT				■	■	■	■	■	■	■	■			Implementing as OJT
- Intensive training				■										
- Advice & Evaluation by Mr. Tsuboi (Uganda Project)							■							5 - 14 Sep
2.4.2 To conduct training in third country/Japan to transfer appropriate technique on upland rice cultivation		←---	---	---	---	---	---	---	---	---	---	---	---→	
Training in Uganda														
- Advanced technical training on upland rice cultivation	JICA Uganda				■	■								13 - 24 Jul
Training in Egypt														
- Observation Programme for High Officials	JICA Egypt, EICA						■							4 - 10 Sep
- Technical Exchange for ARC researchers	JICA Egypt, EICA						■							4 - 10 Sep
- Weed Control	JICA Egypt, EICA					■	■							22 Aug - 5 Sep
- Irrigation Management	JICA Egypt, EICA					■	■							22 Aug - 5 Sep
- Post-harvest and Processing	JICA Egypt, RTTC					■	■							22 Aug - 5 Sep
Training in Japan														
- Selection of Candidate for the Training in Japan	JICA, Project	←---	---	---	---	---	---	---	---	---	---	---	---→	7 courses
Follow up of trainee	Project	←---	---	---	---	---	---	---	---	---	---	---	---→	8 participants to Japan
- Followup visit from Egypt	Project, EICA, RRTC								■	■				31 Oct - 6 Nov
2.5 To demonstrate rice cultivation to expose farmers to appropriate upland rice cultivation technique														
2.5.1 To grow upland rice in demonstration farms in Gezira, White Nile, Sennar, Gedaref, River Nile and Northern States	Project, 6 SMoAs	←---	---	---	---	---	---	---	---	---	---	---	---→	
- Formulation of Action Plan on annual activities		■	■	■							■			
- Purchase of Input		■	■	■	■	■	■	■						
- Summer Season (Demo Farms)		Land Preparation & Sowing & Management						Sampling & Harvest						
- Collection data and analysis									■	■	■			
- Monitoring Action Plan		←---	---	---	---	---	---	---	---	---	---→			
2.5.2 To transfer appropriate upland rice cultivation technique to farmers through cultivation in demonstration farms	Project			■	■	■	■	■	■	■	■			Implementing as OJT

Capacity Building Project for the implementation of the Executive Programme for Agricultural Revival - Plans of Operation

OUTPUT 2 - Rice Production Component - YEAR 6 ←--→ Monitoring/Trial by the Project Planned Completed (as of February 2016)

Activities	Implementing party	2015 Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	2016 Jan	Feb	Mar	Remarks
2.5.3 To hold Farmers Field Schools to transfer appropriate upland rice cultivation technique					Completed and to be continued by the counterparts or Sudanese									
2.5.4 To conduct Rice Field Day events to raise awareness of farmers and the private sector, etc. on upland rice cultivation and marketing														
∗To develop upland rice cultivation technique of agricultural extension workers and farmers through monitoring activity in demonstration farms and its acquisition, regarding Activity 2.4 and 2.5														
	Project, 6 SMoAs													Including technical advice on upland rice cultivation instead of holding a workshop for 2.4.1
2.6 To prepare a handbook on rice cultivation technique based on results of activities in 2.2 together with those in 2.3, 2.4 and 2.5.														
	Project, 6 SMoAs	←-	-	-	-	-	-	-	-	-→				
2.7 To conduct planning, monitoring and evaluation of rice development on a regular basis														
2.7.1 To prepare annual reports on rice cultivation development which present plans and progress/results on various issues (analysis, planning, monitoring & evaluation, technical development, seed production, and extension)					Completed and to be continued by the counterparts or Sudanese									
2.7.2 To hold wrap-up workshops to present results of the year, lessons learnt and plans for the next year														
2.7.3 To hold forums for national rice promotion to share information on rice cultivation development														
Other Activities														
Evaluation and Workshop for season 2015 - 2016	Project, FMoAF, 6 SMoAs													Workshop (19 Jan)
JCC	Project													

Annex 5

List of Equipment (up to February 2016)

Item	Quantity	Location
Computers	35	26 Federal MoAF, 5 Khartoum Project Office, 2 Gezira Project Office, 2 Kassala Project Office
Laptop Computer	2	1 Khartoum Project Office, 1 Federal MoAF
Projector	3	2 Khartoum Project Office, 1 White Nile State MoA
Video camera	4	1 Khartoum Project Office, 2 Gezira State MoA, 1 Sennar State MoA
Digital camera	3	1 Gezira MoA, 1 Khartoum Project Office, 1 Gezira Project Office
Copy/Printer	6	2 Khartoum Project Office, 2 Gezira Project Office, 2 Kassala Project Office
Generator	2	1 Kosti Project Office, 1 Kassala Project Office
Regulator	2	Khartoum Project Office
Air conditioning	3	1 Kosti Project Office, 2 Kassala Project Office
Handy GPS set	11	Gezira Project Office
Automatic Level B40	4	Gezira Project Office
pH meter	1	Gezira Project Office
Hygrometer	4	Gezira Project Office
Platform Balance (0~150 kg) Digital	3	Gezira Project Office
Sprayer	3	Gezira State MoA
Grain Rigidity Tester	1	Gezira Project Office
pH Tester	11	Gezira Project Office
Stone remover	7	Gezira Project Office
Tractor	9	6 Gezira State MoA, 3 White Nile State MoA
Chisel Plough	6	4 Gezira State MoA, 2 White Nile State MoA
Disk Harrow	6	4 Gezira State MoA, 2 White Nile State MoA
Disk Plough	6	4 Gezira State MoA, 2 White Nile State MoA
Ridger 4 rows	6	4 Gezira State MoA, 2 White Nile State MoA
Ditcher	6	4 Gezira State MoA, 2 White Nile State MoA
Rear Blade (Leveler)	6	4 Gezira State MoA, 2 White Nile State MoA
Trailer	6	4 Gezira State MoA, 2 White Nile State MoA
Seed Drill	10	5 Gezira State MoA, 1 White Nile State MoA, 1 River Nile State MoA, 1 Northern State MoA, 1 Sennar State MoA, 1 Gedaref State MoA
Combine harvester	4	Gezira State MoA
Rice milling machine	22	Gezira State MoA
Laser Leveler	2	Gezira State MoA
Pop rice machine	2	Gezira State MoA
Rice bread cooker	2	Gezira State MoA
Small pump	5	4 Gezira State MoA, 1 White Nile State MoA
Drying Chamber	1	ARC
Water Flow Tester	1	ARC
Soil Fertility Tester	2	ARC
pF Meter	1	ARC
Awn Remover	1	Gezira State MoA
Electric Balance (Medium)	3	ARC

Vehicle (Nissan patrol)	2	1 Khartoum Project Office (Plate No. 114/9), 1 Gezira Project Office (Plate No. 114/10)
Vehicle (Pick up)	3	1 Gezira Project Office (Plate No. 114/43), National Rice Project (114/21), White Nile State MoA (Plate No. 114/22)

Annex 6

Ministry of Agriculture and Irrigation

Newsletter

CAPACITY BUILDING PROJECT
FOR
THE IMPLEMENTATION OF THE EXECUTIVE PROGRAMME
FOR
THE AGRICULTURAL REVIVAL

Japan International Cooperation Agency

August 2015
No.16

Contents

Upland Rice Cultivation Begins in the Final Season of the Project

The Project and 6 targeted States (Gezira, Sennar, Gedaref, River Nile, Northern and White Nile) commenced **Upland Rice Cultivation in Season 2015.** This season is the **final season** because the Project will terminate on March 2016.

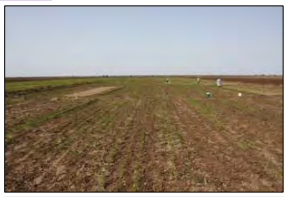
In this season, the Project and 6 States cultivate **total 24 demonstration sites (54.5 feddans)**. Details are in a table right-hand side.

Gezira State :	10. Wad Sawi (Seed/Demo) (4.5 fed)	**River Nile State :**
1. Wad Bahai (Demo) (2.0 fed)	**Sennar State :**	1. Atbara 1 (1.0 fed)
2. Abdelrahman (Demo) (2.0 fed)	1. Almahlaj (2.5 fed)	2. Atbara 2 (1.0 fed)
3. Shibairab (Demo) (2.0 fed)	2. Almergani (2.5 fed)	3. Kanour (1.0 fed)
4. Frejab (Demo) (2.0 fed)	3. Maiurno South (2.5 fed)	**Northern State :**
5. Wad Alasha (Demo) (2.0 fed)	**Gedaref State :**	1. Dongola Island (1.0 fed)
6. Frejap (Seed/Demo) (4.0 fed)	1. Al Fau (ARC) (2.0 fed)	2. Zawrat (1.0 fed)
7. Wad Alasha (Seed/Demo) (3.5 fed)	2. Al Fau (Farmer 1) (2.0 fed)	**White Nile State :**
8. Area 44 (Seed/Demo) (4.0 fed)	3. Al Fau (Farmer 2) (2.0 fed)	1. Elfardos 1 (2.0 fed)
9. Wad Al Naim (Seed/Demo) (4.0 fed)	4. Shuwak (2.0 fed)	2. Elfardos 2 (2.0 fed)

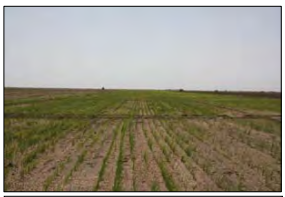
Gezira State

Demo Site

Wad Bahai. Rice growth is generally good but land leveling is not uneven. One plot should be much smaller. (July 2015)



Abdelrahman. Good rice cultivation management but there are some missing hills due to uneven land levelling. (July 2015)



Shibairab. Rice growth is generally good. The damage by termite is observed. (July 2015)

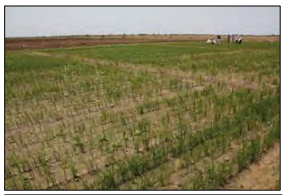
Frejab (Demo). One plot should be much smaller for appropriate irrigation and weeding. (July 2015)

Wad Alasha (Demo). Good cultivation management but needs more weeding. (July 2015)

Seed Production / Demo Site

In this season, Gezira State MoA cultivates 5 Seed Production sites in the farmers' field.

Frejab (Seed/Demo). After applying fertilizer, the field should be plowed. (July 2015)



Wad Alasha (Seed/Demo). Good cultivation management but weeding is necessary. (July 2015)

Area 44 (Seed/Demo). Rice growth is good but there are some missing lines due to the trouble of seeding machine. Extensionists should be in the field at each operation. (July 2015)

Wad Al Naim (Seed/Demo). There are some missing hills but rice growth is generally good. (July 2015)

Wad Sawi (Seed/Demo). Rice growth is generally good but symptom of lacking water and fertilizer is observed. (July 2015)

Trial Site

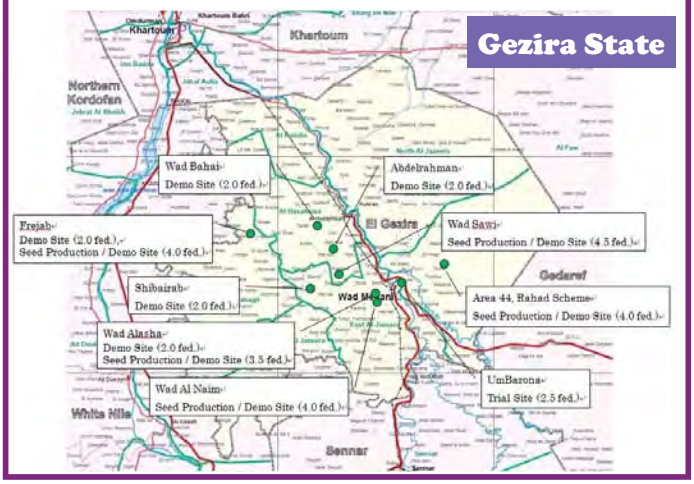
In the season 2015, **3 experiments (Irrigation Seed Rate + Plant Spacing Trial, The source of Nitrogen fertilizer Trial and Organic Fertilizer Trial)** are being implemented to develop appropriate upland rice technique in UmBarona with Gezira State Ministry.

Irrigation Seed Rate + Plant Spacing Trial. (July 2015)

The source of Nitrogen Fertilizer Trial. (July 2015)

Organic Fertilizer Trial. (July 2015)

Maps of Upland Rice Cultivation Sites 2015



Sennar State

Sennar State MoA started with 4 demo sites but 1 of them was cancelled due to lack of water. So in this season 2015, Sennar State MoA cultivates **3 demo sites** (**total 7.5 feddans**).

Almahlaj. First sowing was failed. Re-sowing was finished and germination was observed. (August 2015)

Almergani. Mr. Nakagaki, Mr. Mohieldin (NRP), extensionists and farmer discussed. (June 2015)

Maiurno South. Making waterway with a tractor after sowing. (June 2015)

Gedaref State

Gedaref State MoA cultivate **4 demo sites** (**total 8 feddans**) in the season 2015. There are 3 sites in Al Fau and 1 site in Shuwak.

Al Fau (ARC site). There are some missing hills. (August 2015)

Al Fau (Farmer's site 1). Land leveling is not enough. (August 2015)

Al Fau (Farmer's site 2). Good cultivation management with small plotting. (August 2015)

Shuwak. Good cultivation management. Thinning is required. (June2015)

River Nile State

River Nile State MoA cultivates **3 demo sites** (**total 3 feddans**) in the season 2015.

Atbara 1. First irrigation and application of herbicide were finished after sowing. Good plotting. (June 2015)

Atbara 2. Application of herbicide and second irrigation were finished after sowing. (June 2015)

Kanour. After second plowing, sowing and irrigation (4 times) were finished. Germination rate is not so good because of sowing deep. (June 2015)

Northern State

Northern State MoA cultivates **2 demo sites** (**total 2 feddans**) in the season 2015. They planned to sow in July in order to avoid flowering under heat condition.

Dongola Island. Good germination. (August 2015)

Zawrat. After 2nd irrigation. Good plotting. (August 2015)

White Nile State

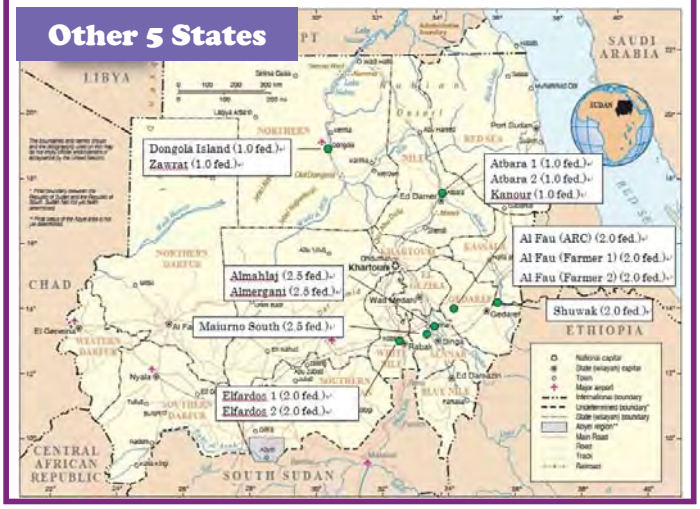
White Nile State MoA cultivates **2 demo sites** (**total 4 feddans**) in the season 2015.

Elfardos 1 (left-hand side) and Elfardos 2 (right-hand side). (August 2015)

There are some good plots but also some bad plots (big missing hills). (August 2015)

Maps of Upland Rice Cultivation Sites 2015

Other 5 States



Hand over to Equipment for ARC Rice Research Activity

A ceremony of handing over equipment for ARC rice research activity, was held on 4th June 2015 at Ministry of Agriculture in Gezira State. Main equipment is Soil Nutrient Tester, Drying Chamber, Electrical Current-meter, Electric Balance, etc. ARC's research is expected to contribute rice development in Sudan.

Project office
Ministry of Agriculture & Forestry
Jama'a street, Khartoum, Republic of Sudan
Phone: +249-902062117, +249-903983721
E-mail: nakagakiosamu@gmail.com
takeshi_matsuda@cdc-kobe.com
http://www.jica.go.jp/sudan/English.index.html

Ministry of Agriculture and Irrigation

Newsletter

CAPACITY BUILDING PROJECT
FOR
THE IMPLEMENTATION OF THE EXECUTIVE PROGRAMME
FOR
THE AGRICULTURAL REVIVAL

Japan International Cooperation Agency

JICA

September 2015
No.17

Contents

Observation Programme for High Officials & Technical Exchange for ARC Researchers in Egypt

High Officials and Mr. Ando in farmer's demo field.

The Project in collaboration with EICA (Egyptian International Center for Agriculture) and **RRTC** (Rice Research and Training Center) organized an **Observation Programme on Rice Cultivation for High Officials** (including DGs [GMs] of 6 targeted States MoAs and Federal MoAF, etc. See a table right-hand side for details) in Egypt. It was held from **4 to 10 September 2015** (See a table below for details). The objective is to deepen the understanding of rice cultivation and rice promotion activity in Egypt and to learn Egyptian experience for Sudanese high officials to apply in Sudanese rice sector development.

Name of Participants	Position & Organization
Dr. Adil Yousif Eltayib Babiker	Director General of International Cooperation Directorate, Federal MoAF
Mr. Mohieldin Ali Mohamed	National Rice Coordinator, National Rice Project, Federal MoAF
Dr. Saifaldean Hassan Aboud	Director General, Gezira State MoA
Mr. Elfadil Abdelmotalib Abdelkarim	Director General, General Administration of Agriculture, Gezira State MoA
Mr. Abdelmunim Majzoub Elhasan	Head of Rice Promotion Unit, Gezira State MoA
Mr. Ahmed Mohamed Youssif Ahmed	General Manager, White Nile State MoA
Mr. Emadeldeen Mohammed Ali	General Manager, Northern State MoA
Mr. Abdelgadir Mohamed Ahmed	Director, Department of Technology Transfer and Extension, Sennar State MoA
Mr. Saleh Abdo Saeed Khilil	Director, Department of Technology Transfer and Extension, River Nile State MoA

Left photo: Visiting Rice milling plant.
Above photo: Discussion with rice milling company.

Rice Field Day.

Schedule of Observation Programme

Day	Date	Topic
1	4/9 (Fri)	- Arrive to Cairo (Stay in Cairo)
2	5/9 (Sat)	- Meeting: EICA - Briefing on schedule and activities of EICA, etc. - Move to Tanta (Stay in Tanta)
3	6/9 (Sun)	- Meeting: RRTC (Rice Research & Training Center) - Explanation on RRTC activities - RRTC Tour - RRTC Research Farm (Stay in Tanta)
4	7/9 (Mon)	- Visit: Rice milling company (Milling process, Quality produced, Marketing procedure, Seed moisture content) (Stay in Tanta)
5	8/9 (Tue)	- Move to Alexandria - Meeting: RTTC (Rice Technology Training Center) - RTTC Tour (Post-harvest operation, Labs, Milling plant) - Move to Tanta (Stay in Tanta)
6	9/9 (Wed)	- Field Day in RRTC Demonstration Farmer's Field in relation to Hybrid programme - Move to Cairo (Stay in Cairo)
7	10/9 (Thu)	- Evaluation and Closing at EICA - Departure from Cairo

At the same time of the above Observation Programme, **Technical Exchange for ARC Researchers** was also held in collaboration with **EICA** and **RRTC** in Egypt. Eight rice researchers (including National Rice Research Coordinator; Prof. Ahmed) participated in technical exchange (See a table below for the schedule). The objective is to deepen the understanding of rice research, and to learn Egyptian experience how to integrate research and extension for Sudanese researchers.

Schedule of Technical Exchange

Day	Date	Topic
1	4/9 (Fri)	- Arrive to Cairo (Stay in Cairo)
2	5/9 (Sat)	- Meeting: EICA - Briefing on schedule and activities of EICA, etc. - Move to Tanta (Stay in Tanta)
3	6/9 (Sun)	- Meeting: RRTC (Rice Research & Training Center) - Explanation on RRTC activities - RRTC Tour - RRTC Research Farm (Stay in Tanta)
4	7/9 (Mon)	- Visit: RRTC - Breeding section (Presentation, Discussion with researchers, Field visit) - Agronomy section (Presentation, Discussion with researchers) (Stay in Tanta)
5	8/9 (Tue)	- Move to Alexandria - Meeting: RTTC (Rice Technology Training Center) - RTTC Tour (Post-harvest operation, Labs, Milling plant) - Move to Tanta (Stay in Tanta)
6	9/9 (Wed)	- Visit: RRTC - Crop protection (Field visit and discussion with scientists: Rice Pathology, Rice Entomology, Rice Weed Control) - Move to Cairo (Stay in Cairo)
7	10/9 (Thu)	- Evaluation and Closing at EICA - Departure from Cairo

Name of Participants (Researchers)	
Prof. Ahmed Abdel Gadir Elsiddig	Dr. Bashir Mohammed Ahmed Adam
Dr. Amna Ahmed Abdalla Eltahir	Dr. Mahasin Ali Mohamed
Dr. Khalid Abdalla Osman Adam	Dr. Arafa Abdalla Mohamed Osman
Mr. Hassan Salim Ahmed Salim	Dr. Hassan Abdelgader Mubarak Ali

Explanation about RTTC.

Visiting laboratories of RTTC.

Visiting RRTC Research (Experimental) farms.

Training abroad for MoA staff since 2010

In the year 2015, the Project prepared **4 training courses for extensionists** in **Uganda** and **Egypt**. Total **48** extensionists were trained. In addition, the Project (will) sends 8 extensionists/staff for 7 training courses in Japan.

The Project provided opportunities of trainings abroad for total **378 extensionists/administrators/ researchers of MoA** since the beginning of the Project, 2010. The result is shown in a table right-hand side.

Country	No. of trainee	Country	No. of trainee
Japan (Total)	**63**	FY 2011	48
FY 2010	3*	FY 2012	32
FY 2011	12	FY 2013	36*
FY 2012	18*	FY 2014	15
FY 2013	12	FY 2015	12
FY 2014	10	**Egypt (Total)**	**159**
FY 2015	8	FY 2013	50
Uganda (Total)	**156**	FY 2014	56*
FY 2010	13	FY 2015	53*
Total			**378**

Number of Trainees Abroad

* Including high officials for observation visit or technical exchange for researchers.

Advanced Training for Rice Cultivation in Uganda

12 Participants < 13 - 24 July 2015> by JICA "Promotion of Rice Development (PRiDe) Project"

Day	Date	9:15-10:45	11:00-12:30	13:30-14:45	15:00-16:15
1	13/07 (Mon)	KQ410 9:20 Arrive Entebbe		Entebbe → Kampala	Rest
2	14/07 (Tue)	Opening, PRiDe Project and Pre-test	Field Visit	Rice in General	NERICA in Uganda
3	15/07 (Wed)	Upland Rice Cultivation	Lowland Rice Cultivation	Rice Insects and Diseases	Weed and weed control
4	16/07 (Thu)	Yield survey and components	Yield survey practice	Yield survey practice	
5	17/07 (Fri)	Self Study			
6	18/07 (Sat)				
7	19/07 (Sun)				
8	20/07 (Mon)	Kampala → Jinja	Visit Jinja Rice Mill		Jinja → Kampala
9	21/07 (Tue)	Seed production	Field Practice: Sowing, Off-type rouging	Practice : Rice Mill	
10	22/07 (Wed)	Water and rice	Seed and fertilizer calculation	Rice promotion activity in Uganda	Research & Extension
11	23/07 (Thu)	Rice Extension in Uganda	Statistics	Statistics	Post-test
12	24/07 (Fri)	Wrap-up	Closing	Namulonge → Airport KQ415 18:35	

Practice: Rice Mill.

Calculation practice with Excel.

Training for Rice Post-Harvest & Processing in Egypt

8 Participants < 22 Aug - 5 Sep 2015 > by Rice Technology Training Center (RTTC)

Day	Date	Topic	Place
1	22/8 (Sat)	- Arrive to Cairo - Registration - Travel from Cairo to Alexandria - Reception and Accommodation	RTTC (Alexandria)
2	23/8 (Sun)	- Orientation RTTC facilities - Rice mill operation - Handling equipment	RTTC (Alexandria)
3	24/8 (Mon)	- Principal science of rice receiving, cleaning and grading - Rice paddy husking equipment and separation machines	RTTC (Alexandria)
4	25/8 (Tue)	- Rice receiving, cleaning and grading - Practical work: Rice receiving, cleaning and grading (Adjustment and Maintenance)	RTTC (Alexandria)
5	26/8 (Wed)	- Rice whitening and polishing - Parboiling rice technique	RTTC (Alexandria)
6	27/8 (Thu)	- Practical work: Husking, whitening and polishing section (Adjustment and Maintenance)	RTTC (Alexandria)
7	28/8 (Fri)	- Study Tour (Bibliotheca Alexandrina)	RTTC (Alexandria)
8	29/8 (Sat)	- Rice colour sorting and packing - Practical work: Colour sorting and packing machines (Adjustment and Maintenance)	RTTC (Alexandria)
9	30/8 (Sun)	- One pass rice mill - Practical work: One pass rice mill machines	RTTC (Alexandria)
10	31/8 (Mon)	- Laboratory inspection (Quality control) - Practical work: Determination moisture	RTTC (Alexandria)
11	1/9 (Tue)	- Practical work: Paddy inspection - Practical work: White rice inspection	RTTC (Alexandria)
12	2/9 (Wed)	- Study tour (Private sector rice mill)	RTTC (Alexandria)
13	3/9 (Thu)	- Storage and drying principle techniques - Control of losses in stored rice	RTTC (Alexandria)
14	4/9 (Fri)	- Wrap up meeting (Course evaluation)	RTTC (Alexandria)
15	5/9 (Sat)	- Travel from Alexandria to Cairo - Departure from Cairo	RTTC (Alexandria)

Lecture on handling equipment. Participant asks question to lecturer.

Visiting rice milling facilities.

Training for Irrigation & Water Management in Egypt

15 Participants < 22 Aug - 5 Sep 2015 > by Egyptian International Center for Agriculture (EICA) and Rice Research and Training Center (RRTC)

Day	Date	Topic	Place
1	22/8 (Sat)	- Arrive to Cairo - Registration - Introduction	EICA (Cairo)
2	23/8 (Sun)	- Questionnaire - Introduction to rice production - Cultural practices for rice crop	EICA (Cairo)
3	24/8 (Mon)	- Rice ecology - Aerobic rice	EICA (Cairo)
4	25/8 (Tue)	- Rice irrigation management	RRTC (Kafr el-Sheikh)
5	26/8 (Wed)	- Water management under salt affected soils	RRTC (Kafr el-Sheikh)
6	27/8 (Thu)	- Egyptian rice milling system	RRTC (Kafr el-Sheikh)
7	28/8 (Fri)	- Reporting	RRTC (Kafr el-Sheikh)
8	29/8 (Sat)	- Rice production under drought conditions	RRTC (Kafr el-Sheikh)
9	30/8 (Sun)	- Soil and water analysis	RRTC (Kafr el-Sheikh)
10	31/8 (Mon)	- Water management for SRI	RRTC (Kafr el-Sheikh)
11	1/9 (Tue)	- Farmer field trip "Improved irrigation technologies"	RRTC (Kafr el-Sheikh)
12	2/9 (Wed)	- Rice: nutrient disorders & nutrient management	RRTC (Kafr el-Sheikh)
13	3/9 (Thu)	- Participants Presentation	EICA (Cairo)
14	4/9 (Fri)	- Evaluation	EICA (Cairo)
15	5/9 (Sat)	- Closing - Departure from Cairo	EICA (Cairo)

Lecture on rice irrigation management.

Field practice: Rice irrigation management.

Training for Weed Control in Egypt

13 Participants < 22 Aug - 5 Sep 2015 > by Egyptian International Center for Agriculture (EICA) and Rice Research and Training Center (RRTC)

Day	Date	Topic	Place
1	22/8 (Sat)	- Arrive to Cairo - Registration - Introduction	EICA (Cairo)
2	23/8 (Sun)	- Questionnaire - Introduction to rice production - Introduction to weed science	EICA (Cairo)
3	24/8 (Mon)	- Water and nutrient management & weed control	EICA (Cairo)
4	25/8 (Tue)	- Integrated weed management - Weed management under SRI	RRTC (Kafr el-Sheikh)
5	26/8 (Wed)	- Weed management under salt affected soils	RRTC (Kafr el-Sheikh)
6	27/8 (Thu)	- Egyptian rice milling system	RRTC (Kafr el-Sheikh)
7	28/8 (Fri)	- Reporting	RRTC (Kafr el-Sheikh)
8	29/8 (Sat)	- Cultural practices & weed control	RRTC (Kafr el-Sheikh)
9	30/8 (Sun)	- Herbicides: selectivity - mode of action	RRTC (Kafr el-Sheikh)
10	31/8 (Mon)	- Weed management in seed production systems	RRTC (Kafr el-Sheikh)
11	1/9 (Tue)	- Farmers fields: demonstration field trip	RRTC (Kafr el-Sheikh)
12	2/9 (Wed)	- Weed ecology - Weed biological characters	RRTC (Kafr el-Sheikh)
13	3/9 (Thu)	- Participants Presentation	EICA (Cairo)
14	4/9 (Fri)	- Evaluation	EICA (Cairo)
15	5/9 (Sat)	- Closing - Departure from Cairo	EICA (Cairo)

Lecture on integrated weed management.

Weed management under salt affected soils.

Project office

Ministry of Agriculture & Forestry
Jama'a street, Khartoum, Republic of Sudan

Phone: +249-902062117, +249-903983721
E-mail: nakagakiosamu@gmail.com
takeshi_matsuda@cdc-kobe.com
http://www.jica.go.jp/sudan/English.index.html

Ministry of Agriculture and Irrigation

Newsletter

CAPACITY BUILDING PROJECT
FOR
THE IMPLEMENTATION OF THE EXECUTIVE PROGRAMME
FOR
THE AGRICULTURAL REVIVAL

Japan International Cooperation Agency

JICA

October 2015
No.18

Contents

Technical Advice from 2 Prominent Rice Experts

The Project invited 2 Japanese Authorities on Rice; **Mr. Tatsushi Tsuboi** and **Dr. Ryoichi Ikeda**, from August to September 2015. They visited Federal Ministry, State Ministries, Rice Cultivation Fields, ARC Research Centers, Private Sectors, etc. Their visit and advice were important for Rice Sector Development in Sudan. They acknowledged that Sudan has a potential to produce more rice and develop rice sector as Egypt did.

Mr. Tatsushi Tsuboi

Dr. Ryoichi Ikeda

Mr. NERICA appreciated improvement of rice cultivation technique but can improve further

Mr. NERICA, namely Mr. Tatsushi Tsuboi is one of the best rice cultivation experts in Japan. He visited Sudan every year since 2009 and he gave technical advice to Sudanese staff.
He belongs to JICA Uganda "Promotion of Rice Development (PRiDe) Project". The Uganda Project accepted total 150 Sudanese extensionists to train rice cultivation technique and knowledge since 2010.
This year, Mr. Tsuboi visited 4 States MoAs (Gezira, Sennar, Gedaref and River Nile) with limited time and evaluated how much the technique is improved from 2010 till now.

Main Evaluation and Technical Advice from Mr. Tatsushi Tsuboi

- Extensionists have surely improved their cultivation and management skills of upland rice. They understand basic skills (operations) such as land preparation, sowing, weeding, water management, fertilization, etc.
- However they still make simple calculation mistakes on their experiment. Moreover experiment is for farmer's field. The content should be practical one.
- All operations (preparation, sowing, weeding, water management, fertilization, etc.) are important. If only one operation was not enough, it would directly reflect the low yield.
- The appropriate seed rate is 20kg/fed, but most of demo fields exceeded the rate. Too much rate prevent proper growth of rice.
- It is important to think by themselves and try by themselves.

Date	Topic
Sep 5th (Sat)	- Arrive to Khartoum - Meeting: Project Team
Sep 6th (Sun)	- Move to Gezira State - Visit Experiment Site - Visit Demo Site and Advice
Sep 7th (Mon)	- Visit Demo Site and Advice
Sep 8th (Tue)	- Move to Gedaref State - Visit Demo Site and Advice - Move to Gezira State
Sep 9th (Wed)	- Move to Sennar State - Visit Demo Site and Advice - Move to Gezira State
Sep 10th (Thu)	- Meeting: Gezira State MoA (Minister) - Lecture on experiment plan and content - Move to Khartoum - Meeting: Federal Minister - Meeting: JICA Sudan Office
Sep 11th (Fri)	- Move to River Nile
Sep 12th (Sat)	- Visit Demo Site and Advice - Move to Khartoum
Sep 13th (Sun)	- Reporting
Sep 14th (Mon)	- Departure from Khartoum

Mr. Tsuboi (4th from the left) gave technical advice at experiment site in Gezira State. Mr. Nakagaki is the left.

Mr. Tsuboi visited demo site in Sennar State and gave technical advice to head of rice unit and extensionists.

Mr. Tsuboi visited demo site in River Nile State and gave technical advice to head of rice unit and extensionists.

Mr. Tsuboi gave lecture about design of experiment in Gezira SMoA.

Dr. Ikeda, Technical Advice from the point of view of Rice Researcher

Dr. Ryoichi Ikeda, Ex-Professor of Tokyo University of Agriculture (2009 - 2014) , ex-Head of Biological Resources Division of WARDA (Africa Rice Center, Benin, 2002 - 2007) visited Sudan from 22nd August to 3rd September 2015. He is a researcher and academician in rice.
This was his 2nd visit to Sudan. He visited Gezira, Gedaref and White Nile State this time. He observed progress of demo sites, seed production sites and trial site and gave advice to extensionists. Furthermore, he visited ARC Headquarters (Wad Medani) and 2 ARC research center (Rahad and White Nile) to discuss with researchers and he also conducted a lecture on rice production techniques with special emphasis on rice seed production.

Dr. Ikeda (the 3rd from the left) observed the rice growth and listened the explanation from researchers with Mr. Nakagaki (the middle) in ARC White Nile Research Station.

Dr. Ikeda (the left) visited the site of ARC HQ and discussed with researchers. The middle is Mr. Nakagaki.

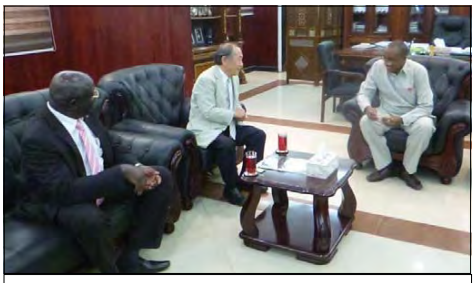
Dr. Ikeda conducted a lecture at ARC HQ.

Advice to Extensionists at trial site in Gezira State.

Date	Topic
Aug 22nd (Sat)	- Arrive to Khartoum
Aug 23rd (Sun)	- Meeting: Federal MoAF (Minister)
Aug 24th (Mon)	- Meeting: Federal MoAF (Undersecretary, DG of IC)
Aug 25th (Tue)	- Meeting: Project Team
Aug 26th (Wed)	- Move to Gezira State - Visit Demo and Seed Production Site, and Advice - Meeting: Gezira State MoA (DG)
Aug 27th (Thu)	- Visit Demo and Seed Production Site, and Advice - Visit Arab Sudanese Seed Company and Discussion
Aug 28th (Fri)	- Reporting
Aug 29th (Sat)	- Visit Demo and Seed Production Site, and Advice
Aug 30th (Sun)	- Visit Trial Site and Advice - Visit Demo and Seed Production Site, and Advice
Aug 31st (Mon)	- Move to Gedaref State - Meeting: ARC (Rahad Research Station) - Visit Demo Site and Advice - Move to Gezira State
Sep 1st (Tue)	- Move to White Nile State - Meeting: ARC (White Nile Research Station) - Visit ARC Site and Advice - Move to Gezira State
Sep 2nd (Wed)	- Meeting: ARC HQ - Visit ARC Site and Advice - Lecture <Rice production techniques with special emphasis on rice seed production> for researchers - Move to Khartoum - Meeting: JICA Sudan Office
Sep 3rd (Thu)	- Meeting: ARC (National Rice Research Coordinator) - Departure from Khartoum

The Project Met with Federal Minister and other High Officials

From the right, Minister (Prof. Ibrahim Adam), Mr. Nakagaki, Mr. Tsuboi and Dr. Hassan. (10th September)



From the left, Undersecretary (Mr. Baha Eldin), Mr. Nakagaki and Minister (Prof. Ibrahim Adam). (23rd August)

Mr. Osamu Nakagaki, Chief Advisor of the Project, had a discussion with **Federal Minister (Prof. Ibrahim Adam Ahmed Eldukheri)** on 23rd August and 10th September 2015. Mr. Nakagaki reported the progress of project activity. They discussed upland rice development in Sudan and activity after the Project terminates.
Mr. Nakagaki also had a meeting with **Undersecretary (Mr. Baha Eldin Mohamed Khamis)** and **DG of International Cooperation Directorate (Dr. Adel Yousif Altayeb)**. They discussed the issues related to project activity (Egypt training, Terminal Evaluation, etc.).

Left Photo: Meeting with Undersecretary.
Right Photo: Meeting with DG of IC.

Project office

Ministry of Agriculture & Forestry
Jama'a street, Khartoum,
Republic of Sudan

Phone: +249-902062117, +249-903983721
E-mail: nakagakiosamu@gmail.com
takeshi_matsuda@cdc-kobe.com
http://www.jica.go.jp/sudan/English.index.html

Ministry of Agriculture and Forestry

Newsletter

CAPACITY BUILDING PROJECT
FOR
THE IMPLEMENTATION OF THE EXECUTIVE PROGRAMME
FOR
THE AGRICULTURAL REVIVAL

Japan International Cooperation Agency

JICA

November 2015
No.19

Contents

Rice Field Day in Gedaref, Gezira and Sennar

Rice Field Day events were held in **Gedaref**, **Gezira** and **Sennar** State in **November 2015**. VIPs participated in these events such as **Ambassador of Japan**, **Governor of Gedaref and Sennar State** and **Ministers of each State MoA**. These 3 events gathered a total of **700 participants**, including a lot of farmers. Media (TV, etc.) broadcasted these events.

Gedaref State: Governor, Ambassador of Japan, Minister of Gedaref SMoA, etc. (2 Nov. 2015)

Gezira State: Demonstration of harvesting by new Combine Harvester made in Japan. (5 Nov. 2015)

Sennar State: Governor and Ambassador of Japan and other VIPs were in the venue. (15 Nov. 2015)

Governor and Ambassador of Japan in the 2nd Rice Field Day in Gedaref

Gedaref State MoA held **Rice Field Day** on **2nd November 2015** in Al Fau, Gedaref State. There were approximately 250 participants including VIPs such as Governor of Gedaref State, Ambassador of Japan, Minister of Gedaref State MoA, etc.

Mr. Ahmed Ibrahim Arabee is a farmer of Al Fau demo farm and is also an union leader. His demo site was selected as a place to hold Rice Field Day last year and this year again.

Minister of Gedaref State MoA said in his speech that **rice is one of main cash crops** and Gedaref State has potential to grow it. Governor said that we call and invite **all farmers to grow upland rice crop**. Gedaref State committed to give **full support to MoA to promote upland rice in Gedaref State**.

Governor, Ambassador of Japan and Minister of Gedaref State MoA operated Combine Harvester.

Governor of Gedaref welcomed Ambassador of Japan.

From the left above, Mr. Hideki Ito (Ambassador of Japan), Mr. Osamu Nakagaki (Chief Advisor of the Project), Dr. Abdalla Suliman (Minister of Gedaref State MoA) and Mr. Margani Salih (Governor of Gedaref State).

The venue of the Rice Field Day.

Demonstration of Rice Milling Machine.

Ready for 2nd Stage (Expansion Stage) 5th Rice Field Day in Gezira State

Gezira State MoA held **Rice Field Day** on **5th November 2015**. This was the 5th Rice Field Day in Gezira State for 5 successive years from 2011. In this year, unfortunately Ambassador of Japan could not attend the event but approximately **250 participants** were gathered.
Area 44, Block 9 (Rahad Scheme), a demo site of Mr. Dafaalla Bashir was selected as the place for the event. This is the 2nd time to select his site and he is the best upland rice farmer in Sudan. He produced more than 4t/ha every year from 2013.
In the speech of Minister of Gezira State MoA, Gezira State is nearly in the end of the 1st stage (introductory stage) and now ready to be in the **2nd stage (expansion stage)**. Gezira State will expand upland rice and be **the center of upland rice in Sudan**.

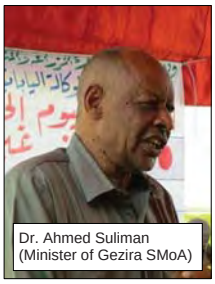

Demo site of Area 44, Block 9 (Rahad Scheme)


Exhibition of rice and machinery.


The farmer and his son.


The venue of the Rice Field Day.


Mr. Osamu Nakagaki (Chief Advisor of the Project)


Dr. Ahmed Suliman (Minister of Gezira SMoA)


Gezira State MoA showed gratitude for the Project.

Follow-up Visit from Egypt

The Project organized the first follow-up visit to Sudan from Egypt. Members of Egyptian mission were DG of EICA (Egyptian International Center for Agriculture), a senior researcher of RRTC (Rice Research and Training Center) and the staff of JICA Egypt office. The Project guided the mission to several site visits in Gezira and Gedaref State and arranged an interview to extensionists who participated in trainings in Egypt and meetings with Sudanese high officials and rice researchers.
As a result of the visit, the mission understood well the situations of upland rice cultivation and the research in Sudan, and collected information to re-programme training courses for Sudanese extensionists in future. Moreover the visit helped to make a connection between Egyptian side (EICA and RRTC) and MoA of Sudan. They got new information about productions of other crops besides rice and development of human resource in agricultural area. It was a fruitful visit for both Egyptian and Sudanese sides.


Meeting with Gezira State MoA.


Interview with extensionists who participated in training in Egypt.

3rd Rice Field Day in Sennar

Sennar State MoA held **Rice Field Day** on **15th November 2015**. This was the 3rd time Rice Field Day for 3 successive years from 2013. In this year, a demo site of Maiurno South was selected as the place for the event. Sennar State MoA cultivated upland rice in Maiurno are since 2012 and it was the first time to be selected. The Project appreciated the effort of extensionists and farmers in this area.

There were approximately **200 participants** including some VIPs such as **Governor of Sennar State**, **Ambassador of Japan**, **Minister of Sennar State MoA**, **Senior Representative of JICA Sudan Office**, etc. A lot of farmers also participated in this event and saw upland rice field and the demonstration of harvesting.

Japanese Ambassador said in his speech that Sudan should focus on agriculture and we hope Sudan become rice exporter soon.
Minister of Sennar State MoA appreciated the Japanese support on upland rice to Sennar State.


Governor of Sennar State and Ambassador of Japan operated Combine Harvester.


Mr. Shigeru Otake (Senior Representative of JICA Sudan Office)


Mr. Hideki Ito (Ambassador of Japan)


Dr. Baha Eldeen Ahmed (Minister of Sennar SMoA)


Sennar State showed gratitude for Japan.

Project office

Ministry of Agriculture & Forestry
Jama'a street, Khartoum, Republic of Sudan

Phone: +249-902062117
+249-903983721
E-mail: nakagakiosamu@gmail.com
takeshi_matsuda@cdc-kobe.com
http://www.jica.go.jp/sudan/english.index.html

Ministry of Agriculture and Forestry

Newsletter

CAPACITY BUILDING PROJECT
FOR
THE IMPLEMENTATION OF THE EXECUTIVE PROGRAMME
FOR
THE AGRICULTURAL REVIVAL

Japan International Cooperation Agency

January 2016
No.20

Contents

Workshop for Further Development of Upland Rice Production in Sudan

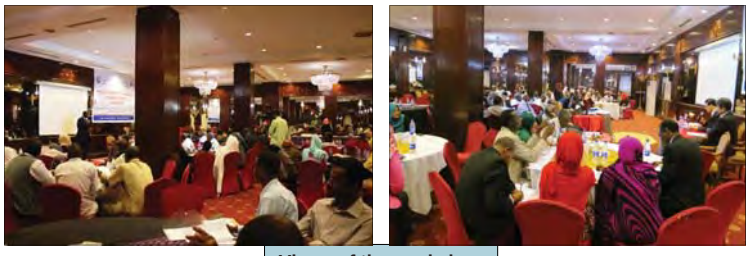
The Project, Federal Ministry of Agriculture and Forestry (FMoAF) and State Ministries of Agriculture (SMoAs) organized the **Workshop for further development of upland rice production in Sudan,** on **19th January 2016**, at Churchill Ballroom in Grand Holiday Villa, Khartoum. A total of 76 participants including some VIPs such as Eng. Ali Gadoom El Ghali (Undersecretary of FMoAF), Mr. Hideki Ito (Ambassador of Japan), Dr. Baha Eldeen Ahmed (Minister of Sennar SMoA), Dr. Abdalla Suliman Abdalla Suliman (Minister of Gedaref SMoA), Dr. Mohamed Abdalla Omer Abdalla (Minister of White Nile SMoA), Mr. Seiichi Koike (Resident Representative of JICA Sudan Office), etc. took part in the workshop.

Undersecretary of FMoAF praised the effort of the Project and each States and mentioned that upland rice is one of main promising strategic crops for Sudan, and the technology which were developed by the Project will be used and applied by farmers. **Minister of Gedaref SMoA**, on behalf of 6 States, stressed that Gedaref State has long term plan to promote upland rice. **Ambassador of Japan** and **Resident Representative of JICA Sudan Office** praised the effort of Ministry of Agriculture for 6 years.

Two TV (including National TV), National Radio and some newspapers reported the workshop.

[Opening Remarks, From the left] Eng. Ali Gadoom El Ghali (Undersecretary of FMoAF), Mr. Hideki Ito (Ambassador of Japan), Dr. Abdalla Suliman Abdalla Suliman (Minister of Gedaref SMoA), Mr. Seiichi Koike (Resident Representative of JICA Sudan Office)

[Left photo] from the left, Mr. Ahmed Mohamed Yousif (DG of White Nile SMoA), Dr. Mohamed Abdalla Omer Abdalla (Minister of White Nile SMoA), Mr. Osamu Nakagaki (Chief Advisor of the Project)
[Right photo] from the left, Dr. Abdalla Suliman Abdalla Suliman (Minister of Gedaref SMoA), Prof. Mamoun Ibrahim Dawelbet (CTC Group), Dr. Izz Eldeen Hassan Mohamed (CTC Group)



Views of the workshop

Programme of the Workshop

Time	Item	Notes
11:00	Registration	
11:30	[Workshop: Session 1] Opening - Resident Representative from JICA Sudan Office - Ambassador of Japan - Minister of Gedaref State MoA - Undersecretary of Federal MoAF	Chairperson: Mr. Elamien Hassan (DG, PAE, Federal MoAF)
12:30	Presentations - Achievement of the Project (by Experts of the Project) - Summary of the Activity (ARC and NRP)	
13:10	Result of season 2015 and Action Plan for Season 2016 (1) Gezira State MoA (2) Sennar State MoA	(10 minutes for each state's presentation)
13:30	Break	(Prayer Time)
14:00	(3) Gedaref State MoA (4) River Nile State MoA (5) Northern State MoA (6) White Nile State MoA	
14:40	[Workshop: Session 2] Presentation - Facts & Prospect on Upland Rice Development (by Chief Advisor of the Project) Open Discussion on Further Development of Upland Rice Production in Sudan	Chairperson: Mr. Mohieldin Ali (National Rice Coordinator, NRP)
15:50	Closing - Director General of PAE, Federal MoAF	

Presentations and Discussion

Mr. Takamasa Ando (Rice Cultivation Expert) and **Mr. Akio Goto (Deputy Chief Advisor / Rice Cultivation Expert)** presented the **Achievement of the Project**. Then, **Prof. Ahmed A. Elsiddig (National Rice Research Coordinator, ARC)** and **Mr. Mohieldin Ali Mohamed (National Rice Coordinator)** presented summary of their activity and plan. After that, **Six SMoAs** (Gezira, Sennar, Gedaref, River Nile, Northern and White Nile) presented their **Results of activity in the season 2015** and their **Action Plans for the season 2016**. **Gezira State** will cultivate NERICA 4 for **2,210 feddans (526 ha) in 2016**. Finally, **Mr. Osamu Nakagaki (Chief Advisor of the Project)** presented "Facts & Prospect on Upland Rice Development". After their presentations, total 11 participants delivered their opinions. The main points for further development of upland rice production in Sudan are shown in the table.

Categories	Main Points for further development of upland rice production in Sudan
Financial aspect	・Limited transportation for supervision to sites. ・Lack of machine for harvest (combine harvester) and for milling. ・Coordination between Federal MoAF & State MoAs (financial support).
Approach	・**Approach should be Systematic.** ・Revising NRDS ・Activation of NRC (National Rice Council)
Extension	・Collaboration between research and extension (Egypt case: RRTC [Rice Research and Training Center] has 500 feddans demo sites).
Technical Issues	・**Securing seed purity.** ・Proper seed rate. ・Proper weeding ・Harvest time (with proper moisture content)
Marketing	・Milling method and system should be developed. ・How to cope with private sector and foreign investor
Training for Extensionists	・Capacity building should be continued.
Others	・Gezira State MoA is ready to provide any support to other states for more farmers to cultivate rice.

Yield Results of the 6 SMoAs in 2015

After harvesting, yield survey was conducted of all sites in 6 States. The yield results (whole area yield) of 6 States are shown in the tables.

Wad Alasha (demo) got **7.9 t/ha**. This is tremendous result. In Gezira State, 6 sites exceeded more than 3 t/ha. One site in Gedaref State also got almost 4 t/ha. The results of other 4 States were better than last season's results. All States showed their improvement of yield. It shows the potential and possibility of rice production in Sudan and suitability of NERICA 4.

State	Site	Area (ha)	Area (fed)	Yield (kg/ha)	Yield (kg/fed)
Gezira	Wad Bahai	0.65	1.54	2337	982
	Shibairab	0.73	1.74	2362	992
	Abdelrahman	0.69	1.65	**3075**	**1291**
	Wad Alasha (demo)	0.62	1.47	**7917**	**3325**
	Frejab (demo)	0.68	1.62	470	197
	Area 44, Block 9 (Rahad Scheme)	1.77	4.22	**3468**	**1457**
	Wad Sawi	1.47	3.5	**4378**	**1839**
	Frejab (seed/demo)	1.25	2.98	831	349
	Wad Al Naim	1.24	2.95	**4586**	**1926**
	Wad Alasha (seed/demo)	1.28	3.04	**4489**	**1885**
	UmBarona	0.32	0.76	2718	1142
TOTAL/Average		10.7	25.47	**3423**	**1438**

State	Site	Area (ha)	Area (fed)	Yield (kg/ha)	Yield (kg/fed)
Sennar	Maiurno South	1.05	2.5	602	253
	Almahlaj	1.05	2.5	735	309
	Almergani	1.05	2.5	1891	794
TOTAL/Average		3.15	7.5	1076	452

State	Site	Area (ha)	Area (fed)	Yield (kg/ha)	Yield (kg/fed)
Gedaref	Al Fau (ARC)	0.84	2.0	1889	793
	Al Fau (Farmer) 1	0.84	2.0	1053	442
	Al Fau (Farmer) 2	0.84	2.0	**3996**	**1678**
	Shuwak (Ministry)	0.84	2.0	777	326
TOTAL/Average		3.36	8.0	1929	810

State	Site	Area (ha)	Area (fed)	Yield (kg/ha)	Yield (kg/fed)
River Nile	Atbara 1	0.42	1.0	1912	803
	Atbara 2	0.42	1.0	1189	500
	Kanour	0.42	1.0	N/A	N/A
TOTAL/Average		1.26	3.0	1551	652

State	Site	Area (ha)	Area (fed)	Yield (kg/ha)	Yield (kg/fed)
Northern	Dongola Island	0.42	1.0	1949	819
	Zawrat	0.42	1.0	2481	1042
TOTAL/Average		0.84	2.0	2215	931

State	Site	Area (ha)	Area (fed)	Yield (kg/ha)	Yield (kg/fed)
White Nile	Elfardos A	0.84	2.0	918	385
	Elfardos B	0.84	2.0	976	410
TOTAL/Average		1.68	4.0	947	398

Project office
Ministry of Agriculture & Forestry
Jama'a street, Khartoum, Republic of Sudan
Phone: +249-902062117, +249-903983721
E-mail: nakagakiosamu@gmail.com
takeshi_matsuda@cdc-kobe.com
http://www.jica.go.jp/sudan/English.index.html

Annex 7

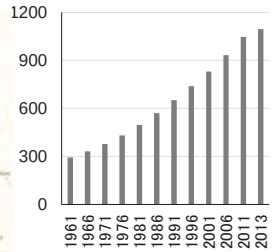
Lecture in

Rice production techniques with specialized emphasis on rice seed production

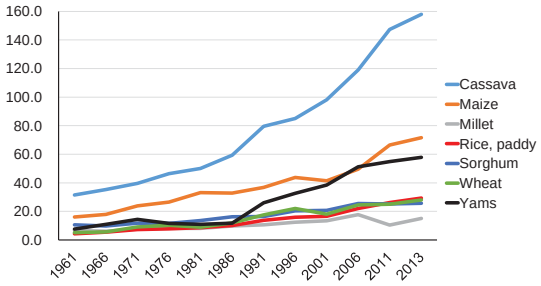
Wed. 2 Sept. 2015

JAICAF
Ryoichi Ikeda

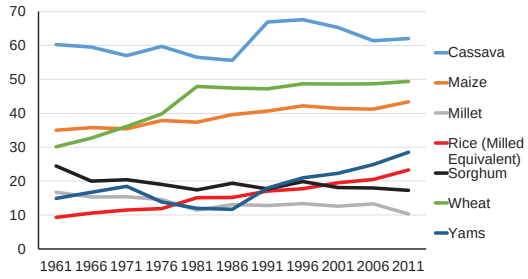
Contents



Population in Africa
(1 million) （FAO Stat）



Crop production in Africa （million t）

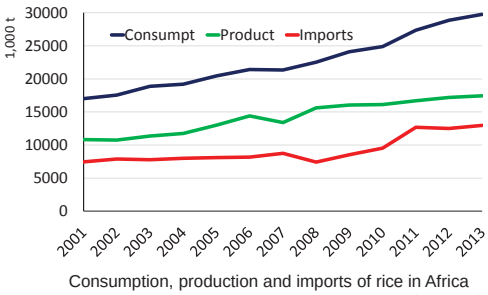


Food supply quantity (kg/capita/yr) in Africa

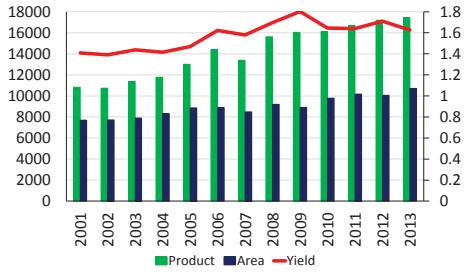
Why rice in Africa, now?

Rice;

can be cooked easily
can be transported easily
is delicious and nutrient rich food
can be stored longer



Consumption, production and imports of rice in Africa
（USDA stat）



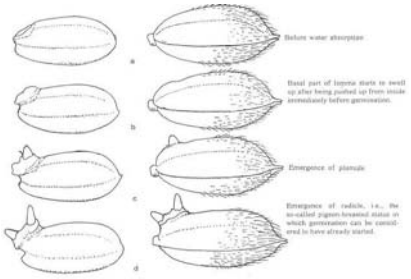
Rice production (1000t), Area harvested (1000 ha)
and Yield (t/ha) in Africa cited from USDA

Top 10 countries of rice yield in Africa

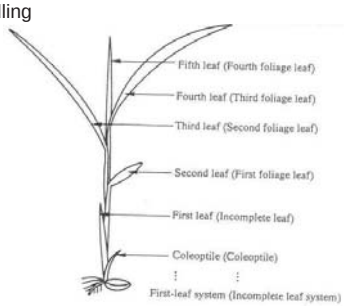
	Country	2011	2012	2013
1	**Egypt**	**9.57**	**9.53**	**9.64**
2	**Morocco**	**7.02**	**7.60**	**7.54**
3	**Rwanda**	**5.52**	**5.72**	**5.34**
4	**Mauritania**	**5.19**	**6.94**	**4.55**
5	**Réunion**	**4.57**	**4.33**	**4.33**
6	**Kenya**	**3.97**	**4.86**	**5.24**
7	**Benin**	**3.94**	**3.33**	**3.03**
8	**Sudan (former)**	**3.72**	**3.17**	**3.31**
9	**Senegal**	**3.72**	**4.67**	**3.91**
10	**Somalia**	**3.56**	**4.87**	**1.47**

(t/ha) cited from FAOSTAT

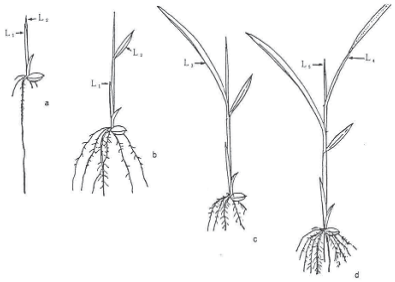
Seed and germination



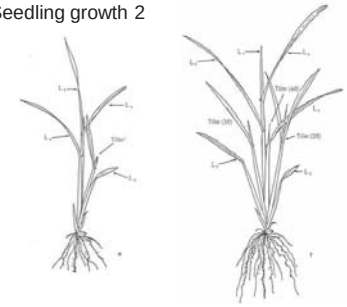
Seedling



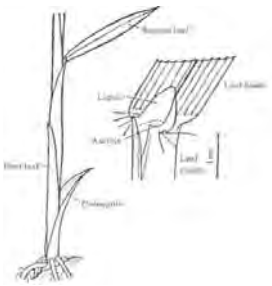
Seedling growth 1



Seedling growth 2

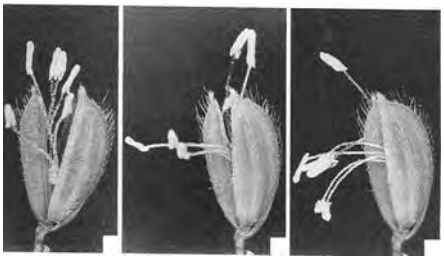


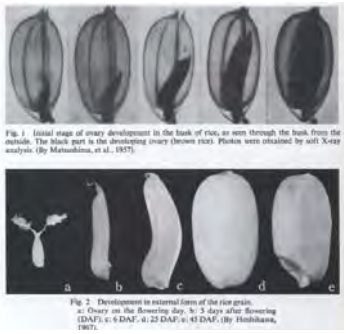
Leaf



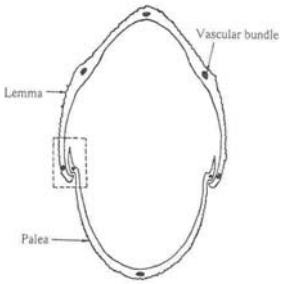
Panicle

Spiklets

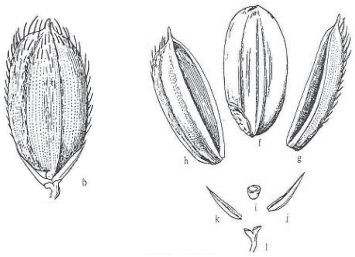




Cross section of the central portion of paddy

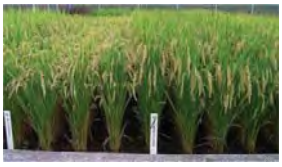


Structure of rice seed



What is a variety?

- A variety is a breeding line of rice that has successfully undergone tests for **distinctiveness**, **uniformity** and **stability**.
- It will also have been successfully tested for value for cultivation and use.
- Only after successfully passing these tests will a variety be released for use.



2015/8/4

Outline of seed multiplication

- Setting of target & planning
  - Present situation of rice & demands of seed
- Treatment of pre-seeding
  - Seed sterilization & soaking, land preparation
- Cultivation
  - Direct seed/transplant, space planting, single plant
- Rogueing of off-types
  - Field observation, protect from contamination
- Harvest & storage
  - Careful harvesting, storage of quality seed
- Distribution & conservation

2015/8/4 21

The importance and principles of quality seed

- High production, high market price and low cost of inputs make rice farming profitable.
- If rice farming is to be successful, plant breeders, seed farms, and farmers must produce quality seed.
- Quality seed is pure, clean and viable seed.
- Using quality seed can increase your yield between 5 and 20 percent.
- By using quality seed, you will save money on the inputs to your crop and, because of higher yields, you will get more income or have more food for the family.

2015/8/4 22

Quality seed is:

- **Pure ---** there is only one variety; not a mix.
- **Clean ---** does not contain weed seeds, stones or litter, and the grains are not discolored by disease.
- **Viable ---** they have high germination and the seedlings are vigorous.

2015/8/4

Preparation of seeding

Field:

1. Make a layout of the field
2. Land preparation:

   Soil surface of field must be flat.

Seed:

1. Use a reliable seed (where is the seed source?)
2. Dicision of seed volume for seeding
3. Seed steralization & soaking

2015/8/4 24

Preparation of seeds for multiplication

☆Planting space

30×20 cm : 66,666 plants / acre

20×20 cm : 100,000 plants / acre

☆1,000 seeds weight (30g～25g)

3 kg : 100,000 ～ 120,000 seeds

2 kg : 66,666 ～ 80,000 seeds

1 kg : 33,333 ～ 40,000 seeds

☆Seed volume required (after check and clean)

Direct seeding 10.0～20.0 kg / acre

On nursery 10.0～15.0 kg / acre

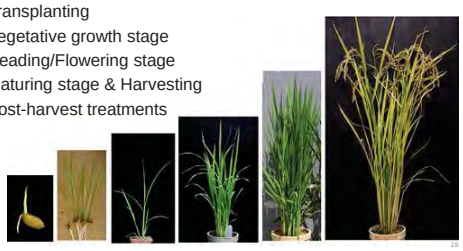
(for transplanting to paddy field)

Observation & rouging any off-types

- Look at the rice plants along each line
- Make clear the characteristics of each variety
- Rogue any off-types and doubtful plants immediately
- Record the kind of and number of rogued off-types on your note, if it's possible

Check in each stage

- Seeding
- Seedlings on nursery bed
- Transplanting
- Vegetative growth stage
- Heading/Flowering stage
- Maturing stage & Harvesting
- Post-harvest treatments



Identification of off-types

- Plant height
- Color of leaves, sheaths, and straws
- Presence or absence of awns
- Degree of Panicle exertion
- Angle of flag leaf
- Size, shape, and color of grains
- Diseased or insect-damaged plants
- Apiculous color (presence or absence)
- Glabrous or pubuscent
- Heading and maturity dates (extra early or late)
- Plant types and panicle types (open or closed)

Harvesting & storage

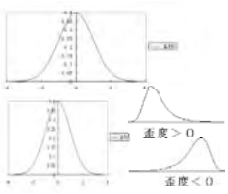
- Final checking before harvesting
- Exclude the plants of border lines from seed production
- Carefully harvesting and threshing
- Drying and cleaning the seed
- Fumigation and storage

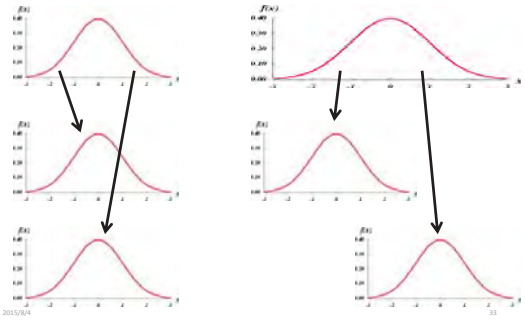
Conservation & distribution

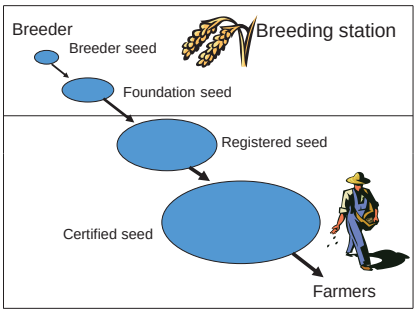
- Attention on a seed storage
  - Keep seed cleanness
    free from fungus, rice weevil, grain moth
  - Storage condition
    Temperature, moisture, space etc.
  - Labeling of all bags for seed storage

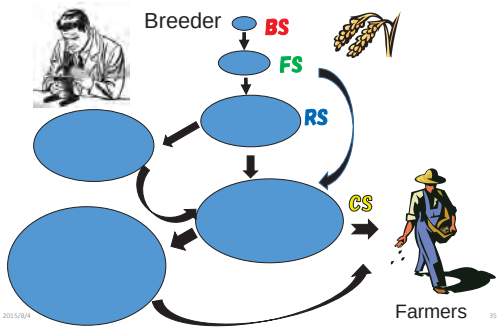
Causes of varietals degradation

1. Mixing in of foreign seeds
2. Segregation
3. Out-crossing
4. Mutation
5. Random drift









In Japan, it is assumed that appearance ratio of off-types is below 0.01% as the allowable range.

Field inspection

Seed multiplication of rice in Japan

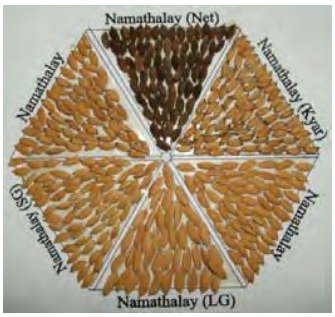
	Cultivated area (ha)			Production (t)	
	1979	1980	1981	1979	1981
Foundation seed farm	12	12	12	36	---
Registered seed farm	122	124	125	488	---
Certified seed farm	8,376	8,789	9,049	41,880	37,817

Importance of seed multiplication system

- It is most important for seed multiplication system to deliver continually pure variety seeds to farmers.
- Seed multiplication must assume responsibility for the quantity of the seeds as well as their varietal purity.

If the seed production system were not,

- farmers can not get high quality seed.
- farmers can not continue rice cultivation efficiently.
- many variations will occur in the same variety like "Namathalay".
- they can not find the causes of any problems occurring in seed.



Serious infestation of weedy rice

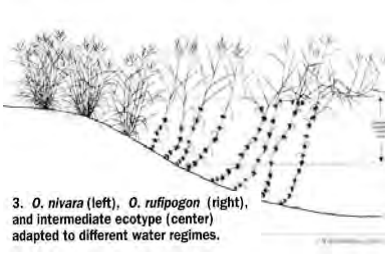
Rice sample at a rice miller in Myanmar

What is weedy rice?

- They are variable in appearance and occur in all major rice-growing areas; America, Europe, the Caribbean, Africa and Asia.
- The origin of weedy rice in Asia is as yet unclear, though it is thought that they are natural hybrids of cultivated (*O. sativa*) and wild rice species (*O. rufipogon* and *O. nivara*).
- The characteristics are seed shattering, seed dormancy and competitiveness with cultivated rice.

Oryza rufipogon Griff.

Perennial



3. *O. nivara* (left), *O. rufipogon* (right), and intermediate ecotype (center) adapted to different water regimes.

How to prevent weedy rice?

- Use “clean seed” from a “known source”
- Take care to thoroughly clean machinery
- Canals should be cleared to infestations

Manual weeding is effects for reducing initial infestations of weedy rice.

Removal of weedy rice plants when the weed first infests a field can help prevent more serious infestations in future crops.




2015/8/4 49




2015/8/4 50




2015/8/4 51



2015/8/4 52




2015/8/4 53

2015/8/4 54


2015/8/4 55


2015/8/4 56

Have a Rice Day!

- The principle of seed multiplication is not difficult, but there are many points that you have to do carefully.
- Anyone can produce uniform seed if you obey the attention.

بسم الله الرحمن الرحيم

اللهم صلِّ وسلم على سيدنا محمد النبي الأمي وعلى آله وصحبه وسلم

Gezira State

Ministry of , Animal Wealth and Natural

In Collaboration with

Japan International Cooperation Agency (JICA)

Post-harvest Technology Expert

Mr. Tokumoto Osamu

Rice Pre- & Post-harvest Technology training program

Rice Quality

Prepared by:

Faiga Abdo

Rice Promotion Unit - وحدة تطوير الأرز

Dec. 2015

Overview:

Quality of rice is not always easy to define as it depends on the consumer and the intended end use for the grain. All consumers want the best quality that they can afford.

As countries reach self-sufficiency in rice production, the demand by the consumer for better quality rice has Increased. Traditionally, plant breeders concentrated on breeding for high yields and pest resistance.

Recently the trend has changed to incorporate preferred quality characteristics that increase the total economic value of rice. Grain quality is not just dependent on the variety of rice, but quality also depends on the crop production environment, harvesting, processing and milling systems.

Why is it important to harvest at the right moment ?

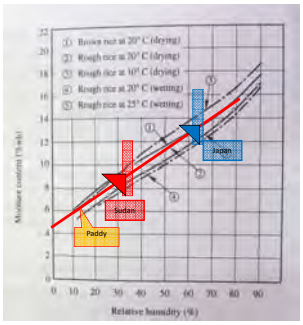
Good timing of the harvest is very important to get a high yield of good quality rice.

What is the best time to harvest grains ?

- ◆ The grain has 20-24% grain moisture content.
- ◆ 80-85% of the grains are straw colored and the grain in the lower part of the panicle are in the hard dough stage “about 30 days after flowering”.
- ◆ The grains are firm but not easily broken when squeezed between the teeth.

Moisture content:

Paddy is at its optimum milling potential at moisture content of 14% wet weight basis (<13% for storage). Grains with high moisture content are too soft to withstand hulling pressure which results in grain breakage and possibly pulverization of the grain. Grain that is too dry becomes brittle and has greater breakage.



Degree of purity:

Purity is related to the presence of dockage in the grain. Dockage refers to material other than paddy and includes chaff, stones, weed seeds, soil, rice straw, stalks, etc. These impurities generally come from the field or from the drying floor. Unclean paddy increases the time taken to clean and process the grain. Foreign matter in the grain reduces milling recoveries and the quality of rice and increases the wear and tear on milling machinery.

Degree of purity:

- **Dockage in Paddy:**

Remove light foreign matter, stones, weed and seeds from a 100gm sample. Obtain the total weight then compute the dockage percentage as follows:

$$\%\text{Dockage} = \frac{\text{Wt. of dockage}}{\text{Total Wt. of sample}} \times 100$$

Varietal Purity:

A mixture of varieties causes difficulties at milling and usually results in reduced capacity, excessive breakage, lower milled rice recovery and reduced head rice. Different sizes and shaped grains make it more difficult to adjust hullers, whiteners and polishers to produce whole grains. This results in low initial husking efficiencies, a higher percentage of re-circulated paddy, non-uniform whitening, and lower grade of milled rice.

Varietal Purity:

Cracked grains:

Overexposure of mature paddy to fluctuating temperature and moisture conditions leads to development of fissures and cracks in individual kernel. Cracks in the kernel are the most important factor contributing to rice breakage during milling. This results in reduces milled rice recovery and head rice yields.

Procedure for Measuring

- **Crack Detector :**

Using the Paddy Crack Detector, count the number of cracked grains in a 100 grain sample then compute the % cracked grains using the equation:

$$\%\text{cracked grains} = \frac{\text{No. of cracked grains}}{\text{100 grains}} \times 100$$

Grain dimensions:

Grain size and shape (length-width ratio) is a varietal property. Long slender grains normally have greater breakage than short, bold grains and consequently have a lower milled rice recovery. The grain dimensions also dictate to some degree the type of milling equipment needed. For instance, the Japanese designed milling equipment may be better suited to short bold, japonica grains whereas Thai made equipment will be more suitable for longer, slender grain types.

Procedure for Measuring

- **Grain Dimensions:**

Using a caliper or photographic enlarger, collect 20 paddy samples at random from each replicate and measure the dimensions to obtain the average length and width of the paddy grains. To obtain the paddy shape, the following equation can be used:

$$\text{length to width ratio (L/W)} = \frac{\text{Ave. Paddy length mm}}{\text{Ave. Paddy Width mm}}$$

Immature grains:

The amount of immature paddy grains in a sample has a major affect on head rice yield and quality. The immature rice kernels are very slender and chalky and this results in excessive production of bran, broken grains and brewer's rice. The optimal stage to harvest grain is at about 20-24% grain moisture or about 30 days after flowering. If the harvest is too late, many grains are lost through shattering or dry out and are cracked during threshing, which causes grain breakage during milling.

Immature grains:

Head Rice & Small Broken

Fine Broken

Procedure for Measuring

- **Immature Grains :**

  Select a 25 gm grain sample and select, segregate and weigh the immature grains in sample. Calculate the percentage immature grains in the sample using the formula:

$$\%\text{immature grains} = \frac{\text{Wt. immature grains}}{\text{Total weight of sample}} \times 100$$

بسم الله الرحمن الرحيم

اللهم صلِّ وسلم على سيدنا محمد النبي الأمي وعلى آله وصحبه وسلم

Gezira State

Ministry of , Animal Wealth and Natural

In Collaboration with

Japan International Cooperation Agency (JICA)

Post-harvest Technology Expert

Mr. Tokumoto Osamu

Rice Pre & Post-harvest Technology

Data Analysis & Quality Control

Prepared by:
Sara Karar,

Nov. 2015

Background

In 2012 to 2014 the main issue was cracked kernels

- Parboiling Equipment
- Harvesting at 15-24%

Recommended by the Expert Mr. Tokumoto

In 2015, the main issue is to determine optimum time for harvesting :

Moisture content at Harvest: Av. 18 %
After 3-5 days: Av. 13 %
After a Week: Av. Less than 10 %

As the result, Moisture Content at Harvest shall be more than 20 %.

Data Analysis Activity 2013-2015

Quality of Rice Analysis in 2013-2015

Result of Quality Analysis (Gezira) in Average

Year	Moisture Content Nerica-4	
	Paddy	Brown Rice
2013	14.0%	10.4%
2014	13.2%	10.9%
2015	18.4%	12.1%

Year	Cracked Kernel (Brown Rice)	
	Nerica-4	Other Variety
2013	56.1%	-
2014	68.9%	-
2015	30.1%	-

Year	Hardness	
	Nerica-4	Other Variety
2013	87.1	-
2014	77.4	-
2015	72.1	-

Result of Quality Analysis
Physical Property

Result of Quality Analysis (Sennar) NERICA-4

Year	Moisture Content Nerica-4	
	Paddy	Brown Rice
2013	12.0%	9.7%
2014	14.0%	11.4%
2015	21.4%	18.0%

Year	Cracked Kernel (Brown Rice)	
	Nerica-4	Other Variety
2013	34.8%	-
2014	40.0%	-
2015	56.0%	-

Year	Hardness	
	Nerica-4	Other Variety
2013	88.3%	-
2014	42.30%	-
2015	39.6	-

Result of Quality Analysis (Gedaref)

Year	Moisture Content Nerica-4	
	Paddy	Brown Rice
2013	-	-
2014	-	13.0%
2015	Less than 8%	Less than 8%

Year	Cracked Kernel (Brown Rice)	
	Nerica-4	Other Variety
2013	-	-
2014	8.0%	-
2015	40.0%	-

Year	Hardness	
	Nerica-4	Other Variety
2013		
2014	49.6	
2015	76.4	

Structure of Paddy Seed

Structure of Paddy in 2014 (%)

Items \ Location	Shiberab	Gouaalrehait	Rahad	Wad Bahai	Abdoalrahman	Faris	Hadad	Houah
Paddy	66.4	58.0	45.0	55.4	64.0	51.0	53.0	52.4
Paddy with Rachis	16.4	21.4	28.6	11.0	15.4	31.0	30.8	25
Sub-total	82.8	79.4	73.6	66.4	79.4	82.0	83.8	77.4
Husekd Paddy	6.0	4.4	3.2	13.4	3.6	3.6	5.0	6.4
Immature Paddy	1.6	1.2	0.8	1.4	1.6	2.8	0.8	1.4
Empty Paddy	1.4	1.8	4.0	1.0	1.0	2.4	1.6	1.6
Local Variety	7.0	8.6	14.4	12.4	12.6	6.8	7.0	11.6
Stems	0.8	2.0	3.0	4.2	1.0	2.0	0.8	1.2
Weed Seed	0.24	2.6	1.0	1.2	0.8	0.0	0.0	0.0
Impurities	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.4
Mudball	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0

Strure of Paddy in 2015 (%)

Items \ Location	Umbarona	Rahad	Wad Bahai	Wad Sawi	Abdoalrahman	Shiberab
Paddy	48.0	62.4	42.4	47.6	47.2	35.6
Paddy with Rachis	40.8	19.6	30.0	37.2	21.6	36.8
Sub-total	88.8	82.0	72.4	84.8	68.8	72.4
Husekd Paddy	1.2	1.6	3.2	0.0	5.2	6.8
Immature Paddy	0.4	2.0	2.8	1.2	2.0	1.2
Empty Paddy	0.8	0.8	3.6	0.6	1.6	2.4
Local Variety	6.4	12.8	15.6	12.4	19.2	15.6
Stems	2.4	0.8	2.4	1.0	3.2	1.6

Purity of NERICA-4 Seed

Purity of NERICA-4 Seed Claasified by Dem-farm

Location	2014		Location	2015	
	Nerica-4(%)	Local(%)		Nerica-4(%)	Local(%)
Hosh	87.0	13.0	Umbarona	93.3	6.7
Hadad	92.3	7.7	Wad Sawi	87.2	12.8
Faris	92.3	7.7	Abdorahaman	78.2	21.8
Rahad	96.6	3.4	Rahad	86.5	13.5
Gousalrehaid	90.2	9.8	Wad Bahai	82.3	17.7
WadBahai	84.3	15.7	Shiberab	82.3	17.7
Shiberab	92.2	7.8			

Nerica-4 (Bottom) , Nerica-6 (Above)

As the Result:

- The Purity Ratio of NERICA-4 Seed is still low
- The Hardness of NERICA-4 is soft, Easy to Broken
- Width of NERICA-4 Paddy is thin. 2.0 mm of thickness sieve is appropriate at present

Laboratory Equipment

Moisture Meter

Cracks Inspector

Hardness Meter

Caliper

Paddy with Rachis

White rice

Summary Report of seasons 2013 & 2015:

1. The Moisture of Paddy harvested in 2015 is 18.3% in average became less than 10% within week.
2. The analysis of result on Cracked is 56.1% 2013 M.C at harvest 14%, 68.9% 2014 M.C at harvest 13.2% and 30.1% 2015 M.C at harvest 18.4%.
3. The purity of Nerica4 can be controlled by appropriate removal of off-type variety in the field

Summary Report of seasons 2013 & 2015:

4. Minimum and maximum rate of purity of Nerica4 seed in 2014 was 83.6 % (Min) and 96.6% (Max), in 2015 was 78.2%(Min) and 93.3% (Max).
5. The purity of Nerica4 can be controlled by appropriate removal of off-type variety in the field
6. Paddy with rachis will prevent seed drilling work
7. Weed seeds can be controlled by appropriate weed control

Storage Losses

Storage losses:

1. Quantitative losses
2. Qualitative losses

Moisture Losses

$$M.C\ \%\ (W_b) \quad \frac{w}{D + W}$$

If we have 100 ton of paddy at M.C 14%

$$M.C\ (W_b) = \frac{W1}{100 = (D + W1)} = 14\%$$

$$W1 = \frac{14}{86} D = 0.1628\ D$$

$$W1 = \frac{14}{86} D = 0.1628\ D$$

$$D + 0.1628\ D = 100\ ton$$

$$1.1628\ D = 100\ ton$$

$$D\ (Dry\ matter) = 100 / 1.1628 = 78.2\ ton$$

$$W1 = 100 - 78.2 = 2.8\ ton\ at\ 14\%$$

If the M.C is decreased from 14% to 9%,
How much the weight of paddy?

Dry matter is not change (78.2 ton)
W1 change to W2

$$M.C\ (W_b) \quad \frac{W2}{78.2 + W2}\ 100 = 9\%$$

$$100\ W2 = 9\ (78.2 + w2)$$

$$91W2 = 9 * 78.2\ ton$$

$$W2 = 7.7\ ton$$

How much weight loss?

How much weight loss?

$$W = W1 - W2$$

$$W = 21.8 - 7.7\ ton = 14.1\ ton$$

اللهم صلّ وسلم على سيدنا محمد النبي

Gezira State

Ministry of , Animal Wealth and Natural

In Collaboration with

Japan International Cooperation Agency (JICA)

Post-harvest Technology Expert

Mr. Tokumoto Osamu

Rice Post-harvest Technology training program

Rice Milling Machine Technology

Prepared by:
Fadlelmola Ali

Nov. 2015

One-pass Milling Machine:

(Japanese Model)

This one pass machine performs the husking, separation of husks and brown rice, the whitening and bran removal.

ADVANTAGES:

- **Highly efficient in Husking and polishing**
- **Low-cost maintenance required**
- **Easy to operate and service**
- **The machines may be driven by motors or diesel engines.**

- A moisture content of 14% M.C is ideal for milling: If the M.C is too low, high grain breakage will occur resulting in low head rice recovery.

- Different varieties of paddy have different milling characteristics that require individual mill settings. Mixing varieties will generally lead to lower quality of milled rice.

Structure of RMU

The components of the machine:

Inlet Unit :

- Hopper
- Vibrating screen
- Magnetic unit
- Hopper slide
- Flow regulator

The components of the machine:

Husking Unit:

- Rubber rollers (1200&980 r/min)
- Husk clearance adjuster
- Husk blower (1680 r/min)
- Husk duct

Different r .p.m

The components of the machine:

Milled Rice Cleaning Devices:


The components of the machine:

Polishing Unit :

- Milling Roll (900r/min)
- Intake Screw
- Hexagonal screen
- Resistance board and weight
- Milling Chamber Blower (3,400 rpm)



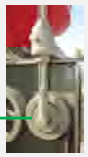


The components of the machine:

Power Transmission :

- Motor's pulley & 4 V- shape belts
- The main pulley & 4 V-shape belts
- Husking rollers' pulleys
- Hopper's pulley
- Blowers' pulleys
- Tension pulley (A)
- Tension adjustment of the blower (B)

The components of the machine:

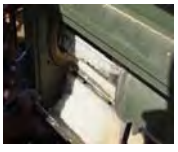



Safety Measures and Maintenance:

If the paddy clogged in the husking chamber, increase the clearance between the husking rubber rollers by Husk clearance adjuster


Safety Measures and Maintenance:

- If the brown rice clogged in polishing chamber, loose the bolts of the screen holder by drive socket to remove it, then remove the screen to clean the polishing chamber. After that use wire brushes to clean the screen from bran.


Safety Measures and Maintenance:

• If the diameter of the rubber roller after wear and tear show a difference of 3 mm, the quick and the slow roller should be used in turn

Safety Measures and Maintenance:

• If the intake screw or milling roll or hexagonal screen worn, new one should be replaced

Broken rice and Flour of fine broken rice clogging between Screen & Roll, if Paddy Moisture Content is less than 10 %

Construction Condition of RMUs in 2015:

No.	Location	S/V & Reciponsive Person of RMU	No. of RMU	State	Rehabilitation	Assembling	3 Phase Installation	Electric Connection	Test Run	Remarks
1	Dongola	Mr. M. Mandor	2	Northern	✔	✔	✔	×	✔	Under rehabilitation of Husk / paddy cleaning yard and electric connection (Cable and internal connection)
2	Atbara	Mr Aboubida	1	River Nile	✔	✔	✔	✔	✔	Completed
3	Damer	Mrs Hager	1		×	✔	×	×	×	Location under study, Assembling completed
4	Shuwak	Aboubida	1	Gedaref	✔	✔	×	×	✔	Under 3 phase installation and electric connection (Cable and internal connection), Test run was done by generator
5	Al Fau	Khaled	1		✔	✔	×	×	✔	Under 3 phase installation and electric connection (Cable and internal connection), Test run was done by generator
6	Kassab	Almogera	1	Sennar	✔	✔	×	×	✔	Under 3 phase installation and electric connection (Cable and internal connection), Test run was done by diesel engine
7	Wad Hashim	Mrs Salma	1		✔	✔	×	×	✔	Under 3 phase installation and electric connection (Cable and internal connection), Test run was done by diesel engine
8	Fadasi	Mrs Aasha	2	Gezira	✔	✔	✔	✔	✔	Completed
9	Hasahisa	Mr Hessan Mrs Manwa	2		✔	✔	✔	✔	✔	Completed
10	Hosh	Mr Sidig Ahmmed	2		✔	✔	✔	✔	✔	Completed
11	Hy-abudalla	Mr Aboubida Mrs Manal	2		✔	✔	×	×	×	3 phase cost is expensive (need transformer because the location is far from the National Grid Line)
12	Rahad 44	Mr Akram Mr Aymen	2		✔	✔	×	×	×	Under 3 phase installation and electric connection (Cable and internal connection)
12	UmBarona	Mr Tarig Osaman	1		✔	✔	×	×	×	Under 3 phase installation and electric connection (Cable and internal connection)
14	Furijab	Mr Mohmmed Abdalla	1		✔	✔	×	×	×	Under 3 phase installation and electric connection (Cable and internal connection)
15	Kosti	Mr Khaled Saeed	1	White Nile	✔	✔	✔	✔	✔	Completed
16	Duem	Mr Osama	1		✔	✔	✔	✔	✔	Information yet to be collected

as of Nov. 23, 2015

: Available of Training after Electricity issue is concluded
: Issue of Electricity

Safety Cover Installation

Husk Duct

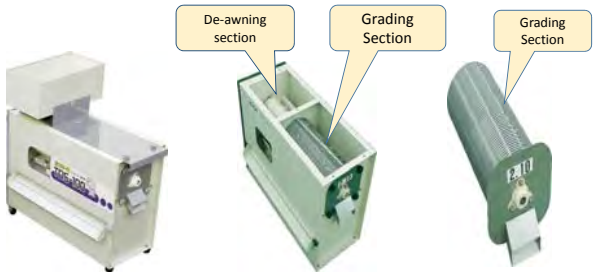
Impurities, Rachis and Awn:

Rachis and Awn Problems:

1. Clogging in husking room
2. Clogging in milling Chamber
3. Clogging in drilling tubes

De-awner and Rachis Remover with Grader:

The machine consists of De-awning (Threshing) section to remove Awns and Rachis attached on the paddy, and Grading section to remove other varieties and un-healthy small paddy.



De-awner Assembling

Sites Visit – Gezira State

Sites Visit – Other States

Sites Visit – Other States

Field Day

Thank You

Capacity Building Project for the Implementation of the Executive Program for the Agricultural Revival

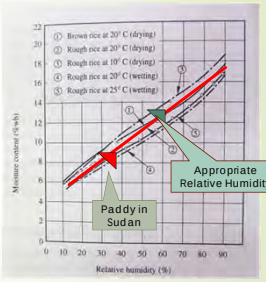
Traditional Underground Storage MATMORA Revival

Rice Post-harvest Technology

By Mr. Abdelmunim Magzoub: Rice Promotion Unit Manager (Gezira State)
Mr. TOKUMOTO Osamu Msc. (JICA Expert)

Relation between Equilibrium Rice Moisture Content & Relative Humidity

Equilibrium Moisture Content
The climate in Sudan is dry and hot in the harvest season of rice. The moisture content of cleaned paddy is less than 11 % by my teeth and crack in the Brown Rice generated very much.
The graph shows the Equilibrium Moisture Content of Rice (Paddy: Rough Rice & Broun Rice) at 10 ~ 25 ℃.
The moisture content of paddy in Sudan reaches less than 10 % naturally in the harvest season by the relative humidity and to its equilibrium moisture content.
If the moisture content at Harvest is 15 %, the moisture content of paddy is dried to less than 10 % during post-harvest process **naturally**, without drying process. Low moisture content generates cracks in paddy kernels and produces broken rice, and post-harvest loss more.
Appropriate moisture content of Paddy **at Harvest** shall be more than 20%.

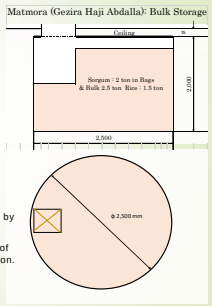


Remark: in 2015, MC at Harvest 18%, 3 days after Less than 13%, a week after Less than 10%

Traditional Underground Storage (TUS: Matmora) of Farmers

Main Objective

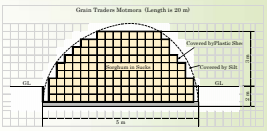
- To store grain in appropriate moisture content safety (13%) and keep the moisture content more than 13 % to protect the cracks in the kernels.
- To protect the moisture contend reduction (Weight Reduction)
- To avoid direct sun-shine and to keep safety temperature less than 25 ℃ for Rice.
- The humidity in the Matmora shall be researched. (70~75% of RH may be appropriate)



The top of stored grain in sacks is covered by grass or Straws

The wall and floor are applied by mixture of Feces of animal and Silt for water protection.

Gadaref Underground Storage System for Traders



- ◆ 2 m of Depth, 20m of Length, 5 m of Width, 3m of Hight
  15,000 sacks 90 kg for Middle size Matmora (135,000 ton of Sorghum
- ◆ Large size of Matmora is 50,00 sacks storage. (450,000 ton)
- ◆ Power-shovel shall be required
- ◆ Ceiling is Plastic and Straws of sorghum
- ◆ Sacks are Covered by Grass and Plastic Sheet

Sorghum Storage in Gedaref

Russian Silo ((1,000,000 sacks of 90 kg)

Common Storage

French Steel Silo

Future Rice Storage System Research & Development for Farmers

- To Develop Improved Matmora System **for Farmers**
- To Study Traditional Matmora System & Analysis
- To Research on Storage Condition in Traditional Matmora
- To Design one Module of Appropriate Modern Matmora **for Farmers**

- **Prototype Production**
- **Promotion for National Project**

Annex 9

List of Trainees to 3rd Country

Training	Period	Number of Participants
Basic Training on Rice Cultivation in Uganda	6 – 10 December 2010	13
Advanced Training on Rice Cultivation in Uganda	19 May – 8 June 2011	2
Basic Training on Rice Cultivation in Uganda	13 – 17 June 2011	22
Advanced Training on Rice Cultivation in Uganda	9 – 27 January 2012	2
Basic Training on Rice Cultivation in Uganda	5 – 10 February 2012	22
Basic Training on Rice Cultivation in Uganda	20 – 25 May 2012	22
Advanced Training on Rice Cultivation in Uganda	4 – 22 June 2012	10
Advanced Training on Rice Cultivation in Uganda	15 – 26 April 2013	8
Agricultural Machinery Training in Egypt	19 April – 3 May 2013	15
Weed Control Training in Egypt	19 April – 3 May 2013	20
Basic Training on Rice Cultivation in Uganda	9 – 15 June 2013	22
Rice Post-Harvest & Processing Training in Egypt	21 October – 4 November 2013	15
Advanced Training on Rice Cultivation in Uganda	23 June – July 4 2014	15
Irrigation & Water Management Training in Egypt	1 – 15 August 2014	15
Weed Control Training in Egypt	1 – 15 August 2014	15
Rice Post-Harvest & Processing Training in Egypt	1 – 15 September 2014	12
Advanced Training on Rice Cultivation in Uganda	13 – 24 July 2015	12
Irrigation & Water Management Training in Egypt	22 August – 5 September 2015	15
Weed Control Training in Egypt	22 August – 5 September 2015	13
Rice Post-Harvest & Processing Training in Egypt	22 August – 5 September 2015	8
Total		278

	State	Name	Period of Training in Uganda		Period of Training in Egypt			
			Basic	Advanced	Agricultural Machinery	Weed Control	Post-Harvest Processing	Irrigation and Water Management
1	Gezira State	Osman Dafaalla Ombabi Mohamed	6 - 10 Dec. 2010					
2	Gezira State	Mohamed Ahmed Omer Mohamed	6 - 10 Dec. 2010					
3	Gezira State	Osman Ali Mohamed Obaid	6 - 10 Dec. 2010					
4	Gezira State	Mohamed Hassan Adam Mohamed	6 - 10 Dec. 2010	4 - 22 Jun. 2012				
5	Gezira State	Elfadil Ali Elfadil Khalid	6 - 10 Dec. 2010	19 May - 8 Jun. 2011				
6	Gezira State	Abdelgahadir Bakri Derweesh Elsaddig	6 - 10 Dec. 2010	4 - 22 Jun. 2012		22 Aug. - 5 Sep 2015		
7	Gezira State	Aamir Mohammed Hussein Algaly	13 - 18 Jun. 2011					
8	Gezira State	Ahmed Elamien Abbas Ahmed	13 - 18 Jun. 2011					
9	Gezira State	Asma Ahmed Khalid Abdalla	13 - 18 Jun. 2011					
10	Gezira State	Mubark Abdelrahman Yagoub Ahmed	13 - 18 Jun. 2011					1 - 15 Aug. 2014
11	Gezira State	Elbashier Abdalla Elbashier Abdelfadeel	13 - 18 Jun. 2011					
12	Gezira State	Safeeldien Ibrahim Hassan Mohammed	13 - 18 Jun. 2011					
13	Gezira State	Siddig Hassan Ahmed Abdella	13 - 18 Jun. 2011	9 - 27 Jan. 2012				
14	Gezira State	Khabab Yousif Dafallah Ahmed	13 - 18 Jun. 2011	9 - 27 Jan. 2012				
15	Gezira State	Nafissa Abdalmounem Ramadhane Salim	13 - 18 Jun. 2011					
16	Gezira State	Osama HajMusa Abdelrahman Hajmusa	13 - 18 Jun. 2011	4 - 22 Jun. 2012		19 Apr. - 3 May 2013		
17	Gezira State	Abobida Ahmed Gafer	5 - 10 Feb. 2012				22 Aug. - 5 Sep. 2015	
18	Gezira State	Yassen Elsadig Yassen	5 - 10 Feb. 2012	23 Jun. - 4 Jul. 2014	19 Apr. - 3 May 2013		22 Aug. - 5 Sep. 2015	
19	Gezira State	Tarig Osman Awad	5 - 10 Feb. 2012	15 - 26 Apr. 2013		22 Aug. - 5 Sep 2015		
20	Gezira State	Manal Mohmed Tom	5 - 10 Feb. 2012					
21	Gezira State	Fayza Osman Ahmed Ali	5 - 10 Feb. 2012					
22	Gezira State	Fadlelmola Ali Eldow	5 - 10 Feb. 2012			19 Apr. - 3 May 2013	21 Oct. - 4 Nov. 2013	
23	Gezira State	Mohamed Elsamani Mohamed	5 - 10 Feb. 2012	4 - 22 Jun. 2012		19 Apr. - 3 May 2013		
24	Gezira State	Nzar Omar Abdelmagid	5 - 10 Feb. 2012	4 - 22 Jun. 2012		19 Apr. - 3 May 2013		
25	Gezira State	Ahmed Ibrahim Balla Abdalla	5 - 10 Feb. 2012			19 Apr. - 3 May 2013		
26	Gezira State	Rasael Abdelfarag Balal Saeed	5 - 10 Feb. 2012					
27	Gezira State	Omer Badi Mohammed Badi	5 - 10 Feb. 2012	15 - 26 Apr. 2013			1 -15 Sep. 2014	
28	Gezira State	Elgaili Mustafa Ahmed Ali	5 - 10 Feb. 2012					
29	Gezira State	Ashraf Abdalkhalig Abdalnaseah Serag	20 - 25 May 2012	23 Jun. - 4 Jul. 2014	19 Apr. - 3 May 2013		21 Oct. - 4 Nov. 2013	
30	Gezira State	Saifaldin Osman Mustafa Elhaj	20 - 25 May 2012			1 - 15 Aug. 2014		
31	Gezira State	Hatim Gafar Mohammed Bakheit	20 - 25 May 2012					
32	Gezira State	Fathelrahman Ahmed Abdelrahman Omer	20 - 25 May 2012					22 Aug. - 5 Sep. 2015
33	Gezira State	Awad Elkarim Ibrahim Hamid Omer	20 - 25 May 2012			1 - 15 Aug. 2014		
34	Gezira State	Hashim Alasad Abdalgader Ahmed	20 - 25 May 2012		19 Apr. - 3 May 2013		21 Oct. - 4 Nov. 2013	
35	Gezira State	Mohamed Anwr Gasim Mohamed	20 - 25 May 2012					
36	Gezira State	Abdalrahim Mohamed Tom Elhag	20 - 25 May 2012					
37	Gezira State	Bashir Ahmed	20 - 25 May 2012	15 - 26 Apr. 2013				
38	Gezira State	Hussein Ahmed Fadol El Mola Mohamed	9 - 15 Jun. 2013					
39	Gezira State	Alsiddig Mohammed Altayeb Osman	9 - 15 Jun. 2013	23 Jun. - 4 Jul. 2014			21 Oct. - 4 Nov. 2013	
40	Gezira State	Kholud Elnour Elimam Ahmed	9 - 15 Jun. 2013	23 Jun. - 4 Jul. 2014				22 Aug. - 5 Sep. 2015
41	Gezira State	Mohamed Abdalla Eltayeb Elobid	9 - 15 Jun. 2013					22 Aug. - 5 Sep. 2015
42	Gezira State	Hesham Abdelgani			19 Apr. - 3 May 2013			
43	Gezira State	Husein Eltayeb Yousif			19 Apr. - 3 May 2013			
44	Gezira State	Rehab Ali Tajelser Elkhalifa				19 Apr. - 3 May 2013		
45	Gezira State	Mohaned Mohammed Ali Mohammed		13 - 24 Jul. 2015		19 Apr. - 3 May 2013		
46	Gezira State	Aisha Ahmed Yousif Haj Edrees				19 Apr. - 3 May 2013		
47	Gezira State	Marwa Ibrahim Ali Mohamed Ali					21 Oct. - 4 Nov. 2013	
48	Gezira State	Akram Ali Mohammed Hamdalneel		13 - 24 Jul. 2015		1 - 15 Aug. 2014		
49	Gezira State	Ayman Adam Siddig Adam				1 - 15 Aug. 2014		
50	Gezira State	Khalid Hassan Mohagir Babiker					1 -15 Sep. 2014	
51	Gezira State	Amir Bashir Abdelwahid Bashir					1 -15 Sep. 2014	
52	Gezira State	Sara Ahmed Mohammed Krar					1 -15 Sep. 2014	
53	Gezira State	Amin Ahmed Elaagib		13 - 24 Jul. 2015				1 - 15 Aug. 2014
54	Gezira State	Sarah Abdallah Alryah						1 - 15 Aug. 2014
55	Gezira State	Sama Hassan Elhadi Alamin						1 - 15 Aug. 2014
56	Gezira State	Faiga Abdo Ibrahim Alomary						1 - 15 Aug. 2014
57	White Nile State	IzzEldeen Gafar Ahmed Koko	6 - 10 Dec. 2010					
58	White Nile State	Khalid Said Abrahim Mohamed	6 - 10 Dec. 2010	19 May - 8 Jun. 2011		19 Apr. - 3 May 2013		
59	White Nile State	Mujtaba Mohamed Awadalla Mohamed	6 - 10 Dec. 2010					
60	White Nile State	Osama Mohamed Musa Noreldaim	6 - 10 Dec. 2010				21 Oct. - 4 Nov. 2013	
61	White Nile State	Ahmed Mamoun Hassan Ali	6 - 10 Dec. 2010					
62	White Nile State	Elsadig Adam Osman Madani	6 - 10 Dec. 2010	13 - 24 Jul. 2015	19 Apr. - 3 May 2013			
63	White Nile State	Abdalkarem Musa Abdalla	13 - 18 Jun. 2011					
64	White Nile State	Egbal Ali Doka Mursal	13 - 18 Jun. 2011					
65	White Nile State	Wisal Abdelrahman Ishag Mohamed	13 - 18 Jun. 2011					
66	White Nile State	Elhadi Mekki Moniem Maala	13 - 18 Jun. 2011					
67	White Nile State	Ibrahim Abdelkarim Abbekar Adam	13 - 18 Jun. 2011					
68	White Nile State	Mustafa Hasaballa Ahmed Abdalla	13 - 18 Jun. 2011					
69	White Nile State	Suhir Kheiri Abdelgalil Mohamed	13 - 18 Jun. 2011					
70	White Nile State	Tahani Omer Ibrahim Babekir	13 - 18 Jun. 2011					
71	White Nile State	Mohammed Ahmed Mohammed Rahma	13 - 18 Jun. 2011					
72	White Nile State	Amir Mohamed Ahmed Mohamed-Hamad	13 - 18 Jun. 2011					
73	White Nile State	Salah Ahmed Idress Mohomed	5 - 10 Feb. 2012	4 - 22 Jun. 2012				1 - 15 Aug. 2014
74	White Nile State	Mousa Abdalla Alobid Adam	5 - 10 Feb. 2012	15 - 26 Apr. 2013				
75	White Nile State	Hayat Musa Farah Gobara	9 - 15 Jun. 2013					
76	White Nile State	Dafaalla Elzakir Elmekki Eltahir	9 - 15 Jun. 2013	23 Jun. - 4 Jul. 2014				
77	White Nile State	Hitham Ibrahim Mohammed		13 - 24 Jul. 2015	19 Apr. - 3 May 2013		21 Oct. - 4 Nov. 2013	
78	White Nile State	Elbasher Elkhalifa Elzain				19 Apr. - 3 May 2013		
79	White Nile State	Elmahi Ageed Elmahi				1 - 15 Aug. 2014		
80	White Nile State	Nedal Abdallh Abdelsamad Mhamad					1 -15 Sep. 2014	
81	White Nile State	Ellaimon Ali Suliman Elbushari				22 Aug. - 5 Sep 2015		
82	White Nile State	May Mohamed Gabir Yasin				22 Aug. - 5 Sep 2015		
83	White Nile State	Gafaar Hassan Hussien Sabil					22 Aug. - 5 Sep. 2015	

84	White Nile State	Motasim Abdalla Babkr Mohamed						22 Aug. - 5 Sep. 2015
85	White Nile State	Zainab Adam Abakar Idris						22 Aug. - 5 Sep. 2015
86	Gedaref State	Umkalthom Abdelrazig Fadlelmola Mansor	5 - 10 Feb. 2012	4 - 22 Jun. 2012				
87	Gedaref State	ElGnaid Ali Ahmed Ali	5 - 10 Feb. 2012					
88	Gedaref State	Babekir Ahmed Mohamed Ali	20 - 25 May 2012					
89	Gedaref State	AbuAbeida Hasabelrasoul Ahmed Eldow	20 - 25 May 2012	23 Jun. - 4 Jul. 2014		19 Apr. - 3 May 2013	1 -15 Sep. 2014	
90	Gedaref State	Mubark Omar Mohamed Asad	20 - 25 May 2012	15 - 26 Apr. 2013		1 - 15 Aug. 2014		22 Aug. - 5 Sep. 2015
91	Gedaref State	Elhussein Elsafi Ali Abudulla	9 - 15 Jun. 2013	13 - 24 Jul. 2015		19 Apr. - 3 May 2013	22 Aug. - 5 Sep. 2015	
92	Gedaref State	Mustafa Ismail Mohammed Abdelrahman	9 - 15 Jun. 2013	23 Jun. - 4 Jul. 2014		19 Apr. - 3 May 2013	1 -15 Sep. 2014	
93	Gedaref State	Khalid Abdallah Ahemad Alzein	9 - 15 Jun. 2013	13 - 24 Jul. 2015	19 Apr. - 3 May 2013		21 Oct. - 4 Nov. 2013	
94	Gedaref State	Mohammed Abdelhameed Abdalla Tebin	9 - 15 Jun. 2013		19 Apr. - 3 May 2013		21 Oct. - 4 Nov. 2013	
95	Gedaref State	Mkram Osman Musa Edris				1 - 15 Aug. 2014		22 Aug. - 5 Sep. 2015
96	Gedaref State	Muna Abdelmutalab Hussian				22 Aug. - 5 Sep 2015		1 - 15 Aug. 2014
97	Gedaref State	Mohamed Osman Aldaw Ibrahim				22 Aug. - 5 Sep 2015		1 - 15 Aug. 2014
98	Gedaref State	Ashraf Ahmed Mohammed				22 Aug. - 5 Sep 2015		
99	Gedaref State	Elhaga Elsamani Omer Mohamad						22 Aug. - 5 Sep. 2015
100	Sennar State	Babekir Ali Hamad Fadlalla	5 - 10 Feb. 2012		19 Apr. - 3 May 2013		21 Oct. - 4 Nov. 2013	
101	Sennar State	Elmoghira Mohieldian Ibrahim Boshara	5 - 10 Feb. 2012	4 - 22 Jun. 2012			1 -15 Sep. 2014	
102	Sennar State	Mohammed Badraldein Altahir Aesa	20 - 25 May 2012			1 - 15 Aug. 2014		
103	Sennar State	Elnaiem Hassan Bella Rabh	20 - 25 May 2012					
104	Sennar State	Elzein Mohammed Hamed Mohammed	20 - 25 May 2012	15 - 26 Apr. 2013				
105	Sennar State	Altoum Yagoob Mohammed Eisa	9 - 15 Jun. 2013			22 Aug. - 5 Sep 2015		
106	Sennar State	Talal Gepreel	9 - 15 Jun. 2013	23 Jun. - 4 Jul. 2014				
107	Sennar State	Nehad Fadul Elseed Ishag	9 - 15 Jun. 2013					
108	Sennar State	Mohamed Elamin Babiker Omer Mohamed	9 - 15 Jun. 2013					
109	Sennar State	Lubna Mohammed Abdalrahman		13 - 24 Jul. 2015	19 Apr. - 3 May 2013		21 Oct. - 4 Nov. 2013	
110	Sennar State	Faisal Goma Hamid Gibreel				19 Apr. - 3 May 2013		
111	Sennar State	Mohamed Hamoda Hamid Naway				19 Apr. - 3 May 2013		
112	Sennar State	Hashim Eltom Ibrahim Gangary				19 Apr. - 3 May 2013	22 Aug. - 5 Sep. 2015	
113	Sennar State	Hala Salih Hussein Ibrahim		23 Jun. - 4 Jul. 2014		22 Aug. - 5 Sep 2015		
114	Sennar State	Alhadi Fadul Abdallah Yagoub		23 Jun. - 4 Jul. 2014			1 -15 Sep. 2014	
115	Sennar State	Emtenan Mohammed Mohammed Ahmed		23 Jun. - 4 Jul. 2014			22 Aug. - 5 Sep. 2015	
116	Sennar State	Jwahir Alfadill Elbagir Ahmed				1 - 15 Aug. 2014		
117	Sennar State	Ibrahim Omer Hussin Omer				1 - 15 Aug. 2014		22 Aug. - 5 Sep. 2015
118	Sennar State	Khalda Ahmed Khlill Mohammed				1 - 15 Aug. 2014		22 Aug. - 5 Sep. 2015
119	Sennar State	Elhindi Omer Elmadani Mohammed		13 - 24 Jul. 2015				1 - 15 Aug. 2014
120	Sennar State	Negood Ahmed Mohammed Ahmed						1 - 15 Aug. 2014
121	Sennar State	Almahady Adam Mohammed Khalil		13 - 24 Jul. 2015				1 - 15 Aug. 2014
122	Sennar State	Osman Ahmed Hassan Osman				22 Aug. - 5 Sep 2015		
123	Sennar State	Sueliman Adam Gama Hamid						22 Aug. - 5 Sep. 2015
124	River Nile State	Ali Ahmed Ali Taha	13 - 18 Jun. 2011					
125	River Nile State	Nour Eldin Awadalla Mohamed Alzain	5 - 10 Feb. 2012	15 - 26 Apr. 2013			1 -15 Sep. 2014	
126	River Nile State	Ali Yousef Eldoma Eltaher	5 - 10 Feb. 2012	4 - 22 Jun. 2012				
127	River Nile State	Elgaali Abdallah Mohammed Ahmed Abrahem	20 - 25 May 2012					
128	River Nile State	Tarig Ibrahim Mohammed Mustafa	20 - 25 May 2012					
129	River Nile State	Magda Malik Mahgoub Sideeg	20 - 25 May 2012					
130	River Nile State	Malik Ezelden Ibrahim Elkhalil	9 - 15 Jun. 2013	23 Jun. - 4 Jul. 2014				
131	River Nile State	Bashir Mohamed Osman Ali	9 - 15 Jun. 2013			19 Apr. - 3 May 2013		
132	River Nile State	Amal Osman Babikir Ibrahim	9 - 15 Jun. 2013			19 Apr. - 3 May 2013		
133	River Nile State	Hagir Mohamed Ahmed Saad	9 - 15 Jun. 2013	23 Jun. - 4 Jul. 2014	19 Apr. - 3 May 2013		21 Oct. - 4 Nov. 2013	
134	River Nile State	Nimat Hashim Ali Osman		13 - 24 Jul. 2015	19 Apr. - 3 May 2013		21 Oct. - 4 Nov. 2013	
135	River Nile State	Madina Ali Mousa Ali				1 - 15 Aug. 2014		22 Aug. - 5 Sep. 2015
136	River Nile State	Hussein Abdelhamied Satti				1 - 15 Aug. 2014		
137	River Nile State	Fatima Mohamed Abd Elfatah Osman				22 Aug. - 5 Sep 2015	1 -15 Sep. 2014	
138	River Nile State	Aboobeida Ali Mohammed Hussain					22 Aug. - 5 Sep. 2015	1 - 15 Aug. 2014
139	River Nile State	Mohamed Ahmed Abdalmohsin						1 - 15 Aug. 2014
140	River Nile State	Areeg Elawad Elsheikh Mohamed				22 Aug. - 5 Sep 2015		
141	River Nile State	Faigah Alhadi Hassan Magzob						22 Aug. - 5 Sep. 2015
142	Northern State	Yasin Hassan Mohamed Salih	6 - 10 Dec. 2010					
143	Northern State	Osman Galal Osman Satti	13 - 18 Jun. 2011	15 - 26 Apr. 2013				
144	Northern State	Mohamed Hassan Abdeen Elhassan	5 - 10 Feb. 2012	4 - 22 Jun. 2012		19 Apr. - 3 May 2013		
145	Northern State	Alaeldin Idris Farah Idris	5 - 10 Feb. 2012			19 Apr. - 3 May 2013		
146	Northern State	IsamEldin Idris Abdelhalim Idris	20 - 25 May 2012			22 Aug. - 5 Sep 2015		1 - 15 Aug. 2014
147	Northern State	Mohamed AbdElrahim Hamza Mohamed	20 - 25 May 2012					
148	Northern State	Elkheir Mohamed Joma Dafe	20 - 25 May 2012					
149	Northern State	Mohammed Elaid Nuri Salih Abdoon	9 - 15 Jun. 2013	23 Jun. - 4 Jul. 2014	19 Apr. - 3 May 2013		21 Oct. - 4 Nov. 2013	
150	Northern State	Baha Eldeen Abdalla Hamed Haj	9 - 15 Jun. 2013	23 Jun. - 4 Jul. 2014	19 Apr. - 3 May 2013		21 Oct. - 4 Nov. 2013	
151	Northern State	Mandor Tufieg Mohamed Elkgir	9 - 15 Jun. 2013	13 - 24 Jul. 2015			1 -15 Sep. 2014	
152	Northern State	Waleed Osman Hussien Saleem	9 - 15 Jun. 2013					
153	Northern State	Fowzy Mohamed Ali Ahmed				1 - 15 Aug. 2014		
154	Northern State	Mohamed Alamin Ibrahim Mohamed				1 - 15 Aug. 2014		
155	Northern State	Safwat Bakri Osman Mohamed						1 - 15 Aug. 2014
156	Northern State	Nagi Abdelnbi Mohammed Hussein					22 Aug. - 5 Sep. 2015	
157	Northern State	Abd Elrahman Abdalla Khider						22 Aug. - 5 Sep. 2015
158	Northern State	Amar Osman Mohmmedzien						22 Aug. - 5 Sep. 2015
159	National Rice Project	Yasir Hussein Mohammed	20 - 25 May 2012					

List of Trainees to Japan

FY 2011

Course Title (Japanese)	Course Title	Place	Period	Name of Participants	Organization
持続的農業生産と環境保全のための土壌診断技術	Soil Diagnosis Technology for Sustainable Agricultural Production and Environmental Conservation	JICA Hokkaido (Obihiro)	9 May – 29 July 2011	Elsadig Mohammed Hassan	Agricultural Research Corporation, Federal MoA
植物保護のための総合防除	Integrated Pest Management for Plant Protection	JICA Hyogo	6 June – 3 Sep 2011	Bashir Mohamed Elamin	Plant Protection Directorate, Federal MoA
アフリカ地域「陸稲品種選定技術」	Upland Rice Variety Selection for Africa	JICA Tsukuba	19 July – 2 Nov 2011	Awadalla Mohammed Awadalla	Seed Propagation, White Nile State MoA
農業政策企画	Planning of Agricultural Policy	JICA Tsukuba	28 Aug – 23 Sep 2011	Leila Salih Mohamed Ali	Planning Office, Gezira State MoA
農業普及企画管理者	Agricultural Extension Planning and Management	JICA Tsukuba	4 Sep – 12 Nov 2011	Islam Mohammed Khier Osman	National Rice Project, Federal MoA
乾燥地における土地・水資源の適正管理と有効利用	Appropriate Management of Land and Water Resources for Effective Utilization in Arid/Semi-arid Regions	JICA Chugoku, Egypt	6 Sep 2011 – 13 Jan2012	Mujtaba Mohammed Awadalla	Management of Technology Transfer and Extension, White Nile State MoA
農民参加による農業農村開発	Integrated Agriculture & Rural Development through the Participation of Local Farmers	JICA Tsukuba	13 Nov – 17 Dec 2011	Alfadil Ali Alfadil Khalid	General Agricultural Administration, Gezira State MoA
アフリカ地域　農業生産性向上のための農業機械・農機具改良	Improvement of Agricultural Machinery and Equipment for the Growth in Agricultural Productivity for African Countries	JICA Hokkaido (Obihiro)	9 Jan – 2 Mar 2012	Hesham Mohamed Abdelgani Osamn	General Agricultural Administration and Agricultural Engineering Administration, Gezira State MoA
				Ashraf Abdalkhalig Abdalnasear Serag	General Agricultural Administration, Gezira State MoA
				Hashim Alasad Abdalgader Ahmed	General Agricultural Administration, Gezira State MoA
ICTによる農業情報の活用技術	ICT (Information and communication technology) for Agricultural Information use	JICA Hokkaido (Obihiro)	16 Jan – 21 Apr 2012	Hana Hashim Salih Babiker	Technology Transfer and Extension Administration, Federal MoA
稲作技術開発	Rice cultivation techniques development	JICA Tsukuba	26 Feb – 23 Nov 2012	Mubarak Abdelrahman Yagoub Ahmed	General Agricultural Administration, Gezira State MoA
Total				**12 Participants**	

Annex 10

FY 2012

Course Title (Japanese)	Course Title	Place	Period	Name of Participants	Organization	Title of Action Plan	Relevance of Activities of the Project
持続的農業生産と環境保全のための土壌診断技術	Soil Diagnosis Technology for Sustainable Agricultural Production and Envirnmental Conservation	JICA Hokkaido (Obihiro)	7 May – 27 July 2012	Mohmmed Abdalla Eltayeb Elobaid	Land Use, Gezira State MoA	Reclamation salinity soils in central province	He can not implement his action plan because of budget shortage but he utilizes knowledge from the training in his daily job as an extensionist to disseminate upland rice cultivation in Gezira State.
農村開発のための畑地帯における農業基盤整備	Agricultural Infrastructure Improvement in Upland Crop Farming Areas for Rural Development	JICA Hokkaido (Obihiro)	14 May – 3 Aug 2012	Noureldin Awadalla Mohamed Alzain	National Rice Project, Federal MoA	Introducing of upland rice in the River Nile State	His action plan was made in line with the direction of the Project and was implemented.
植物保護のための総合防除	Integrated Pest Management for Plant Protection	JICA Kansai	4 June – 1 Sep 2012	Ahmed Ibrahim Balla Abdallah	Rice Promotion Unit, Gezira State MoA	Weeds management in upland rice in Gezira State Sudan	As a member of Rice Promotion Unit in Gezira State, he suggests weed control for upland rice cultivation to his colleague.
農業普及企画管理者	Agricultural Extension Planning and Management	JICA Tsukuba	24 June – 1 Sep 2012	Igbal Osman Mohhereh	Technology Transfer and Extension Administration, Federal MoA	TOTs program for TTEA staff on Planning and Management	As a leader of Task Team in FY2011, she supported Task Team in FY2012 through implementation of her action plan. She is also new Task Team member in FY2013.
アフリカ地域　稲作振興のための中核的農学研究者の育成	Development of Core Agricultural Researchers for Rice Promotion in Sub-Sahara Africa	JICA Chubu	3 July – 4 August 2012	Hassan Khalid Ali	Agricultural Research Corporation, Federal MoA	Potential of Rice genotypes in High Terrace and Karu soil in River Nile State, Sudan	His research will assist upland rice cultivation in future.
乾燥地における持続的農業のための土地・水資源の適正管理	Appropriate Management of Land and Water Resources for Sustainable Agriculture in Arid/Semi-arid Regions	JICA Chugoku, Egypt	15 Aug – 25 Dec 2012	Hussein Ahmed Fadol Elmola Mohamed	General Administration of Agriculture, Gezira State MoA	Improvement of Crop Productivity in Irrigated Areas of Gezira State using Appropriate Irrigation Schedules and Soil Fertilization	As a member of Rice Promotion Unit in Gezira State, he is trying to implement his action plan.
農業政策企画	Planning of Agricultural Policy	JICA Tsukuba	19 Aug – 15 Sep 2012	Suad Ibrahim Abdalla Gamaldin	Planning and Agricultural Economics Directorate, Federal MoA	Improvement of Agricultural Policy (Final report has not been submitted yet.)	As a head of department, her action plan targeted whole department. She advised junior staff in their work. She also attended the policy formulation course and implemented the action plan.
農民参加による農業農村開発	Integrated Agriculture & Rural Development through the Participation of Local Farmers	JICA Hokkaido (Sapporo)	29 Aug – 29 Sep 2012	Nzar Omar Abd Elmagid Magbol	Rice Promotion Unit, Gezira State MoA	The Diffusion of Rice Production through Farmers Field Schools In East Gezira Locality and Umelqura Locality (2013-2014)	As a member of Rice Promotion Unit in Gezira State, he is preparing implementation of his action plan in next season.
ICTによる農業情報の活用技術	ICT (Information and Communication Technology) for Agricultural Information Use	JICA Hokkaido (Obihiro)	14 Jan – 20 Apr 2013	Hind Musa Ibrahim Mohamed	Horticultural Sector Administration, Federal MoA	1. Fruits &Vegetables information database 2. Training for information department staff in HSA	She is one of core member of Information Management Working Group and also one of staff of IT Unit in HSA. Her action plan was presented in front of DG of HSA and started since June 2013.
アフリカ地域「陸稲栽培及び品種選定技術」	Upland Rice Cultivation and Variety Selection Techniques for Africa	JICA Tsukuba	17 Mar – 2 Nov 2013	Siddig Hassan Ahmed Abdella	Rice Promotion Unit, Gezira State MoA	Effect of different weed control methods on growth and yield on irrigated upland rice	He has been in charge of the management of a seed production site and demonstration sites in our project. He is expected to be a leader of extensionists for upland rice cultivaztion in Gezira State.
Total				**10 Participants**			

FY 2013

Course Title (Japanese)	Course Title	Place	Period	Name of Participants	Organization	Title of Action Plan	Relevance of Activities of the Project
持続的農業生産と環境保全のための土壌診断技術	Soil Diagnosis Technology for Sustainable Agricultural Production and Environmental Conservation	JICA Hokkaido (Obihiro)	7 May – 26 Jul 2013	Fathelrahman Ahmed Abdelrahman Omer	General Administration of Agriculture, Gezira State MoA	The Management of Chemical Fertilizer	As a core member of chemical use instruction in Rice Promotion Unit in Gezira State, he suggests chemical use for upland rice cultivation to his colleague
農村開発のための畑地帯における農業基盤整備	Agricultural Infrastructure Improvement in Upland Crop Farming Areas for Rural Development	JICA Hokkaido (Obihiro)	14 May – 3 Aug 2013	Abobida Ahmed Gafer Elmahi	Rice Promotion Unit, Gezira State MoA	The Leveling of Land	He ia a leader to instruct land preparation to other staff in South Gezira.
植物保護のための総合防除	Integrated Pest Management for Plant Protection	JICA Kansai	3 Jun – 31 Aug 2013	Abdelghadir Bakri Derweesh Elsaddig	Rice Promotion Unit, Gezira State MoA	Improvement Knowledge on pest control for Gezira Farmers	He is trying to utilise knowledge and skills for pest control in NERICA Trial field in Gezira State.
農業普及企画管理者	Agricultural Extension Planning and Management	JICA Tsukuba	15 Jul – 14 Sep 2013	Sawsan Ali Abd Elmageed	Technology Transfer and Extension Administration, Federal MoA	Uplifting farmer's life by using technology transferred by extension workers	Shw was one of participants last year's advanced training. In this year, as a member of Task Team, she implements her action plan.
乾燥地における持続的農業のための土地・水資源の適正管理	Appropriate Management of Land and Water Resources for Sustainable Agriculture in Arid/Semi-arid Regions	JICA Chugoku, Egypt	12 Aug – 25 Dec 2013	Yassen Elsadig Yassen Alem	Rice Promotion Unit, Gezira State MoA	The development of rice production in Gezira State by using fertilizers	He is a supervisor of a upland rice demonstration site. He is expected to give farmers advice on soil fertility and irrigation management for upland rice cultivation.
アフリカ地域(英語圏)稲作収穫後処理	Post-harvest Rice Processing for English Speaking African Countries	JICA Tohoku	14 Aug – 28 Sep 2013	Omer Badi Mohammed Badi	Rice Promotion Unit, Gezira State MoA	Timely miling	He was core members for operateion of post harvest activities in Rice Promotion Unit in Gezira State. He is expected to be more active based on improved knowledge and skills for post harves.
農民参加による農業農村開発	Integrated Agriculture & Rural Development through the Participation of Local Farmers	JICA Hokkaido (Sapporo)	19 Aug – 28 Sep 2013	Osama Hajmusa Abdelrahman Hajmusa	Rice Promotion Unit, Gezira State MoA	Improvement of upland rice through cooperatives	Ha is expected to be more active to work in Gezira's demonstration field through his action plan.
農業政策企画	Planning of Agricultural Policy	JICA Tsukuba	22 Aug – 21 Sep 2013	Etimad Hamadelneel Aljak Mohamed	International Cooperation and Investment Directorate, Federal MoA	Promotion of rice production under irrigated ecosystem in Gezira State	Shw was one of participants last year's advanced training and she is member of Task Team in this year. She was also nominated as a member of Joint Terminal Evaluation Team.
食料安全保障政策立案のための農業統計の企画・設計	Planning and Designing of Agricultural Statistics for Food Security Policy Making	JICA Tsukuba	25 Aug – 19 Oct 2013	Sumia Ibrahim Elamin	Planning and Agricultural Economics Directorate, Federal MoA	Job Improvement Plan	She was a leader of Task Team in FY2012. She supported Task Teams in FY2013.

稲作技術開発	Rice Cultivation Techniques Development	JICA Tsukuba	16 Feb – 15 Nov 2014	Mohammed Elseamani Mohammed Abdelgadir	Rice Promotion Unit, Gezira State MoA	Productivity improvement of NERICA 4 through optimum seed rate	He conducts a cultivation trial of Action Plan. With the result of the trial, he tries to increase rice yield in farmer's field.
ICTによる農業情報の活用技術	ICT (Information and Communication Technology) for Agricultural Information Use	JICA Hokkaido (Obihiro)	16 Feb – 24 May 2014	Ekhlas Salih Mohamed Ali Elamairi	Planning and Agricultural Economics Directorate, Federal MoA	Create a database of PAE information based on Crop area Planted and Harvested, Productivity, Production & Training to information unit staff	She worked with the Project since 2012. She was a member of Information Management working group and head of IT unit in PAE.
アフリカ地域「陸稲栽培及び品種選定技術」	Upland Rice Cultivation and Variety Selection Techniques for Africa	JICA Tsukuba	16 Mar – 1 Nov 2014	Fadlelmola Ali Eldow Elzeibar	Rice Promotion Unit, Gezira State MoA	Effect of Nitrogen Amount on Plant Growth and Yield in Upland Rice Variety NERICA4	He conducts a cultivation trial of Action Plan and share the result of the trial with colleagues and farmers. The result will be applied to a farmer's field. Then, the farmer extends the result to other farmers.
Total				**12 Participants**			

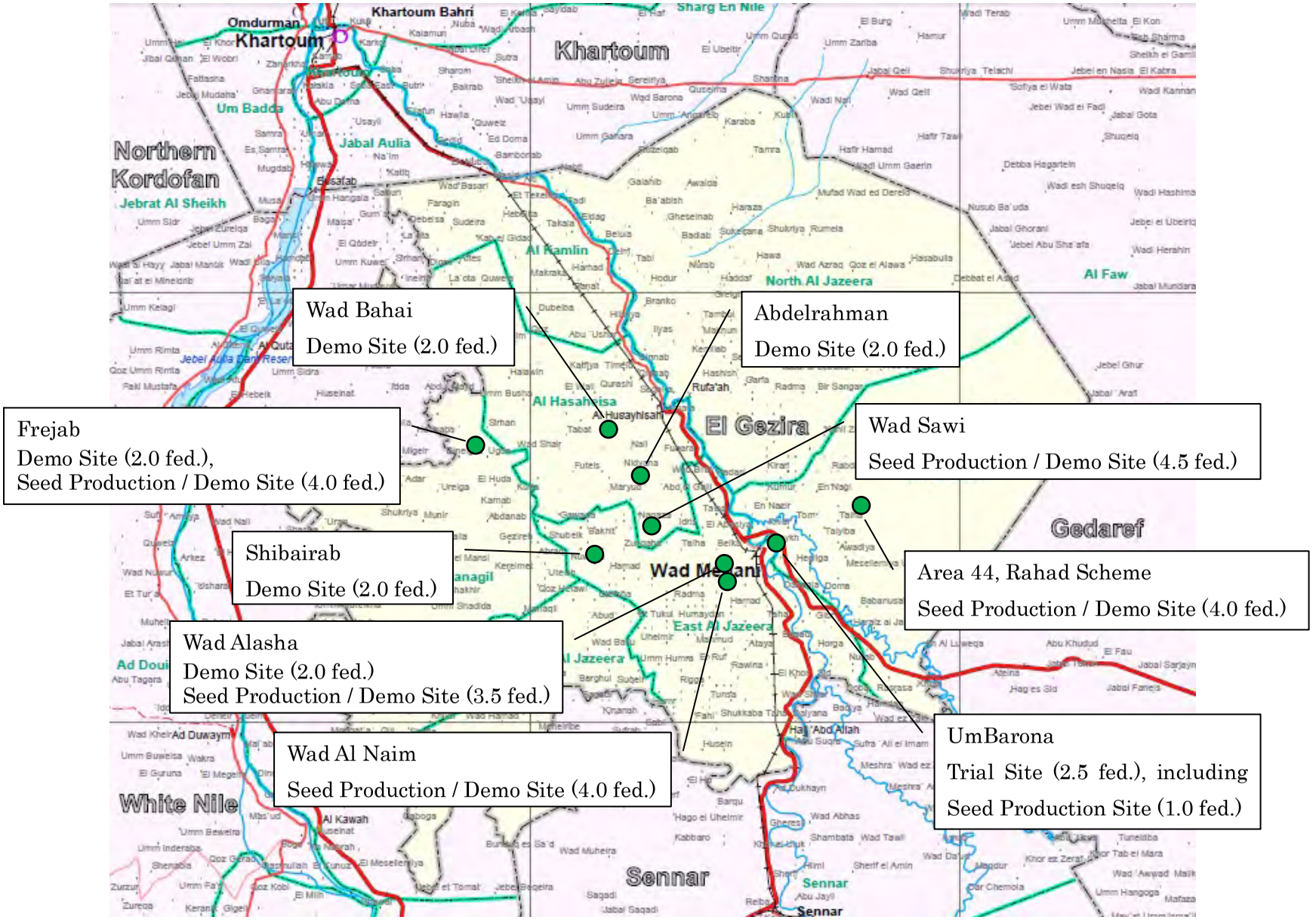
FY 2014

Course Title (Japanese)	Course Title	Place	Period	Name of Participants	Organization	Title of Action Plan	Relevance of Activities of the Project
農業協同組合の組織化推進と事業運営能力の向上	Development of Agricultural Cooperative and Improvement of Management Capacity	JICA Tsukuba	11 May – 19 Jul 2014	Tarig Osman Awad Elseid	Rice Promotion Unit, Gezira State MoA	Establishment of Rice Farmers Group	Mr. Tarig works with rice farmers to increase production by transfering technical points like irrigaiton, weedijg and fertilizer.
農村開発のための畑地帯における農業基盤整備	Agricultural Infrastructure Improvement in Upland Crop Farming Areas for Rural Development	JICA Hokkaido (Obihiro)	13 May – 2 Aug 2014	Ibrahim Mohammed Hassan Ibrahim	Department of Extension, Gezira State MoA	Raise Productivity in Rice and Weat Crops	Mr. Ibrahim organizes small farmers' groups and cultivate rice and wheat.
アフリカ地域 稲作振興のための中核的農学研究者の育成	Development of core Agricultural Researchers for Rice Promotion in Sub-Saharan Africa	JICA Chubu	24 Jun – 2 Aug 2014	Khalid Abdalla Osman Adam	Agricultural Research Corporation, Federal MoA	Breeding for Developing High Yielding, Earliest and Aerobic Varieties under Sudan Condition	Dr. Khalid supported demo farm activity of the Project at the field of ARC Kosti in 2010 as a researcher. Since season 2014 season, after attending Training in Japan, he has worked as a leading reseacher on research activity conducted with the Project.
サブサハラアフリカ地域・CARD-CAADP連携強化によるアフリカ稲作開発振興(A)	Promotion of African Rice Development through strengthening coordination between CARD and CAADP for sub-Sahara African Countries (A)	JICA Tsukuba	27 Jul – 2 Aug 2014	Elamin Mohamed Elamin Hassan Mohyeldin Abdalla Mohamed Osman	DG, International Cooperation and Investment Directorate, Federal MoA Former Minister, Gezira State MoA	Action Plan for Promotion of Rice Production in Sudan – Alignments to National Economic Reform Programme 2015-2019, CAADP and NRDS	Since Mr. Elamin was assinged to DG of ICI, he really cooperates with the Project and coordinates smoothly between the Proect and FMoAI. Former Minister of Gezira SMoA, Mr. Mohyeldin Abdalla understood well the Project activity and lead the State with strong initiative.
乾燥地における持続的農業のための土地・水資源の適正管理	Appropriate Management of Land and Water Resources for Sustainable Agriculture in Arid/Semi-arid Regions	JICA Chugoku, Egypt	29 Jul – 12 Nov 2014	Khalid Saeed Ibrahim Mohamed	Rice Promotion Unit, White Nile State MoA	Action Plan is not required for this training.	He is a core extensionist who takes charge of demo farm activity in White Nile State.
農民参加による農業農村開発(A)	Integrated Agricultureand Rural Development through the Participation of Local Farmers (A)	JICA Hokkaido (Sapporo)	5 Aug – 13 Sep 2014	Malik Ezelden Ibrahim	Rice Promotion Unit, River Nile State MoA	Improve Farmers Income	Mr.Malik worked with the Project since season 2013. He understood the Project activity well and accelerated good coordination between SMoA and the Project. He has played an important role as a supervisor of demonstration farm in cooperation with the Project.
アフリカ地域(英語圏)稲作収穫後処理	Post-harvest Rice Processing for English Speaking African Countries	JICA Tohoku	13 Aug – 27 Sep 2014	Salma Elamin Mohamed Ali	Rice Promotion Unit, Sennar State MoA	Training of Extension Warkers and Farmers in Sennar State on Determination of Rice Optimum Harvesting Time	Ms.Salma worked with the Project since season 2013. She has played a key role on the Project activity such as demo farm as a supervisor and promotion of post-harvest technolgy as an engineer in the State.
稲作技術向上	Improvement of Rice Cultivation Techniques	JICA Tsukuba	9 Mar – 31 Oct 2015	Abuobeida Hasabelrasoul Ahmed	Rice Promotion Unit, Gedaref State MoA	The effect of soil space on the growth and yield of NERICA 4	Since 2012 season, Mr. Abuobeida worked with the Project as a leading extensionist and a supervisor of demonsrtation farm at Shuwak area. He has played a important role on demo farm activity to realize high yield at this site for the State.
アフリカ地域「陸稲栽培及び品種選定技術」	Upland Rice Cultivation and Variety Selection Techniques for Africa	JICA Tsukuba	15 Mar – 31 Oct 2015	Elzein Mohammed Hamid Mohammed	Rice Promotion Unit, Sennar State MoA	The effect of Nitrogen application of different planting method on growth and yield of NERICA 4	Mr. Elzein worked with the Project since season 2012 at Kassab area as a core extensionist of demonstration farm. He understood the importance of project activitiy well and worked as a leader in the field to accelerate the promotion of upland rice in the State.
Total				**10 Participants**			

FY 2015

Course Title (Japanese)	Course Title	Place	Period	Name of Participants	Organization	Title of Action Plan	Relevance of Activities of the Project
農業協同組合の組織化推進と事業運営能力の向上	Development of Agricultural Cooperatives and Improvement of Management Capacity	JICA Tsukuba	10 May – 18 Jul 2015	Abdalla Mohammed Ali Eljenay	Technology Transfer and Extension Administration, Federal MoA	Rehabilitation agricultural Cooperatives through Education and Promotion of Marketing business	Mr. Abdalla didn't take any courses of Output 1but he is a specialist of agricultural extension. He is expected to apply what he learnt in his work place and transfer his colleagues.
農業普及企画管理者	Agricultural Extension Planning and Management	JICA Tsukuba	5 Jul – 5 Sep 2015	Sania Alseemat Fadulalmola	Technology Transfer and Extension Administration, Federal MoA	Capacity building for Technology Transfer & Extension Administration (TTEA) staff Through TOT Programme	Ms. Sania was a participant of trainings (PCM and Feasibility Study) of Output 1 activity in 2012. After that, she went master course and took MSs in 2014. She is now manager of information unit.
アフリカ地域　稲作振興のための中核的農学研究者の育成	Development of Core Agricultural Researcher for Promotion of Rice Production in Sub-Saharan Africa	JICA Chubu	9 Jul – 13 Aug 2015	Amna Ahmed Abdalla Eltahir	Agricultural Research Corporation, Federal MoA	Increasing the Yield of Existing Released Aerobic Rice Varieties in Sudan	Dr. Amna supported the Project on demo farm activity conducted at the field of ARC Kosti in 2010 as a Station Director. Since season 2014 season, she has played important role as a leading core reseacher on rice research activity implemented by ARC with the Project.
乾燥地における持続的農業のための土地・水資源の適正管理	Appropriate Management of Land and Water Resources for Sustainable Agriculture in Arid/Semi-arid Regions	JICA Chugoku, Egypt	2 Aug – 25 Dec 2015	Alhadi Fadul Abdallah Yagoub	Rice Promotion Unit, Sennar State MoA	Improvement of irrigation facilities and soil fertility in kassab irrigated scheme	Mr. Alhadi worked with the Project since season 2013. He has played a key role on demonstration farm activity of the project as a supervisor and an assistant manager of Rice promotion unit to realize expected result by working in the field and cordinating relationship between the Project and SMoA.
アフリカ地域　稲作収穫後処理	Post-harvest Rice Processing for English Speaking African Countries	JICA Tohoku	12 Aug – 27 Sep 2015	Khalid Abdallah Ahemad Alzein	Rice Promotion Unit, Gedaref State MoA	Post harvest Rice Processing	Mr. Khalid worked with the Project since season 2013. He has played a significant role on the project activity such as a supervisor on demonstraton farm activity and as an engineer on promotion activity of post-harvest technolgy in Gedaref State.
サブサハラアフリカ地域・CARD-CAADP連携強化によるアフリカ稲作開発振興(A)	Promotion of African Rice Development through strengthening coordination between CARD and CAADP for Sub-Sahara African Countries (A)	JICA Tsukuba	16 – 27 Aug 2015	Mohieldin Ali Mohamed Bakheet Ahmed Abdelgadir Elsiddig	National Rice Coordinator, National Rice Project, Federal MoA National Rice Research Coordinator, Agricultural Research Corporation, Federal MoA	Promotion of Rice Production in Sudan (2015-2019)	Mr. Mohieldin is National Rice Coordinator. He always cooperated with the Project since 2010. Since Prof. Ahmed became National Rice Research Coordinator in 2013, the cooperation between the Project and ARC became so smooth. Both of them are indispensable for Rice Development in Sudan. They are also members of Bottleneck Issue Working Group for Rice Sector Development Forum in 2014.
農民主導による普及手法	Farmer-Led Extension Method (B)	JICA Hokkaido (Obihiro)	5 Jan – 6 Feb 2016	Almoghira Mohyaldian Ibrahim Bushara	Rice Promotion Unit, Sennar State MoA	to be decided	Mr. Almoghira worked with the Project since season 2012 at Maiurno area continuously as a core extensionist of demonstration farm. He has worked actively in the field as a leader for other extensionisits and farmers to obtain high yield. He is an indispensable extensionist for promoting upland rice in the State.
Total				**8 Participants**			

The Map of Demo, Seed Production / Demo and Trial Sites 2015 (Gezira State)



Annex 11

Remarks on each demonstration site up to the harvest time

＜Gezira State＞

- Demonstration Farm -

(1) Wad Bahai (2.0 feddans)

Sowing Date and Method：11/07, Seed driller	Re-sowing：27/07
Seeding rate and Space：30kg/fed, 25cm	First irrigation：16/07
Pre-irrigation：21-23/06	Irrigation interval：every 4-5 days (with Influence of Rainfall)
Pre-emergence herbicide：14/07	Post-emergence herbicide：Not implemented
Hand weeding：①01/08 ②9-11/09	
Fertilization (N)：①16/08(Urea 50kg/fed) ②13/09(Urea 50kg/fed)	
Others：Termite insecticide 12/09	
Harvest Date：10/11	Yield：2337.1kg/ha

This farm is managed by the same farmer as last year, but the site is located at neighboring farm from last year. At first 3 extensionists (2 males and 1 female) were assigned, but 2 males remained from the second half of the cultivation period.

Sowing date was July 11 and it was the latest in Gezira State. This is because irrigation water was available only from June and land preparation was delayed. This site had 4 feddans last year and weed control was not able to catch up with weed growth. But this year field area decreased to 2 feddans and weeding was quite positive. Yield was able to achieve more than last year's. As this farm is located along the main road and has high demonstration effects as well, small-scale Field Day called "Extension Day" was held at harvest time. 20-30 farmers were invited in the Extension Day. The demonstration of rice harvesting by combine harvester and the explanation on how to cultivate rice was conducted by extensionists.

(2) Shibairab (2.0 feddans)

Sowing Date and Method：30/06, Seed driller	Re-sowing：Not implemented
Seeding rate and Space：30kg/fed, 25cm	First irrigation：03/07
Pre-irrigation：Completed	Irrigation interval：every 4-5 days (with Influence of Rainfall)
Pre-emergence herbicide：Used	Post-emergence herbicide：Not implemented
Hand weeding：①28-29/07 ②15/08 ③23/08 ④ 31/8	
Fertilization (N)：①31/07(Urea 50kg/fed) ② 23/08(Urea 50kg/fed) 13/09(Urea 50kg/fed)	
Others：Termite insecticide 30/07, 1/09	
Harvest Date：22/10	Yield：2361.1kg/ha

This site changed the farm from last year, but the extensionist is the same person as last year. This year is the second year for him to supervise rice cultivation. This extensionist and a farmer were jointly and honestly working on weeding and irrigation. Field condition was much better than last year.

This site is also quite remote from Wad Medani, but the extensionist's performance can deserve high trustworthiness. Thus, his farm might be able to be utilized as seed production farm from next year. He could also be considered to become a leader of rice extensionists in Shibairab region in the future.

Yield of 2.4 t/ha was able to be achieved. It is more than last year's yield. The quality of the

harvested rice is quite pure, because rogueing was actively conducted. If seed used at sowing time had been pure, the yield in this site would have been as high as about 3.0t/ha.

(3) Abdelrahman (2.0 feddans)

Sowing Date and Method：07/07, Seed driller	Re-sowing：22/07
Seeding rate and Space：30kg/fed, 25cm	First irrigation：13/07
Pre-irrigation：Completed	Irrigation interval：every 4-5 days (with Influence of Rainfall)
Pre-emergence herbicide：11/07	Post-emergence herbicide：0.5L/fed, 08/08
Hand weeding：①10/8, ②9/09	
Fertilization (N)：①11/08(Urea 50kg/fed) ② 07/09(Urea 50kg/fed)	
Others：Termite insecticide 12/09	
Harvest Date：27/10	Yield：3074.8kg/ha

This site was the place where yield was the second highest after Area 44 last year. This site is quite remote area from Wad Medani and has only one extensionist assigned. But he is working hard every year and made courteous instruction to farmers. Fertilization, irrigation and weed control ware appropriate. From the second half of maturity stage, rice rogues emerged obviously, but the cultivation condition is much more ideal than last year. The problem of this site is that this extensionist's performance has not yet highly been evaluated.

The yield of more than 3.0t/ha was achieved for the first time this year by the continuous efforts of farmers and the extensionist. As rogueing was also actively conducted like Shibairab, high pure seeds were harvested. If seed used at sowing time had been pure, the yield in this site would have been as high as about 3.5t/ha.

(4) Wad Alasha (2.0 feddans)

Sowing Date and Method：25/06, Seed driller	Re-sowing：Not implemented
Seeding rate and Space：30kg/fed, 25cm	First irrigation：27/06
Pre-irrigation：Completed	Irrigation interval：every 4-5 days (with Influence of Rainfall)
Pre-emergence herbicide：Used	Post-emergence herbicide：07-10/08
Hand weeding：①15/08	
Fertilization (N)：①15/07(Urea 50kg/fed) ②17/08(Urea 50kg/fed)	
Harvest Date：25/10	Yield：7916.5kg/ha

This demonstration farm is the place to grow rice for the first time. An extensionist at this farm has been working in the Project for a long time and is in charge of Wad Al Naim as well. The farmer's motivation was relatively high and rice field was so clean without weeds for the first half of cultivation. Rice rogues were high visible for the second half of maturity stage, but fertilization, irrigation and weed control were conducted properly.

The extensionist spontaneously opened Farmers' Field School in this farm in September 20. He conducted rice field visit and lectured about basic rice cultivation techniques from land preparation to harvest with original handouts to about 30 farmer participants. This kind of activity should be highly appreciated and considered one of the positive outcome of capacity building challenged by the Project.

Amazingly, this site achieved the yield of 7.9t/ha, although rice cultivation is for the first time. The main reasons for high yield are highly motivated farmers, fertile soil, high instruction skills

of extensionists and no flood damage. In addition, as this site is not seed production site, it is likely to lead to high yield that farmers had not actively been rogueing.

(5) Frejab (2.0 feddans)

Sowing Date and Method : 10/07, Seed driller	Re-sowing : Not implemented
Seeding rate and Space : 30kg/fed, 25cm	First irrigation : 12/07
Pre-irrigation : Completed	Irrigation interval : every 4-5 days (with Influence of Rainfall)
Pre-emergence herbicide : Not implemented	Post-emergence herbicide : 28/08
Hand weeding : ①14-18/08 ②8/9 ③4-5/10	
Fertilization (N) : ①17/08(Urea 50kg/fed)	
Others : Termite insecticide 14/09	
Harvest Date : 03/12	Yield : 470.1 kg/ha

The farmer in this site grows rice for the first time this year. Sowing was slightly late, because the availability of irrigation water started late. This farm, which is furthest from Wad Medani, is quite difficult to be monitored. It was expected that an extensionist actively and spontaneously instructs to farmers, as he had some-year experience with the Project. But in fact, as irrigation water was sometimes stopped for the second half of cultivation period, termite damage and stunted rice are observed as well as neglected weeding works. As a result, the yield of this site is the worst in all demo sites and seed production sites this year. The points to be improved are to select self-cultivating farmers who have highly motivated (not just land-owning farmers), to keep constant irrigation availability and to develop extensionists' awareness-raising. As a certain outcome was able to be achieved this year in remote area like Abdelrahman and Shibairab, Frejab is likely to be able to realize a same kind of outcome.

(6) Sowriba (2.0 feddans)

Sowing Date and Method : 23/06, Seed driller	Re-sowing : 25-26/07
Seeding rate and Space : 30kg/fed, 25cm	First irrigation : 08-09/07
Pre-irrigation : 06-07/06	Irrigation interval : every 4-5 days (with Influence of Rainfall)
Pre-emergence herbicide : 02/07	Post-emergence herbicide : Not implemented
Hand weeding : 22-24/07	
Fertilization (N) : Not implemented	
Harvest Date : －	Yield : －

This farm was located quite close to Wad Medani and had 2 extensionists. At first high yield was expected, but the Project was forced to stop cultivation, because a lot of birds had eaten rice seed after sowing. There was no way to recover from it.

- Seed Production / Demonstration Farm -

(1) Area 44, Block 9 (Rahad Scheme) (4.0 feddans)

Sowing Date and Method : 17-21/06, Seed driller	Re-sowing : Completed
Seeding rate and Space : 30kg/fed, 30cm	First irrigation : 28-30/06
Pre-irrigation : Completed	Irrigation interval : every 4-5 days (with Influence of Rainfall)
Pre-emergence herbicide : 28/06	Post-emergence herbicide : Used
Hand weeding : whenever it is necessary	
Fertilization (N) (Urea 50kg/fed) : ①19/08 ②the mid of August ③15/09	

Harvest Date：05/11	Yield：3468.2kg/ha

This farm has had the highest performance in Gezira State since our project started. The farmer has 4-year experience and achieved the yield of more than 5t/ha last year. Field Day was held 3 years ago and Vice President visited this farm last year.

This year, the first sowing was conducted at this farm in all demonstration farms and seed production farms. This farmer obtained the know-how of NERICA 4 cultivation and acquired high yield every year. As usual year, rice growth was extremely smooth until maturity stage. But a lot of rice rogues were observed from maturity stage, although all extensionists selected pure NERICA 4 seeds from mixed seeds by manual for off-season last year. The farmer made a hard work to remove rice rogues before harvest.

The farmer has acquired the techniques to achieve the yield of more than 3.0 t/ha constantly, although he was not able to obtain the yield more than last year's due to the rogueing. Field Day, which have not been held since 3 years ago, was held again in November this season. Field Day had the demonstration of rice harvest with a Japanese and a Chinese combine harvesters. The Egyptian Delegate for the third country training also satisfied with the rice grown at this site.

The positive points for constant high yield are to keep high soil fertility by manure, to supply water constantly and to make a weeding carefully. It is expected that the farmer in this site plays an important role of "Farmer to Farmer Extension".

(2) Wad Sawi (4.5 feddans)

Sowing Date and Method：01/07, Seed driller	Re-sowing：01/08
Seeding rate and Space：30kg/fed, 25cm	First irrigation：03-04/07
Pre-irrigation：Completed	Irrigation interval：every 4-5 days (with Influence of Rainfall)
Pre-emergence herbicide：Used	Post-emergence herbicide：Used
Hand weeding：①23/08 ②whenever it is necessary	
Fertilization (N)：①02/08(Urea 50kg/fed) ②24/08(Urea 50kg/fed) ③15/09(Urea 50kg/fed)	
Others：Termite insecticide 18/08	
Harvest Date：28-29/10	Yield：4377.5kg/ha

This farm is quite close to Faris where Field Day was held last year and the area to grow rice for the first time. A farmer had no experience for rice cultivation, but 2 extensionists have 3 to 4-year experience. At first it was anxious if a farmer who has no experience can grow rice in 4.5 feddans or not. But, he made weeding and regularly irrigated in tidy manner. Before harvest, rogueing was thoroughly conducted.

In spite of the first rice cultivation in this site, extremely high yield of 4.4t/ha was achieved like Wad Alasha (Seed Production). The reasons of high yield are not only fertile soil and farmers' high motivation but also inundation cultivation. Inundation is not an instruction by JICA experts, but an idea by extensionists. As a result, positive outcome was able to be realized.

(3) Frejab (4.0 feddans)

Sowing Date and Method：10/07, Seed driller	Re-sowing：Not implemented
Seeding rate and Space：30kg/fed, 25cm	First irrigation：25/07
Pre-irrigation：Completed	Irrigation interval：every 4-5 days (with Influence of Rainfall)
Pre-emergence herbicide：Used	Post-emergence herbicide：Used

Hand weeding：①26/08 ②whenever it is necessary	
Fertilization (N)：①the beginning of September ② 2/10	
Harvest Date：03/12	Yield：830.6 kg/ha

Like Frejab (demo site), this farm is furthest from Wad Medani. Sowing was slightly late, because the availability of irrigation water started late. The different points from Frejab (demo site) are that area is 4 feddans and that manure is applied before sowing. Although farmers are quite actively working, weeding and rogueing could not catch up with weed growth and irrigation was not available for some time in the second half of the cultivation. As a result, the yield of this site was the second worst this year after Frejab (Demo).

Although there is an example that high yield was achieved in the first year like Wad Sawi, it might be recommend that cultivation area in the first year should be maximum 2 feddans, and that weeding and irrigation should be steadily conducted. Other points to be improved are same as Frejab (Demo site), which is to select self-cultivating farmers who have highly motivated (not just land-own farmers), to keep constant irrigation availability and to develop extensionists' awareness-raising.

(4) Wad Al Naim (4.0 feddans)

Sowing Date and Method：25/06, Seed driller	Re-sowing：15/07
Seeding rate and Space：30kg/fed, 25cm	First irrigation：27-28/06
Pre-irrigation：Completed	Irrigation interval：every 4-5 days (with Influence of Rainfall)
Pre-emergence herbicide：Used	Post-emergence herbicide：0.5L/fed, 08/08
Hand weeding：①15/08 ② whenever it is necessary	
Fertilization (N)：①23/07(Urea 50kg/fed) ②19/08(Urea 50kg/fed)	
Harvest Date：21-22/10	Yield：4586.1kg/ha

There was no rice cultivation in this site last year, but the cultivation has begun again this year. "The Field Day" was held at this site 2 years ago.

Out of 4 feddans, 2 feddans were suitable condition for seed production, which had less rice rogues, but another 2 feddans had a lot of rice rogues and could not be used for seed production. The advantage of this site was to supply water constantly and to give less damage from drought and termites.

Even if the farmer and the extensionist at this farm had some-year experience and were jointly working hard, it seems difficult to manage 4 feddans for seed production. The measurement to produce more pure seed is most likely to make cultivation area smaller like 1 feddan and to purify seed more accurately by manual selection.

The yield of about 4.6t/ha results from the rice cultivation experience of farmers and extensionists. As this site is one of the two major demo sites in Gezira State paralleled with Area 44, Block 9 in terms of rice cultivation performance, it is possible for this farm to produce high qualitative rice seeds constantly, if rogueing thoroughly next season.

(5) Wad Alasha (3.5 feddans)

Sowing Date and Method: 27/07, Seed driller	Re-sowing：10/07
Seeding rate and Space：30kg/fed, 25cm	First irrigation：30/06
Pre-irrigation：Completed	Irrigation interval：every 4-5 days (with Influence of Rainfall)

Pre-emergence herbicide：Used	Post-emergence herbicide：0.5L/fed, 07/08
Hand weeding：①06-07/08 ②17-18/08 ③20-22/9	
Fertilization (N) (Urea 50kg/fed)：①23/07, 08/08 ②20/08 ③12/09	
Harvest Date：26-27/10	Yield：4488.7kg/ha

This farm is located close to Wad Alasha (Demo site). At first 2 extensionists were assigned, but 2 more extensionists who were in charge of Sowriba were re-assigned to this farm. These 4 extensionists have big competent for rice cultivation. Because they have work experience in our Project for 4-6 years and have taken rice cultivation training courses in Japan, Uganda and Egypt.

Although this farmer grows rice for the first time this year, extensionists are often visiting the farm and instructed carefully. Therefore, fertilization, irrigation, weeding were properly implemented until maturity stage. From the second half of maturity stage, rice rogues grew eminently. Thus the farmer was thoroughly removing rice rogues.

The high yield of 4.5t/ha resulted from farmers' high motivation and extensionists' gentle and accurate instruction skills, like Wad Sawi and Wad Alasha (Demo site). This is precisely because high yield cannot be realized in the first year without farmers' efforts and extensionists' proper instruction. It is clearly identified this year that useful instruction skills by extensionists as well as farmers' motivation are indispensable in order to introduce new crops like rice.

(6) UmBarona（1.0 feddan）

Sowing Date and Method：22/06, Seed driller	Re-sowing：07/07
Seeding rate and Space：25kg/fed, 30cm	First irrigation：24/06
Pre-irrigation：Completed	Irrigation interval：every 4-5 days (with Influence of Rainfall)
Pre-emergence herbicide：24/06	Post-emergence herbicide：Not implemented
Hand weeding：①28/07, ②20/08, ③whenever it is necessary	
Fertilization (N)：① 02/08、② 23/08	
Others：Termite insecticide 09/07	
Harvest Date：19-20/10	Yield：2717.8kg/ha

This seed production farm was using a spare space of trial field in the horticulture research center. In this farm, soil fertility was not equal because of the removal of top soil by field levelling. Thus, rice in unfertile soil is stunted. But as a whole, rice growth is almost the same level as other seed production farms. Irrigation and fertilization works were appropriate. The problem was that the whereabouts of responsibility for cultivation management was vague, this was partly because this farm was not farmer's field and partly because extensionists in charge of trial field were not cooperatively and spontaneously working each other. As a result, weeding and rogueing were sometimes lagged.

The yield of 2.7t/ha might be seemingly not low, but more yield, in a sense, should have been realized, at least 3.0t/ha. This was partly because this site is only 1 feddan and located near project office and partly because all extensionists were completely familiar with rice cultivation management through daily field works in trials. It is really needed that the whereabouts of responsibility for each activity should be cleared.

＜Sennar State＞

(1) Maiurno South (2.5 feddans)

Sowing Date and Method : 27/06, Seed Driller	Re-sowing : 28-30/07
Seeding rate and Space : 30kg/fed, 30cm	First irrigation : 04-13/07 (by Pump & Canal)
Pre-irrigation : Not implemented	Irrigation interval : 1time/7days→1time/3days (with influence of Rainfall)
Pre-emergence herbicide : 1.5L/fed, 04-06/07	Post-emergence herbicide : 0.5L/fed, 11/08
Hand weeding : ①26-30/07 ②09-10/08 ③26-27/08 ④06-09/09 ⑤28/09	
Fertilization (N) : ①12/08(Urea 50kg/fed) ②14/09(Urea 50kg/fed)	
Harvest Date : 15/11	Yield : 601.6kg/ha

Preceding crop was Sorghum. Accessibility was good because this site is located near the main road. Irrigation can be done by utilizing canal from sugar cane farm and/or diesel pump of neighbouring farmer.

First harrowing was done on 10/03, plowing by chisel plow was executed on 14/04 and fertilization (organic fertilizer and TSP) was implemented on 30/05. Pre-irrigation was not able to be implemented because of insufficient irrigation water.

In June, only ridging was executed for pre-irrigation, but rainfall was ready to start, so harrowing and levelling were conducted without implementing pre-irrigation and then sowing was done on 27/06.

At the beginning of August, rice growth was not bad, but missing hills at lower places caused by uneven land levelling and improper sowing operation were observed. A lot of weeds such as broad leaf type were observed in spite of weeding by extensionists on 26-30/07. Herbicide (2,4-D) was sprayed on11/08 and first fertilization (Urea, 50kg/fed) was done on 12/08 and then irrigation was implemented. Irrigating water thorough canal of sugar cane farm was realized. It solved the problem on water availability. At the end of August, rice growth was generally good although different growth between first sown rice and re-sown rice was observed with missing hills. Weeding must be completed at this time and reshaping ridges was necessary for proper irrigation.

At the beginning of September, rice growth was fairly good although missing hills were observed despite of re-sowing by extensionists. Field was generally kept clean due to hand weeding by them under rainy condition. Complete reshaping of ridges and canal for proper water management and thorough weeding to avoid competition on water between rice and weeds were required. After finishing these operations, second fertilization must be done as soon as possible. Second fertilization was implemented on 14/09.

At the beginning of October, rice growth was not bad, but missing places were not recovered in spite of conducting re-sowing eventually. Although organic fertilizer was applied at land preparation to improve soil fertility and to accelerate rice growth, the effectiveness was not observed clearly. The reason must be clarified for utilizing organic fertilizer on upland rice cultivation. Non-uniform maturity was observed because of existence of off-type plants which have longer maturity period than NERICA 4. Continuing irrigation was required. Panicles of NERICA 4 must be selected and harvested (panicle reaping) to keep pure seeds for next season because it was difficult to remove all off-type plants which grow at any places.

In the mid of November, late harvesting due to implementing Field Day event caused over-maturity of rice. Realizing proper growth, reducing missing hills and conducting complete

weeding must be done next season to obtain better result. Crop cut yield survey was conducted on 26/10 and harvesting was implemented on 15/11 by combine-harvester (on Field Day event).

(2) Almahlaj (2.5 feddans)

Sowing Date and Method : 22/06, Seed Driller	Re-sowing : ①14/07 ②28-30/07 ③06/08
Seeding rate and Space : 30kg/fed, 30cm	First irrigation : 28/06-02/07
Pre-irrigation : ①09/03 ②21/03	Irrigation interval : 1time/7days→1time/3days (with influence of Rainfall)
Pre-emergence herbicide : 1.5L/fed, 25/06	Post-emergence herbicide : Not implemented
Hand weeding : ①05-06/08 ②26/08 ③22/09	
Fertilization (N) : ①03/09(Urea 50kg/fed, 2.0 feddan) ②10/09(Urea 50kg/fed, 0.5feddan) ③ 06/10(Urea 50kg/fed, 2.0feddan) ④11/10(Urea 50kg/fed, 0.5feddan)	
Harvest Date : 27-30/11	Yield : 734.7kg/ha

Preceding crop was Sorghum. This site was located in Kassab Scheme. It was thought that accessibility to the field was not good, but better than that to the site of last season in this scheme. Pre-irrigation, plowing by chisel plow, fertilisation (TSP) and levelling were done on 09/03, on 14/04, on 25/05 and on 28/05 respectively. Implementing second levelling at crosswise direction and weed control on perennial grass were instructed by experts.

In June, nothing was done even just before starting rain. Second levelling was implemented twice on 10/06 and on 12/06, and sowing was executed on 22/06, but it took 5days to complete first irrigation because of insufficient water in canal. It was made clear that this site has problem on water availability. A lot of weeds such as perennial grass already appeared, so implementing early weeding was strongly recommended.

At the beginning of August, first sown rice did not grow completely. The reasons were such as damage by birds, deep sowing, and death caused by lack of water in the soil after germination with soil moisture. Seedling emergence of re-sown seeds in July was generally good, but non-uniform germination was observed. Weeds already covered most of the field. Quick and complete weeding must be started as soon as possible and reshaping ridges for proper water management was required. At the end of August, different growth between first re-sown rice and third re-sown rice was very clear due to implementing third re-sowing on 06/08. Dividing the places to two parts by big ridge for implementing management separately was instructed.

In September, non-uniform growth because of several re-sowing operation was observed. First fertilisation at first re-sown place (2.0 feddan) was conducted on 03/09 and at second re-sown place (0.5 feddan) on 10/09. Implementing thinning at dense sowing places, proper cultivation management was required for accelerating rice growth.

At the beginning of November, rice growth was not bad, but non-uniform growth was observed because of different time of re-sowing. Second fertilization at first re-sown place was executed on 06/10 and at second re-sown place (in August) on 11/10.

In the mid of November, although rice growth was not so bad, a lot of off-type plants were observed in the field. Under this condition, it was thought that complete removing of off-type plants was impossible. After discussion with the staff of SMoA, it was decided that panicle of NERICA 4 must be harvested as much as possible to get pure seeds instead of removing off-types plants. Crop cut yield survey was implemented on 16/11 and harvesting was executed on 27-30/11.

(3) Almergani (2.5 feddans)

Sowing Date and Method : 21/06, Seed Driller	Re-sowing : ①12/07 ②28-30/07
Seeding rate and Space : 30kg/fed, 30cm	First irrigation : 27-28/06
Pre-irrigation : ①09/03 ②21/03	Irrigation interval : 1time/7days→1time/3days (with influence of Rainfall)
Pre-emergence herbicide : 1.5L/fed, 23/06	Post-emergence herbicide : Not implemented
Hand weeding : ①12-22/07 ②29/7 ③06-07/08 ④14/08 ⑤16/09	
Fertilization (N) : ①24/08(Urea 50kg/fed) ②17/09(Urea 50kg/fed)	
Harvest Date : 15/11	Yield : 1890.6kg/ha

Preceding crop was Sorghum. This site was also located in Kassab Scheme like Almahlaj site. Access road and irrigation canal passed beside the site. Pre-irrigation was conducted twice on 09/03 and on 21/03. First harrowing, fertilization (organic fertilizer and TSP), second harrowing and levelling were implemented on 10/05, on 24-25/05, on 25/05 and on 28/05 respectively.
In June, second levelling at crosswise direction was executed twice on 10/06 and on 18/06, and then sowing was done on 21/06. Pre-emergence herbicide was sprayed on 24/06 and 1st irrigation was finished on 28/06.

At the beginning of August, growth of first sown rice was observed, but the number and growing situation were not satisfactory level. Re-sowing was done twice in July and uneven seedling emergence and different growth between first sown rice and re-sown rice were apparent. Weeding was already started, so field condition was better than Almahlaj site. Completing weeding and implementing 1st fertilization (Urea, 50kg/fed) with proper irrigation were required and then 1st fertilization was done 24/08. Damage by termites must be observed continuously and even after irrigation, if it will expand the area, insecticide must be sprayed as soon as possible and then must be irrigated. Continuous weeding, reshaping ridges and implementing 2nd fertilization were instructed by experts.

In September, rice growth itself was fairly good, although different growth between first sown rice and re-sown rice became obvious. When conducting re-sowing, seeding rate was so high and then competition on water and nutrient was started. Therefore, thinning operation was instructed at dense seeding places, and then it was started immediately by extensionists and farmers. Implementing complete weeding, 2nd fertilization and proper irrigation were required. Second fertilization was conducted on 17/09.

At the beginning of October, rice growth was generally good and number of plants was high like dense growth, but huge amount of off-type plants was observed. It caused non-uniform maturity in the field. It can be said that if complete removing of off-type plants is conducted, half of plants in the field will be removed. It should be impossible and reduce yield dramatically. Therefore, from the viewpoint of obtaining pure seed, selecting and harvesting NERICA 4 as much as possible was instructed.

In the mid of November, rice growth was good, but non-uniform maturity because of off-type plants was observed more widely and seriously. Conducting proper weeding by extensionists and farmer kept the field clean up to the harvest time. Lodging at dense sowing places was observed. Crop cut yield survey was implemented on 07/11 and harvesting was executed on 15/11 by combine-harvester from Gezira State.

＜Gedaref State＞

(1) Al Fau : ARC (2.0 feddans)

Sowing Date and Method : 18/06, Seed Driller	Re-sowing : 20/07

Seeding rate and Space：30kg/fed, 30cm	First irrigation：27/06
Pre-irrigation：Not implemented	Irrigation interval：1time/7days→1time/3days (with influence of Rainfall)
Pre-emergence herbicide：1.5L/fed, 27/06	Post-emergence herbicide：Not implemented
Hand weeding：①16/07 ②30/07 ③16/08 ④29/08 ⑤08/09	
Fertilization (N)：①21/07(Urea 50kg/fed) ②17/08(Urea 50kg/fed)	
Harvest Date：01/11	Yield：1888.7kg/ha

Preceding crop was Sunflower. This site was located in Rahad Scheme and belongs to ARC Rahad Research Station. Due to insufficient water in irrigation canal at the beginning of June, Pre-irrigation was not able to be implemented. Executing sowing at optimum had priority over executing pre-irrigation in consideration of influence of heavy rain on rice. Plowing by chisel plow, fertilization (organic fertilizer, TSP) and harrowing were conducted on 15/05, on 07/06 and on 08/06 respectively. Sowing was done on 18/06, and dividing small plots due to uneven land level was required.

At the beginning of August, rice growth was generally good, although uneven growth was observed. Early growth was not satisfactory level in spite of applying organic fertilizer (2,500kg/fed) to improve soil fertility. Damage by termites was observed at several places and spraying insecticide to limit damage was executed on 06/08, and then irrigation was conducted. 1st weeding, 1st fertilization (Urea, 50kg/fed) and 2nd weeding were conducted on 16/07, on 21/07 and 30/07 respectively. 2nd fertilization was done on 17/08. At the end of August, water was kept in the field, but because of uneven land level, water was not able to cover the field uniformly. Iron toxicity was observed at lower place due to continuous submerged condition and to drain water and to irrigate it again with oxygen for limiting damage by iron toxicity were instructed.

In September, rice growth was not so bad, but irregularity of growth was apparent. Rice already entered heading stage. Keeping water in the field was strongly instructed to avoid occurrence of empty grains without conducting 3rd fertilization. A lot of off-type plants were observed in the field and it was thought that complete removing off-type plants was impossible. Selecting the area based on the necessary amount of seed next season and removing off-type plants thoroughly at this limited area (ex, 20m × 20m) were instructed to obtain pure seeds.

At the end of October, selecting and harvesting panicles of NERICA 4 to keep pure seeds instead of removing off-type plants were conducted continuously, but it seemed to be very difficult to distinguish NERICA 4 from off-type plants because off-type plants also started maturity. Continuing harvesting NERICA 4 was instructed by showing the both grains to identify the different characteristics between NERICA 4 and off-type plants such as grain shape, grain colour. Crop cut yield survey was implemented on 27/10 and harvesting was executed on 01/11 by combine-harvester from Gezira State before conducting Field Day event on 02/11.

(2) Al Fau : Farmer 1 (2.0 feddans)

Sowing Date and Method：02/07, Seed Driller	Re-sowing：①05-10/08 ②16/08
Seeding rate and Space：30kg/fed, 30cm	First irrigation：20-27/07
Pre-irrigation：Not implemented	Irrigation interval：1time/7days→1time/3days (with influence of Rainfall)
Pre-emergence herbicide：1.5L/fed, 19/07	Post-emergence herbicide：Not implemented
Hand weeding：①05-10/08 ②18-22/08 ③28/08 ④21/09	
Fertilization (N)：①23/08(Urea 50kg/fed) ②06/10(Urea 50kg/fed)	
Harvest Date：26-29/11	Yield：1052.8kg/ha

Preceding crop was Groundnut. This site also was located in Rahad Scheme. There was some problem on accessibility, especially rainy season. Pre-irrigation was not implemented due to insufficient and unstable water in irrigation canal in June. Plow by chisel plow, fertilization (organic fertilizer and TSP) first harrowing and second harrowing were conducted on 21/05, on 31/05, on 02/06 and on 04/06 respectively. Sowing was delayed because of lack of irrigation water in canal. It can be said that this site has problem on water availability. Eventually, sowing was implemented on 02/07.

At the beginning of August, lack of water affected not only sowing at optimum time but also executing of 1st irrigation. It took 18days to start first irrigation after sowing. Tremendous poor seedling emergence and non-uniform germination were observed. This site itself has slope, but improper sowing operation created uneven land condition and it impeded uniform irrigation in the field, and eventually, it caused tremendous poor seedling emergence and non-uniform germination. For implementing proper management, dividing plots according to uneven condition, remaking ridges, implementing re-sowing and executing weeding at higher places were required. Weeding and re-sowing were conducted on 05-10/08. After second weeding, first fertilization (Urea, 50kg/fed) was conducted. However, dividing plots as the most important operation was not conducted at all. Seedling emergence of re-sown rice was observed, but a lot of weeds appeared and huge number of missing hills caused by poor seedling emergence was observed. Immediate and concrete actions must be done for improving this kind of miserable situation. Number of growing rice plants was low, but the growing plants must be supported in all possible way.

In September, the number of growing rice plants was still low, but they developed well. It improved field condition gradually with weeding. Farmer worked this time in the field and accepted to implement various important operations in order to improve field and rice situation. After visiting and observing good growing rice plants in field 'Farmer 2', the farmer promised to try to do his best for his field. Although from 08/09, he started to remake ridges for proper water management and implemented 4th weeding on 21/09、it was not observed significant progress of the operations generally for improving field condition.

At the end of October, there was no water in the field due to breakdown of pump for irrigation. Although missing places, weeds and damage by termites were observed widely, field and rice condition seemed to be improved in comparison with last visit. It was stressed strongly to cultivation farmer at the field that if he started and continued proper management at early stage, the condition should be much better. To start selecting and harvesting NERICA 4 as panicle reaping was required because it was easy to distinguish NERICA 4 which was in maturity stage from off-type plants which was in heading stage. Crop cut yield survey was implemented on 18/11 and harvesting was executed on 26-29/11.

(3) Al Fau : Farmer 2 (2.0 feddans)

Sowing Date and Method : 25/06, Seed Driller	Re-sowing : 12/07
Seeding rate and Space : 30kg/fed, 30cm	First irrigation : 27-28/06
Pre-irrigation : Not implemented	Irrigation interval : 1time/7days→1time/3days (with influence of Rainfall)
Pre-emergence herbicide : 1.5L/fed, 26/06	Post-emergence herbicide : Not implemented
Hand weeding : ①11/07 ②21-23/07 ③02-05/08 ④19-20/08 ⑤30/08	
Fertilization (N) : ①23/07(Urea 50kg/fed) ②16/08(Urea 50kg/fed)	
Harvest Date : 02/11	Yield : 3996.1kg/ha

Preceding crop was Groundnut. This site also was located in Rahad Scheme. First Rice Field

Day event in Gedaref State was conducted in this farmer's field in 2014, but actual whole yield (1.9t/ha = 0.8t/fed) was not high in comparison with that (5.5t/ha = 2.3t/fed) of farmer who also cultivated in Rahad Scheme in Gezira State. This season, this farmer in Gedaref State decided to cultivate upland rice again and aim for obtaining higher yield, especially yield per unit area through proper cultivation management. Access to the field was not bad and the field has no serious problem on water availability. Land preparation was executed rapidly and sowing was done on 25/06. Formulating smaller plots by making ridge inside the field was required.

At the beginning of August, rice growth was not bad although missing hills and non-uniform growth caused by improper sowing operation were observed. Smaller plots were formulated by farmer and re-sowing was conducted on 12/07. After weeding, weeds must be moved out of the field because remained weeds became 'houses' of termites. First fertilization (Urea, 50kg/fed) was implemented on 23/07. Complete weeding was required because tough and fertile weeds expanded inside field. Second fertilization was conducted on 16/08 and irrigated water in the field. At the end of August, rice growth was good and was in booting stage. Rice in this stage was keenly sensitive to lack of water and insufficient water caused occurrence of huge amount of empty grains. Executing irrigation immediately and keeping water were strongly required to farmer directly.

In September, rice growth was good and was in full heading stage. However, water was not kept in the field. The importance of irrigation and keeping water in this stage was explained to extensionists and farmer repeatedly, and then farmer started to irrigate water promptly. Rice plants became taller than weeds and they can avoid damage by weeds under this condition. To avoid lodging, third fertilization was not executed and water management was regarded as key operation to obtain good result. 'Grain rot' was observed in this field and this disease is seed transmission disease. Therefore, harvested rice from this field should not be used as seed next season. If rice from this field is used as seed, damaged grains must be removed completely. Off-type plants also were observed in this field and practical concrete procedure to obtain high purity seed for next season must be considered.

At the end of October, although lack of water in the field from booting to heading stage was observed, rice plants became good maturity condition under proper management. Lodging was observed at several paces. Off-type plants were observed due to poor roguing, but better yield was expected rather than that of last season. Crop cut yield survey was implemented on 25/10 and harvesting was executed on 02/11 by combine-harvester from Gezira State on Field Day event at second time for this farmer's field.

(4) Shuwak : Ministry (2.0 feddans)

Sowing Date and Method：14-16/06, Hand	Re-sowing：①25-26/06 ②01/07
Seeding rate and Space：30kg/fed, 30cm	First irrigation：17/06
Pre-irrigation：①10/03 ②28/03	Irrigation interval：1time/7days→1time/3days (with influence of Rainfall)
Pre-emergence herbicide：1.5L/fed, 16/06	Post-emergence herbicide：0.5L/fed, 14/08
Hand weeding：①06/07 ②26/07 ③13-14/08 ④31/08	
Fertilization (N)：①07/07(Urea 50kg/fed) ②29/07(Urea 50kg/fed)	
Harvest Date：12-15/10	Yield：777.3kg/ha

Result of yield survey by sampling indicated high yield potentiality of this field. Based on the cultivation experience of past three seasons, non-uniform growth was considered as most serious problem to be solved in this site. It was thought to be because of soil characteristic and mainly uneven soil fertility in the field. Needless to say that each cultivation management was important, but to realize uniform growth at all area in this field was key point to obtain high

yield. Therefore, some amount of organic fertilizer (100kg/fed) was applied at land preparation to solve the problem in 2014. It showed gradually improvement of uneven soil fertility. This season, organic fertilizer (500kg) was applied the same as 2014. After conducting pre-irrigation twice on 10/03 and 28/03, non-selective herbicide 'Glyphosate' was applied to control perennial grass. Plowing, fertilization (TSP), fertilization (organic fertilizer) were executed on 05/05, 18/05 and on 21/05 respectively. Then harrowing was done on 22/05 and levelling was done on 29/05. After plotting, hand sowing by using 'Karack' (a forked-rake for rice drill-planting) was implemented on 14-16/06. Extensionists confirmed the importance of realizing uniform growth by cultivation management, especially by fertilization of Urea. Insecticide for termites was already sprayed on 30/06 without informing experts on dosage and timing. The amount of seed for each plot must be calculated based on the size (area) of each plot after measuring. The importance of sowing at optimum seeding rate was stressed to extensionists to avoid poor growth by low and high density. Several types of weeds started to cover the field, so after implementing thorough (intensive) weeding, executing first fertilisation especially on poor growth area was instructed.

At the beginning of August, seedling emergence rate was generally good although uneven germination and missing plants were observed without calculation of amount of seed for each plot. Non-uniform growth was observed in the field as a whole and even in each plot as with 2014. First hand weeding was implemented on 06/07 and first fertilization according to growth condition was conducted on 07/07. After second weeding on 26/07, second fertilization was implemented on 29/07, but a lot of weeds were observed. It was confirmed to the extensionists that fertilization has proper timing and optimum dosage based on the growth condition. This point must be considered before applying fertilizer. Second re-sowing was done on 01/07, but damage by termites became more serious issue than missing hills. To minimize the damage by termites, it was required that weeds must be moved out of the field after weeding and insecticide must be sprayed again (second spraying had no problem, because already passed more than one month from first spraying), and then irrigation must be done. Insecticide for termites was sprayed on 04/08 and irrigation was done. Third weeding was implemented on 13-14/08. When visiting the site on 26/08, damage by termites was stopped, but irregularity of the growth became much more apparent. Some plants already started heading. Sufficient weeding inside/outside plots was required.

In the mid of September, uneven growth and non-uniform maturity were observed because of mixing of off-type plants which have longer growth period than NERICA 4. Although 4th weeding was done on 31/08, weeds such as perennial grass were observed several places. Rice plants in heading stage required a lot of water, so it is important to finish complete weeding before heading stage to avoid competition on water between rice and weeds. Lots of off-type plants were observed. NERICA 4 started maturity and off-type plants just started heading. Therefore, now it was easy to distinguish NERICA 4 from off-type plants, so it was suitable time for harvesting necessary amount of grains of NERICA 4 to obtain and keep as seed for next season. To start and finish harvesting NERICA 4 at selected area was required to extensionists. This operation was conducted as panicle reaping of NERICA 4 from 19-21/09.

In October, panicle reaping of NERICA 4 was conducted on 6/10 again and crop cut yield survey was implemented on 11/10. Lodging was observed widely in the field. To avoid occurrence of disease in the lodging rice plants to damage the quality under high humidity, start to harvest was instructed to extensionists. Under consideration of difficulty of realizing uniform growth in this field, even if utilizing organic fertilizer, reducing cultivation area of next season was considered with staff of SMoA. Harvesting at whole area was executed on 12-15/10.

＜River Nile State＞

(1) Atbara 1 (1.0 feddan)

Sowing Date and Method：15/06, Seed Driller	Re-sowing：04/07
Seeding rate and Space：30kg/fed, 30cm	First irrigation：17/06
Pre-irrigation：11/05	Irrigation interval：1time/7days→1time/2days (with small influence of Rainfall)
Pre-emergence herbicide：1.5L/fed, 17/06	Post-emergence herbicide：Not implemented
Hand weeding：21/07	
Fertilization (N)：①21/07(Urea 50kg/fed) ②17/08(Urea 50kg/fed) ③15/09(Urea 50kg/fed)	
Harvest Date：06-10/11	Yield：1912.3kg/ha

Preceding crop was Sorghum. This farmer has three-year experiences on upland rice cultivation since 2012. Pre-irrigation, plowing by disk plow, fertilization (TSP) with harrowing and levelling were implemented on 11/05, 27/05, 03/06 and 09/06 respectively. First Rice Field Day event was conducted in his field in 2014 and he must be core farmer on upland rice cultivation in this State. When visiting the site on 14/06, quality of land preparation including levelling was good. Seed driller was already prepared. After checking seeds, grains of off-type plants were observed, so to check and to remove off-type plants after sowing in the field during the season were confirmed to the extensionists. Sowing was done on 15/06 as planned. Then plotting, herbicide application and 1st irrigation were conducted. When visiting on 30/06, seedling emergence was not bad, but missing hills were observed. Implementing re-sowing, irrigation, weeding and fertilization was required to extensionists and farmer.

At the beginning of August, rice growth was generally good, but missing hills were observed due to non-uniform seedling emergence and damage by termites in spite of conducting re-sowing on 04/07. First weeding was done on 21/07 and then first fertilisation (Urea, 50kg/fed) was conducted. Damage by termites expanded, so spraying insecticide to minimize it and implementing irrigation after spraying were required. Conducting second fertilisation also was required. To avoid damage (attack) by birds, it is indispensable to protect rice by net in this State. Therefore, the Project provided the nets and pipes and explained to the extensionists how to set up the nets properly. Insecticide for termites was sprayed on 10/08 and second fertilization was conducted on 17/08.

In the mid of September, rice growth was not bad and rice entered full heading stage. Rice plants from booting to heading stage were quite sensitive to lack of water and insufficient water caused occurrence of a lot of empty grains. Soil was wet, but wet condition was not enough. The field must be kept submerged condition. According to system of the scheme, to irrigate water was impossible on Friday and Saturday. Therefore, it was imperative to irrigate and keep water in the field as much as possible on Thursday under high temperature condition in this State. Executing irrigation as soon as possible and keeping water were strongly required to extensionists and farmer. Obtaining pure seeds from the field is very important, but obtaining filled grains as much as possible is more important in consideration of actual field situation.

At the end of October, there was no water in the field because of irrigation schedule/system of this scheme. Non-uniform maturity due to mixing with off-type, weeds and white head because of insufficient irrigation water were observed. Panicle reaping of NERICA 4 for obtaining pure seeds was implemented by extensionists, but continuing the operation was required due to poor amount. The extensionists recognized that if keeping enough water from panicle initiation to heading stage was conducted more early, occurrence of empty grains should be limited surely. To avoid high temperature from panicle initiation to heading stage, implementing sowing, not in June, at the end of July or at the beginning of August was considered with staff of SMoA.

Panicle reaping was conducted soon based on the instruction. Crop cut yield survey was implemented on 02/11 and harvesting was executed on 06-10/11.

(2) Atbara 2 (1.0 feddan)

Sowing Date and Method : 15/06, Seed Driller	Re-sowing : ①25/06②30/06-02/07③28/07
Seeding rate and Space : 30kg/fed, 30cm	First irrigation : 16/06
Pre-irrigation : Not implemented	Irrigation interval : 1time/7days→1time/2days (with small influence of Rainfall)
Pre-emergence herbicide : 1.5L/fed, 16/06	Post-emergence herbicide : 10/07
Hand weeding : ①08-09/07 ②19-21/07	
Fertilization (N) : ①14/07(Urea 50kg/fed) ②17/08(Urea 50kg/fed) ③15/09(Urea 50kg/fed)	
Harvest Date : 04-08/11	Yield : 1189.3kg/ha

Preceding crop was Sorghum. This is first season for this farmer to cultivate upland rice. Plowing by dick plow was executed by farmer himself on 01/04. First fertilization (TSP) and harrowing were done on 07/06, and leveling was conducted on 09/06. When visiting the site on 14/06, quality of land preparation, especially levelling was generally good. Farmer made plots to be suitable for rice because he understood the characteristic of his field well. Explanation on off-type plants was executed by the experts. Sowing was done on 15/06 and 1st irrigation was implemented on 16/06 after spraying herbicide. When visiting on 30/06, seedling emergence rate was low because of deep sowing, insufficient cleaning operation of seeds and lack of irrigation water. Re-sowing was started by farmer on 25/06. It seems that high temperature also affected germination of seeds. Second re-sowing was implemented by extensionists and farmer to cover the missing area.

At the beginning of August, re-sowing was conducted several times and germination of re-sown seeds was not bad, but damage by birds was observed. The growth between first sown rice and re-sown rice was different and cultivation management must be changed based on the difference. First weeding was executed on 08-09/07, but weeds were observed at several places. Herbicide (2,4-D) was sprayed on 10/07, insecticide for termites was sprayed on 11/07 and 1st fertilization (Urea, 50kg/fed) was executed on 14/07. The characteristic symptom of insufficient water was observed and implementing frequent irrigation after weeding was instructed. Second fertilization was implemented on 18/08.

In the mid of September, first sown rice was in heading stage although there was big difference between first sown rice and re-sown rice. When visiting the site on 12/09, the soil of the field was dry because last irrigation was implemented on 09/09. It means that under this high temperature condition, irrigation was not executed for in a row 3 days. Extensionists provided instruction on irrigation to farmer (original farmer went to abroad), but they did not visit the site to check it. To take attention on the symptom on tips of leaf (change of the colour) was understandable, but they forgot to implement basic important operation such as keeping water in the field to avoid empty grains especially just after the heading stage under high temperature condition. It caused serious damage on filling the grains process. We must try to do our best to get better result for farmer who is interested in upland rice cultivation.

At the end of October, there was water in the field, but it was not enough at this time. It was not easy to distinguish NERICA 4 from off-type plants because off-type plants also started maturity like NERICA 4. Panicle reaping of NERICA 4 was conducted by extensionists, but the amount was very small, so continuing panicle reaping was required carefully. Damage by birds was observed because birds-net was not set up appropriately. Checking the nets was instructed. Shifting sowing time from June to July or August must be considered and executed to avoid high temperature from panicle initiation to heading stage for limiting occurrence of empty

grains. This is the first time for this farmer to cultivate upland rice and he worked well in the field based on the instructions from extensionists. Therefore, it is expected that this farmer cultivate upland rice next season again under better situation such as proper sowing time, etc. However, from the viewpoint of water availability of this filed in this scheme, selecting other sites also need to be considered to realizing good result. Anyhow, extensionists must understand the meaning of proper water management and will not repeat same mistake next season on water management. Crop cut yield survey was implemented on 02/11 and harvesting was executed on 4-8/11.

(3) Kanour (1.0 feddan)

Sowing Date and Method : 16/06, Seed Driller	Re-sowing : ①04/07 ②28/07
Seeding rate and Space : 30kg/fed, 30cm	First irrigation : 27/07 (Partially)
Pre-irrigation : 01/04	Irrigation interval : 1time/7days→1time/2days (with small influence of Rainfall)
Pre-emergence herbicide : 1.5L/fed, 17/06	Post-emergence herbicide : Not implemented
Hand weeding : Implemented as needed (Glyphosate was already sprayed on 19/04)	
Fertilization (N) : ①15/07(Urea 50kg/fed) ②12/08(Urea 50kg/fed) ③10/09(Urea 50kg/fed)	
Harvest Date : N/A	Yield : N/A

Preceding crop was Wheat. This is first season for this farmer also to cultivate upland rice. Pre-irrigation, plowing by disk plow, fertilization (TSP) with harrowing levelling by laser leveller were implemented on 01/04, on 10/05, on 17/05 and on 27/05 respectively. When visiting the site on 14/06, top soil was moved by laser leveller and hard surface of the soil at several places appeared. Under this condition, sowing operation by seed driller was not able to be implemented because the surface of the soil was very hard. Re-harrowing was implemented to soften the soil on 14/06 and levelling was done by normal scraper on 15/06, and then sowing was executed on 16/06. Effective utilization method of laser leveller must be considered because this is second time on misusing laser leveller as with 2014. The Project highly appreciated to implement second harrowing immediately after receiving instructions. However, when visiting the site on 30/06, seedling emergence rate was low in spite of the efforts by extensionists and farmer. The reason of low germination rate was thought to be mainly deep sowing. Under high temperature condition, finishing re-sowing as soon as possible and increase the irrigation frequency were instructed to extensionists.

At the beginning of August, re-sowing was executed on 04/07 and on 28/07, and then first fertilisation (Urea, 50kg/fed) was done 15/07. Although there were missing hills and non-uniform growth, rice growth was very good. Field was kept clean condition by frequent weeding by farmer as needed. Advantage on water availability of this site also contributed to accelerating rice growth. Damage by termites was observed and keeping enough irrigation was instructed to extensionists. This good condition of rice was regarded as fruit of daily effort by extensionists and farmer under high temperature condition. Set-up method of bird net was explained.

In the mid of September, rice was in full heading stage, but water was not kept in the field. Although extensionists irrigated water frequently (almost every two days per week), soil was dry and most of the grains already became empty under high temperature condition. There were small amount of re-sown rice plants, but they also received damage by lack of water. Even if we irrigate water fully in the field, empty grain cannot be filled-grain from this situation. Farmer had to abandon his harvest this season. It can be said that assigned extensionists to this site did their best from land preparation for getting good result and they recognized the importance of water, but they were not able to understand correctly what the most important thing for rice plants was at each time. It is imperative to continue practical training (OJT) to enable them to

acquire proper judgment and take appropriate action. Cropping calendar in high temperature area must be considered thoroughly. In addition, from the viewpoint of water availability, searching and selecting other sites where irrigation water can be obtained at suitable time for proper water management must be considered by SMoA.

＜Northern State＞

(1) Dongola Island (1.0 feddan)

Sowing Date and Method : 26/07, Seed Driller	Re-sowing : 11-12/08
Seeding rate and Space : 30kg/fed, 24cm	First irrigation : 01/08
Pre-irrigation : Not implemented	Irrigation interval : 1time/6days→1time/2days (with small influence of Rainfall)
Pre-emergence herbicide : 1.5L/fed, 01/08	Post-emergence herbicide : Not implemented
Hand weeding : 22-24/08	
Fertilization (N) : ①25/08(Urea 50kg/fed) ②22/09(Urea 50kg/fed)	
Harvest Date : 25/11-09/12	Yield : 1949.1kg/ha

This is the third year of implementing demonstration activity in Dongola Island area. Preceding crop was Wheat. This is first season for this farmer to cultivate upland rice. Based on demonstration activity, it was shown that big advantage on water availability and high soil fertility were suitable for upland rice cultivation and as a result, high yield potentiality was realized under proper management. The main issues to be tackled are such as to avoid lodging by control rice growth under fertile soil condition, to control weeds, especially perennial grass and to minimize the damage by birds. This farm can get water through electronic pump irrigation from Nile River. When visiting the site on 15/06, plow by disk plow was already implemented. Several types of weeds such as annual grass and perennial grass were observed. Control method of the weeds by manual and/or chemical must be considered.

At the beginning of August, seedling emergence was good, but improper adjustment of seed driller caused narrow space sowing (12cm). It created problem on rice growth itself due to dense planting and cultivation management especially on hand weeding. Weeds were observed, so conducting complete weeding, re-sowing and irrigation was required. Weeding was conducted on 22-24/08 and re-sowing was done on 11-12/08.

In the mid of September, rice growth was good. Weeding by extensionists and farmer was conducted when visiting the site. Because symptom of lack of water on leaf was observed, implementing sufficient irrigation was instructed. It was required that weeding must be finished during short period for implementing other operation such as irrigation and fertilisation at optimum time. First fertilization (Urea, 50kg/fed) was conducted on 25/08. Second fertilization must be executed after weeding, but as for third fertilization, the necessity must be considered to avoid lodging. It is indispensable for getting good result to conduct proper water management under high temperature condition from sowing to harvesting during cropping season. Second fertilization was done on 22/09.

At the end of October, rice growth was good, but a lot of off-type plants and weeds (especially, perennial grass) were observed. Panicle reaping of NERICA 4 was required for getting pure seeds in this site or in Zawrat site instead of removing off-type plants. As already mentioned, Dongola Island area has high soil fertility, so rice plants can grow well, but weeds can grow more than rice plants. Weeding was implemented by extensionists and farmers, but complete weeding was difficult due to rapid growing speed of weeds. Insufficient water management and improper set-up of birds net were recognized. Extensionists were instructed at these points. Practical and effective weed control method must be considered and introduced for reducing

burden and obtaining good yield under high soil fertility condition. Crop cut yield survey was implemented on 22/11 and harvesting was executed on 25/11-09/12.

(2) Zawrat (1.0 feddan)

Sowing Date and Method : 26/07, Seed Driller	Re-sowing : 13-14/08
Seeding rate and Space : 30kg/fed, 24cm	First irrigation : 03/08
Pre-irrigation : Not implemented	Irrigation interval : 1time/6days→1time/2days (with small influence of Rainfall)
Pre-emergence herbicide : 1.5L/fed, 02/08	Post-emergence herbicide : 28/08
Hand weeding : 10-13/09	
Fertilization (N) : ①03/09(Urea 50kg/fed) ②14/09(Urea 50kg/fed)	
Harvest Date : 26/11-05/12	Yield : 2481.4kg/ha

Preceding crop was Fava bean. This is also first season for this farmer to cultivate upland rice. Irrigation was done by using electronic pump. Plowing by disk plow was done 02/06. When visiting the site, field condition was good because there were less weeds especially, perennial weeds in comparison to Island site. The necessity of proper management such as weeding, fertilization, water management was explained to farmer through extensionists. Sowing was done on 26/07.

In the mid of August, field was divided to small plots by farmer which were suitable for management, particularly for water management. Non-uniform seedling emergence was observed. There were a lot of missing plants in several plots. It can be said that deep sowing caused this problem. Immediate re-sowing and weeding must be done. Rice plans were still small, so implementing hand weeding first and spraying herbicide need to be considered.

In the mid of September, rice growth was not bad, although missing hills were remained despite of re-sowing. Perennial weeds were observed in Island site, but in this site, mainly annual weeds were observed. Herbicide (2,4-D) was sprayed on 28/08. First fertilization (Urea, 50kg/fed) on 03/09. When visiting the site, soil was dry and symptom of lack of water was observed, so irrigating water as soon as possible was instructed to extensionists. Weeding was implemented on 10-13/09 and second fertilization was conducted on 14/09.

At the end of October, rice plants already started maturity. Birds net were set-up appropriately for avoiding damage by birds. Lack of irrigation water was observed at higher places. The number was not so high in comparison to Dongola Island site, but weeds and off-type plants were observed. Continuing checking the nets and keeping irrigation water were required. Plant height was not high and the number of tillers also was not enough. Low soil fertility affected plant growth. Growing rice plants under high temperature condition indicated potentiality of upland rice cultivation in this State surely. Crop cut yield survey was implemented on 22/11 and harvesting was executed on 26/11-05/12.

＜White Nile State＞

(1) Elfardos 1 (2.0 feddans) and Elfardos 2 (2.0 feddans)

Elfardos 1

Sowing Date and Method : 24/06, Seed Driller	Re-sowing : 22/07
Seeding rate and Space : 30kg/fed, 30cm	First irrigation : 02/07
Pre-irrigation : 22/05	Irrigation interval : 1time/7days→1time/3days (with influence of Rainfall)
Pre-emergence herbicide : 1.5L/fed, 28/06	Post-emergence herbicide : 0.5L/fed, 10/08

Hand weeding：①07-21/7 ②05/08 ③16/08 ④15/09	
Fertilization (N)：①02/08(Urea 50kg/fed) ②24/08(Urea 50kg/fed) ③04/09(Urea 50kg/fed)	
Harvest Date：12-22/11	Yield：917.7kg/ha

Elfardos 2

Sowing Date and Method : 24/06, Seed Driller	Re-sowing：22/07
Seeding rate and Space：30kg/fed, 30cm	First irrigation：02/07
Pre-irrigation：22/05	Irrigation interval : 1time/7days→1time/3days (with influence of Rainfall)
Pre-emergence herbicide：1.5L/fed, 28/06	Post-emergence herbicide：0.5L/fed, 10/08
Hand weeding：①07-21/7 ②05/08 ③16/08 ④15/09	
Fertilization (N)：①02/08(Urea 50kg/fed) ②24/08(Urea 50kg/fed) ③04/09(Urea 50kg/fed)	
Harvest Date：12-22/11	Yield：975.6kg/ha

Preceding crop was Groundnut. After selecting the site, plowing by chisel plow was conducted on 21/05 and pre-irrigation was done on 22/05.Fertilization (TSP), harrowing and levelling were implemented on 26/05, on 26/05 and on 20/06 respectively. When visiting the site on 21/06, discussion with manager of Rice Unit and extensionists on seeding rate, sowing space, sowing depth and optimum dosage of pre-emergence herbicide was conducted. Sowing was implemented on 24/06 by new seed driller.

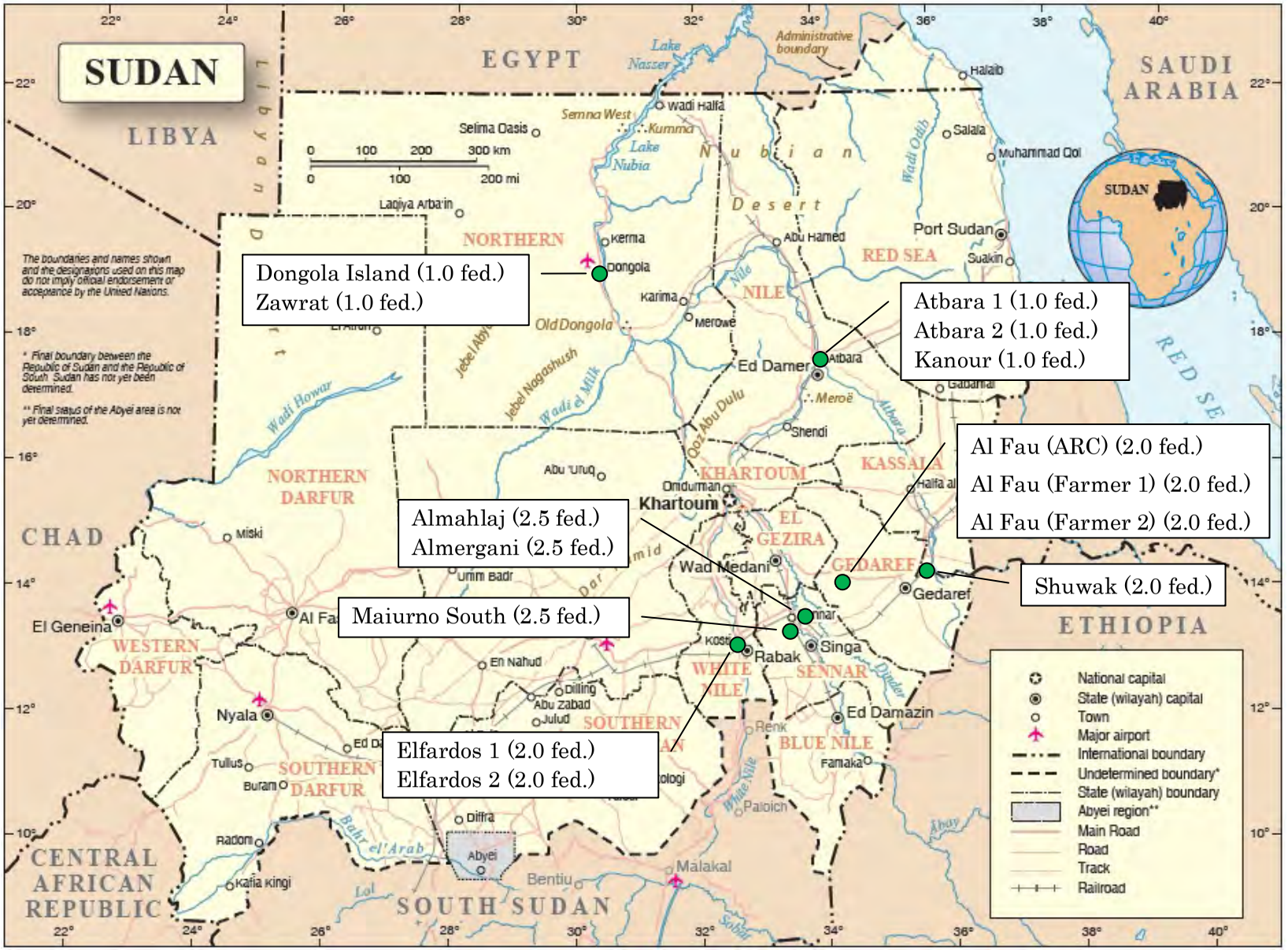
At the beginning of August, non-uniform growth was observed. There were good growing places and poor growing places including missing places. Several seasons are considered such as poor seedling emergence due to uneven land caused by improper levelling and sowing operation, damage by birds, insufficient irrigation water, etc. It must be considered from various aspects of soil based on the upland rice cultivation activities in White Nile State since 2011. First weeding was executed on 07-21/07, but implementing weeding continuously was instructed. Re-sowing was done for missing places, but recovery was not completely. Damage by termites was observed partially. Explanation on damage by termites and measurement against it was done to new extensionists. When visiting the site, irrigation was stopped because of breakdown of irrigation pump. SMoA mentioned to solve the problem as soon as possible. Spraying insecticide for termites, irrigating water and first fertilisation (Urea, 50kg/fed) were instructed. Without spraying insecticide, second weeding was executed on 05/08 and spraying herbicide (2,4-D) was done on 10/08.

In the mid of September, rice growth was not bad although missing hills and non-uniform growth were observed. Rice stared heading partially. Weeding was implemented several times and field was kept generally clean condition. Because weeding was important point for good result, continuous weeding was strongly instructed. Seedling emergence of re-sown seeds was good, but dense planting was observed, so negative effect of dense sowing was explained to extensionists. Third weeding was completed on 16/08 and second fertilisation was done on 24/08 and then irrigation was implemented. Third fertilisation was conducted on 04/09. A lot of off-types were observed and practical procedure to obtain pure seeds must be introduced. To irrigate and keep water at heading stage is imperative to avoid occurrence of empty grains. Implementing proper water management was instructed.

In the mid of October, rice growth was generally good and weeding was conducted. Non-uniform maturity was observed widely at whole area with poor rice growth caused by dense sowing and with missing places. It was difficult to find out plants of NERICA 4 due to covering the field by off-type plants. Non-uniform maturity indicated existence of various off-type plants which have different growing period. Under this condition, it was impossible to

rogue off-type plants completely. Therefore, to search and reap panicles of NERICA 4 among off-type plants was instructed for obtaining pure seeds. Even if it was small amount, it can be increased by seed multiplication. New staff (unit manager and extensionists) have high motivation for getting high yield on upland rice cultivation and each operation was conducted fairly well. When they obtain pure seeds and basic important techniques on upland rice cultivation through working in the field and accumulating experience, it should be the turning point for SMoA on upland rice cultivation activity in this State. Crop cut yield survey was implemented on 08/11 and harvesting was executed on 12-22/11 at both sites.

The Map of Demo (Seed Production) Sites 2015 (Gedaref, Sennar, White Nile, River Nile and Northern State)



別添13