The Republic of the Sudan

Ministry of Agriculture and Forests

The Republic of the Sudan
Capacity Building Project
for Promotion of Rice Production
Project Completion Report

May, 2024

Japan International Cooperation Agency (JICA)

Vision and Spirit for Overseas Cooperation Co., Ltd. (VSOC)

C. D. C. International Corporation

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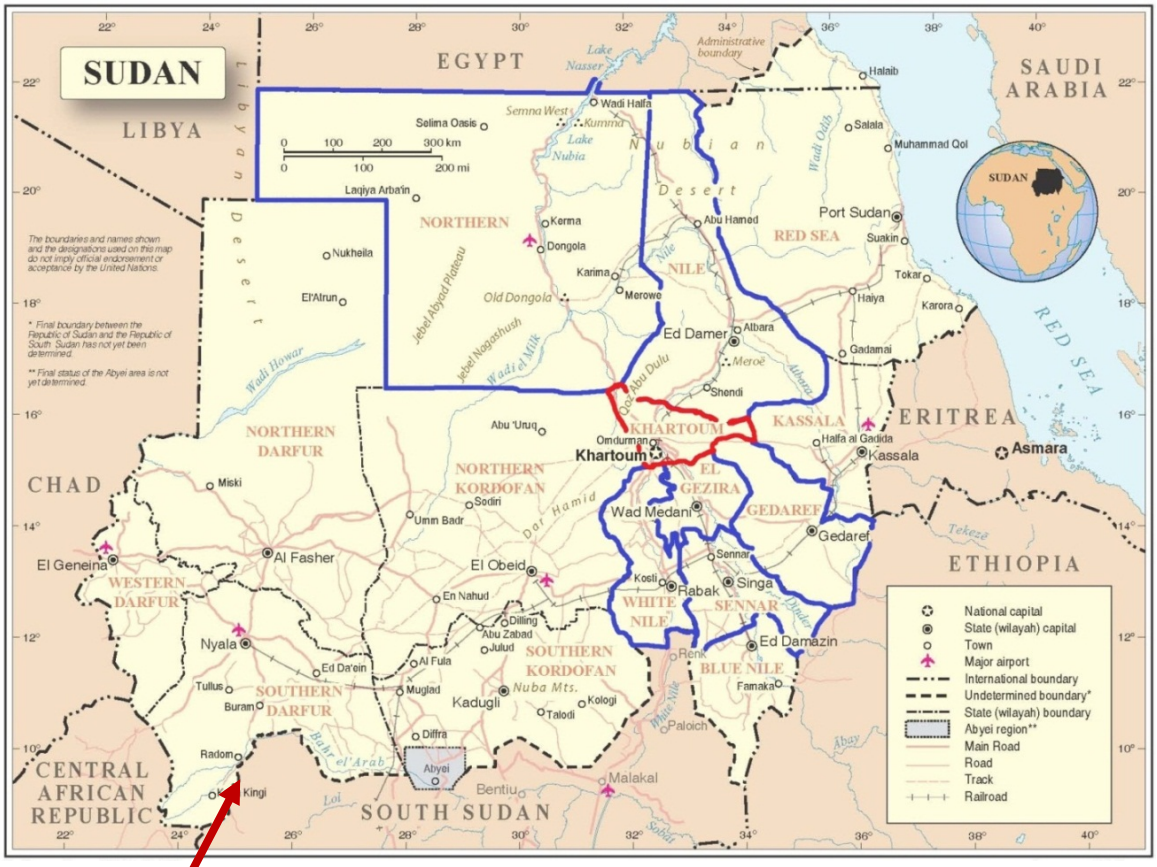
Location Map



Source：United Nations Cartographic Section (processed by author)

The states in the blue line are the target states of the activity. The red line is the capital Khartoum.

Abbreviation

Abbreviation	Name
AAAID	Arab Authority for Agricultural Investment and Development
ARC	Agricultural Research Corporation
ASC	Arab Seed Company
BS	Breeders Seed
CARD	Coalition for African Rice Development
CoE	Center of Excellence
COVID-19	Coronavirus Disease 2019
C/P	Counterpart
CS	Certified Seed
DG	Director General
FAO	Food and Agriculture Organization of the United Nations
FFS	Farmers Field School
FS	Foundation Seed
GRS	Gezira Research Station
HQ	Headquarters
HRS	Hudiaba Research Station
ICD	International Cooperation Directorate
IFAD	International Fund for Agricultural Development
IRRI	International Rice Research Institute
ISTA	International Seed Testing Association
JA	Japan Agricultural Cooperatives
JCC	Joint Coordinating Committee
JICA	Japan International Cooperation Agency
MC	Moisture Content
MoAF	Federal Ministry of Agriculture and Forests
MRS	Maatug Research Station
NERICA	New rice for Africa
NRDS	National Rice Development Strategy
NRP	National Rice Project
NVRC	National Variety Release Committee
OJT	On the Job Training
OR	Ordinary rice
PDCA	Plan-Do-Check-Act
PDM	Project Design Matrix
R/D	Record of Discussions
RoS	Revenue on Sales
RPU	Rice Promotion Unit
RRS	Rahad Research Station
RS	Registered Seed
RSF	Rapid Support Forces
SA	Seeds Administration
SAF	Sudanese Armed Forces
SDG	Sudanese pounds
SMoPER	State Ministry of Production and Economic Resources
SNS	Social Networking Service

SRS	Sennar Research Station
SUNA	Sudan News Agency
TOR	Terms of reference
TSC	Technical Steering Committee
USD	United States Dollar
WNRS	White Nile Research Station

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Chapter 1 Outline of the Project

1.1 Background

For food security, the improvement of agricultural productivity, poverty reduction and livelihood improvement, the Government of the Republic of the Sudan formulated “the Executive Program for Agricultural Revival” (2008-2011) with 8 Federal Ministries including Federal Ministry of Agriculture and Natural Resources (then reorganized into the Federal Ministry of Agriculture and Forests in 2015; hereinafter referred to as "MoAF”) as one of the promotion for various initiatives in the agricultural sector. The Government of Sudan has, in the program, positioned rice as strategically important crop after wheat.

Under such a circumstances, JICA implemented a technical cooperation project called “Capacity Building Project for the Implementation of the Executive Programme for the Agricultural Revival” (2010-2016, hereinafter as “the former Project”), which mainly focused on MoAF and State Ministry of Agriculture (then reorganized into the State Ministry of Production and Economic Resources; hereinafter referred to as “SMoPER”) in six (6) target states (Gezira, White Nile, Sennar, Gedaref, River Nile and Northern) to strengthen the capacity of policy implementation and to support the development of appropriate rice cultivation techniques. In the former Project, several results were given as follows: proper cultivation techniques of NERICA 4 were established; demonstration fields were implemented and seeds were produced in local farms; the capacity of extensionists was strengthened; and it was empirically proved that the rice production was also possible in Sudan. Moreover, MoAF is on the way to develop rice production through the formulation of “National Rice Development Strategy (NRDS)” in 5 years plan (2012-2016) in cooperation with the former Project.

Based on the results and achievements of the former Project, the Government of Sudan requested a technical cooperation project on the “Capacity Building Project for Promotion of Rice Production” (hereinafter as “the Project”) to the Government of Japan in order to strengthen human and organizational capacity of the Government on the promotion of rice production and JICA experts were dispatched since January 2018.

1.2 Purpose

This Project aims to strengthen the seed production system to promote rice production and is expected to achieve the following outcomes.

Overall Goal	
The rice production is promoted in 6 States (Gezira, Sennar, Gedaref, White Nile, River Nile and Northern).	
Project Purpose	
The institutional and technical capacity of Federal Ministry of Agriculture and Forests (MoAF), Agricultural Research Corporation headquarters (ARC HQ), and Center of Excellence located in Gezira State (CoE) for the implementation of rice promotion is improved.	
Outputs	
Output 1	The coordination system of stakeholders in rice promotion at the Federal and State levels is established.
Output 2	Foundation Seed (FS) and Registered Seed (RS) are produced at ARC HQ.
Output 3	Certified Seed (CS) production system is established for ordinary farmers in CoE.
Output 4	The issues of rice marketing are identified based on trial rice sales* in Gezira State. (*) Rice sales indicates both of sale of broken rice and milled local rice
Output 5	The production of CS is started in 5 States (Sennar, Gedaref, White Nile, River Nile and Northern).* (*) Output 5 is aimed to achieve the overall goal.

1.3 Policy

Basic policies of the project implementation are set as follows;

Basic Policy on Technical Aspects

i. To build rice value chain and seed production system. Refer to Figure 1 below.
ii. To utilize the outcome of the former Project.
iii. To implement seed production and extension activities which are centered in Gezira State.
iv. To promote the cooperation between ARC, NRP and Seeds Administration (SA)
v. To ensure the rice profitability, milling activities and sales activities.

Basic Policy on Operational Aspects

i. To keep up consistency and sustainability throughout the project period.
ii. To build rice value chain from seed production to cultivation, post-harvest and marketing
iii. A project team organized by some experts who have experience of the former Project
iv. To build a network between MoAF, ARC and other stakeholders
v. To expedite the cooperation between CoE Gezira and 5 other States

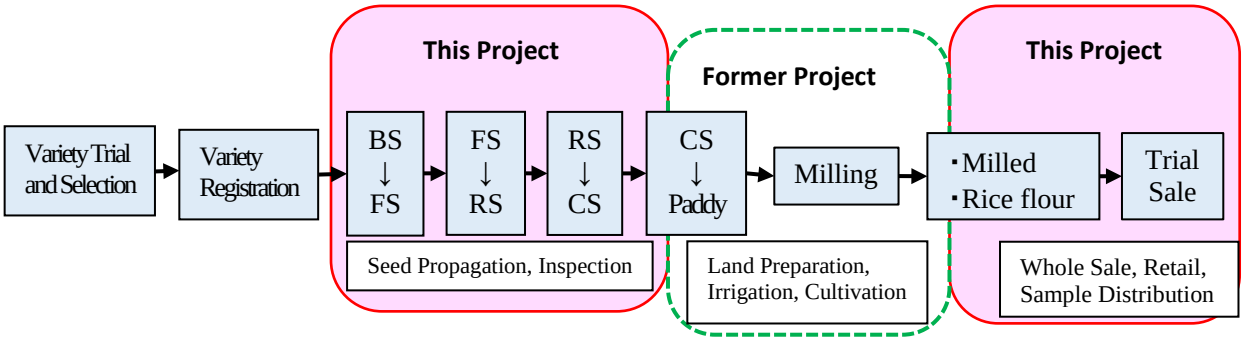


Figure 1. Seed Production System and Rice Value Chain

1.4 Counterparts and Stakeholders

The following institutions are supposed to be the counterparts (hereinafter referred to as "C/P"):

- MoAF (National Rice Project (NRP), Seeds Administration (SA), International Cooperation Directorate (ICD), General Directorate of Agriculture Production, Pilot Projects and Quality Control)
- Agricultural Research Corporation (ARC)
- Six (6) SMoPERs (Gezira, White Nile, Sennar, Gedaref, River Nile and Northern)

The following institutions, organization and individuals are supposed to be the stakeholders:

- Ministry of Finance
- Rice development working group member: private enterprises (CTC, Crown Company, and Alrajhi)
- Swamp Rice farmers in White Nile State
- Member organizations of Arab Union; such as Arab Authority for Agricultural Investment and Development (AAAID)
- Universities
- International Organization (IFAD, FAO, etc.)

Beneficiaries are C/P staff, seed production farmers and ordinary farmers in six (6) target states.

1.5 Period

The Record of Discussion (hereinafter referred to as "R/D") for this Project was signed on July 9th, 2017. The Project started in January 2018, when the JICA experts were dispatched, and was originally scheduled to continue until December 2022, but was extended until May 2024 due to repeated political changes and the global spread of COVID-19, which affected the progress of the Project.

Chapter 2 Project Activities

2.1 Activities for Project Management

2.1.1 Project Implementation Structure

In the framework at the beginning of the Project, it was assumed that only the ARC HQ would implement seed production. However, in reality, the ARC HQ (ARC in Gezira State at the time of 2018) has never implemented rice seed production, and since the ARC White Nile Research Station in Kosti (WNRS) is the Sudanese hub for rice breeding, it was decided to include this research station in project activities after 2019. Furthermore, after 2020, other ARC research stations in Gezira State, Sennar State, Gedaref State and River Nile State was included in seed production activities in ARC. Since ARC is originally a research institute and in a position to promote upland rice cultivation trials, it was believed that encouraging these ARC researchers to conduct upland rice trials would help promote the Project. These stations were responsible for seed production while conducting production trials and upland cultivation trials.

After November 2022, based on the discussions at the JCC in September of the same year, it was decided to establish a new Coordinating Unit with core members from the Technical Steering Committee (TSC) to hold monthly meetings as a new implementation structure to ensure even closer and more regular consultation and communication among the parties involved to achieve Project Purpose. This Coordinating Unit at the federal level held its first monthly meeting on November 29, 2022, and the DG of the International Cooperation Directorate (ICD) requested the target six states to hold a meeting every month to gather stakeholders in rice production and promotion in the states to discuss issues in response to the Coordinating Unit at the federal level. In response to this request, a structure was established to hold state-level coordinating committee meetings in Gezira, Sennar, White Nile, and River Nile States after February 2023, and continued as much as possible after the armed conflict between the Sudanese Armed Forces (SAF) and the Rapid Support Forces (RSF) in April 2023, keeping in mind the expansion of warfare and security (table 1).

Table 1. Coordinating Unit meetings at the central and state government levels

Central/State	Date
MoAF including NRP	29 Nov. 2022, 23 Jan. 2023, 10 Apr. 2023
Gezira State	Mar. 2023
Sennar State	23 Feb. 2023, 5 Mar. 2023, 5 Apr. 2023, 14 May 2023
White Nile State	15 Feb. 2023, Mar. 2023
River Nile State	Mar. 2023

2.1.2 JCC and TSC Meeting

The Joint Coordinating Committee (JCC) and TSC meetings during the project period are shown in the table 2. Due to the effects of the deteriorating security situation caused by political upheaval, infectious diseases, and armed conflicts, the JCC met a total of five times and the TSC met twice. Starting in November 2022, a new Coordinating Unit was established as described above, which effectively took on the functions of the TSC.

Table 2. Records of JCC and TSC

JCC, TSC	Date	No. of participants	Main topics
First JCC	12 Jun. 2018	29 (main C/P attended)	• Explanation of outline of the Project • Approval of Work Plan
Second JCC and First TSC	10 Nov. 2018	29 (main C/P attended including Undersecretary)	• Report of the activities in 2018 • Approval of adding WNRS to the Project activity • Plan of cultivation area in 2019 • Sharing the purpose of TSC
Third JCC[1]	27 Nov. 2019	30 (main C/P attended)	• Report of the activities in 2019 • Issue on unsettled payment to farmers for 2018 production
Fourth JCC	5 Jul. 2022	42 (main C/P attended including Undersecretary)	• Report of the activities in 2020 and 2021 • Presentation of the plan of activities in 2022 • Discussion on issues (issues of unsettled payment to farmers, certification of new varieties, seed inspection)
Second TSC	22 Sep. 2022	13 (ICD, NRP, CoE Gezira, etc.)	• Confirmation of TSC's management structure (including changes to permanent members) • Advance sharing of agenda of JCC and proceedings
Fifth JCC	26 Sep. 2022	31 (main C/P attended, JICA HQ participated online)	• Review of progress of the project activities and remaining issues to be done for achieving the project purpose • 3 conclusions 1) Recommended extension period is until May 2024 2) Major activities to be done during extended period • Both Sudanese and Japanese sides seek approval of their own government

The fourth JCC.

The second TSC.

The fifth JCC.

Photo 1. JCC and TSC meetings

2.1.3 Monitoring Sheet

(1) Preparation for submission of Monitoring Sheet (Ver. 8, 9, 10, 11 and 12)

In response to the political turmoil occurred in October 2021, the delegation of the experts was temporarily suspended from November 2021. The Project, led by the expert in charge, submitted the monitoring sheet (Ver. 8) in January 2022. The Project submitted the monitoring sheet (Ver. 9) in May 2022 as scheduled while the Project submitted the monitoring sheet (Ver. 10) in January 2023 because of collection and accumulation of more confirmed data (FS production data, etc.) and more correct information (results of seed inspection in 2022,

[1] The third JCC was jointly held with the workshop for NRDS revision. That's why the second TSC was not held.

completion of project activities regarding Output 4 to be terminated in January 2023, etc.).

In April 2023, it was not possible to delegate JICA experts to Sudan because of the armed conflict occurred between SAF and RSF. In response to the worsened security situation of the country, the expert in charge completed writing the subsequent MSs (Ver. 11 and 12), collecting and compiling data and information obtained in a remote basis.

(2) Submission of Monitoring Sheets (Ver. 8, 9, 10, 11 and 12)

The Project successfully submitted the monitoring sheets (Ver. 8, 9, 10, 11 and 12) in January, May, December 2022, June 2023 and December 2023.

2.1.4 Baseline Survey and Endline Survey

(1) Baseline Survey

The Project consigned the Baseline Survey on rice production in Sudan to COMATEX Nilotica Ltd. on 15th February 2018. Four companies tendered for the survey. The Project (Japanese expert team and C/Ps) selected COMATEX Nilotica Ltd. in terms of the balance of quality and cost after screening candidates by their papers and interview.

The Baseline Survey was conducted from February to October 2018. The survey showed the basic information of rice production (amount of rice production and import of rice, cultivation area, number of rice production farmer, etc.), farming type, actual situation of post-harvest on rice, preference of consumer and retail shop, retail price, etc. The main results which are related to the Project purpose are shown below.

- In 2017, rice production throughout Sudan was 20,737 tons and the production area was 13,825 feddans. (The area and production of swampy rice in White Nile are excluded in these figures.)
- The number of small farmers with experience in upland rice cultivation was 147 in Gezira, 90 in White Nile, 4 in Gedaref, 25 in Sennar, 22 in River Nile, and 10 in Northern states, for a total of 298 farmers.

(2) Endline Survey

The Project conducted an endline survey to measure the achievement of Objectively Verifiable Indicators of PDM. The Project decided to conduct the survey under a subcontracting agreement, and in November 2022, the Project publicly advertised for subcontractors and received applications from four companies. After evaluating the company's experience and structure, survey work plan, and price, the Project contracted with Tadbeer Consultancy Enterprise in December 2022. From January to March 2023, the company obtained the necessary information (number of farmers per season, cultivated area, amount of seeds distributed, market analysis results, etc.) from the Rice Promotion Unit (RPU) and ARC HQ in the 6 States regarding PDM Output 4 and other indicators for which activities had been completed and results had been obtained. However, the armed conflict that broke out on April 15, 2023 forced the company's consultants to flee the country. Since the company had submitted an interim report in March 2023, and since there was no prospect of a recovery in security, the Project agreed with the company in December 2023 to terminate the subcontract agreement upon receipt of the interim report. The results compiled by the survey are also written in this report.

Although the endline survey through subcontracting agreement was only partially completed, other data were collected by the C/P and JICA experts to measure the level of achievement.

2.1.5 Project Management remotely from Japan

On several occasions during the project period, the Project had to be managed remotely from Japan. The periods during which JICA experts were not dispatched to Sudan and the reasons are shown in the table 3. As a result, out of the 77-month project period, JICA experts were not in Sudan for 36 months.

Table 3. Period during which JICA experts were stopped from being dispatched to Sudan

Period	Reason
April 2019 to September 2019	Coup d'état on April 11, 2019 Turmoil on June 3, 2019
March 2020 to January 2021	Global spread of COVID-19
November 2021 to March 2022	Disturbance that occurred on October 25, 2021
April 2023 to May 2024 (by the end of the project period)	Armed conflict between SAF and RSF on April 15, 2023

During the remote management from Japan, there were periods when project staff and C/Ps were put on standby at home due to the local security situation. While waiting for the security situation to recover, project activities were carried out through daily communication with project staff and C/Ps by phone, e-mail, and SNS.

2.2 Activities for Output 1 "The coordination system of stakeholders in rice promotion at Federal level is established."

2.2.1 Activity 1-1 "MoAF prepares TOR to clarify the role and responsibility of MoAF and SMoPER."

MoAF has a document that defines the role of the NRP and a document that defines the Rice Committee of MoAF, each of which was prepared in 2015 at the encouragement of the former Project. Since the start of the Project in 2018, the Project has regularly discussed with MoAF (Minister, Undersecretary, ICD, and NRP) to reaffirm the division of roles between the relevant federal-level agencies and SMoPERs in the Project.

Specifically, the division of roles on the part of the federal level (MoAF) is mainly to develop activity plans for each state (after consultation with each state), secure budgets and materials (including application to the Federal Ministry of Finance), provide these to the SMoPERs, conduct monitoring of activities, and compile the results. SMoPER is responsible for reviewing the activity plan (in consultation with MoAF), implementing the activities in the field, and reporting on the progress (quarterly) and results of the activities to MoAF.

In addition, on November 26 and 27, 2019, MoAF and JICA Sudan Office jointly organized a meeting on NRDS revision, to which the Project also contributed. Subsequently, the NRDS was revised through the interaction between the CARD Secretariat and the Sudanese side led by the NRP. The NRDS has since become the guideline for rice promotion in Sudan.

2.2.2 Activity 1-2 "MoAF and SMoPER agree with TOR set in activity 1-1."

JICA experts paid a courtesy call and had a discussion with MoAF (Undersecretary, ICD, NRP, ARC, SA, Directorate of Technology Transfer and Extension, Directorate of Agriculture Production, Pilot Projects and Quality Control, Engineering Department), Gezira SMoPER, ARC HQ, etc. in the period of 17th to 28th January 2018. The outline of the Project was explained to C/P and the structure for project implementation of C/P side including the role and responsibility was confirmed and agreed through these discussions. The other five SMoPERs were also discussed and agreed upon during subsequent visits.

2.2.3 Activity 1-3 "The Project encourages MoAF and SMoPERs to fulfill their roles and responsibilities set in TOR."

JICA experts have been constantly encouraging MoAF and SMoPERs to work in accordance with their respective roles and responsibilities. In addition to daily face-to-face discussions with main C/Ps such as NRP and ARC, the Project has also met regularly with high-ranking officials of MoAF to discuss solutions to the issues of the time, such as the non-payment of CS to farmers, and to encourage MoAF to take the initiative in promoting rice cultivation. At times, the Project has also held meetings with state governors to encourage them to take an interest in the promotion of rice cultivation in their state. The following table 4 is a result of the meetings with the main high-ranking officials.

Table 4. Result of meetings with high-ranking officials

High-ranking officials	Date
Minister of MoAF	12 Jun. 2018, 13 Jun. 2018, 21 Jun. 2018, 31 Mar. 2019, 3 Oct. 2019, 3 Mar. 2021, 26 Aug. 2021
Undersecretary of MoAF	25 Jan. 2018, 12 Jun. 2018, 13 Jun. 2018, 21 Jun. 2018, 30 Jun. 2018, 31 Mar. 2019, 11 Nov. 2019, 19 Nov. 2019, 28 Nov. 2019, 1 Mar. 2020, 10 Mar. 2020, 8 Feb. 2021, 3 Mar. 2021, 26 Aug. 2021, 24 Apr. 2022, 23 Jun. 2022, 4 Jul. 2022
Governor of Gezira State	15 Feb. 2021
Governor of Sennar State	22 Feb. 2021
Acting Governor of White Nile State	23 Feb. 2021
Governor of River Nile State	1 Mar. 2021
Minister of Gezira SMoPER	28 Jan. 2018, 4 Nov. 2018, 15 Feb. 2021

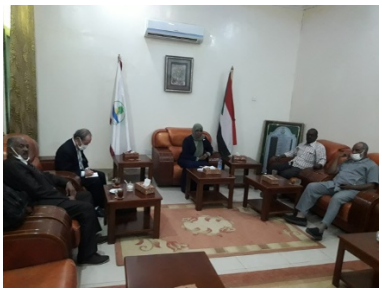
		
Rice bread being handed to the Minister of MoAF (26 Aug. 2021)	Discussion with the acting governor and DG of SMoPER in White Nile State (23 Feb. 2021)	Discussion with the governor and DG of SMoPER in River Nile State (1 Mar. 2021)

Photo 2. Meetings with high-ranking officials

2.2.4 Activity 1-4 “MoAF and NRP disburse the budget and inputs in a timely manner.”

The NRP calculates its budget based on the seed production plan for the following year, and after consultation within MoAF, a budget application has been submitted to the Federal Ministry of Finance. After the application is submitted, the final budget amount has been determined and approved after consultation with the Federal Ministry of Finance. As an example, the table 5 summarizes the budget application process and approved amount for FY2023. Since the Project started in 2018, the Federal Ministry of Finance has generally provided the NRP with a budget around February every year, except in 2023 when the government's financial resources became tight. The budget and equipment (fertilizers, pesticides, etc.) to implement rice cultivation have been disbursed to SMoPERs and ARCs of the six states concerned without any delay. The budgeted amounts contributed from the C/P side from 2018 to 2023 are shown in the table 6.

Table 5. Status of budget application for the 2023 fiscal year

General procedure in every year	Status of NRP's budget application for FY2023
Around August, Ministry of Finance issues budget application guidelines to each department	On October 5, Received budget application guidelines from the Ministry of Finance
-	On October 11, Submitted budget proposal to MoAF (Planning Division)
-	On November 7, After consultation with MoAF, it was decided to set the budget request at 434 million SDG
Around September-October, Consultation between departments and the Ministry of Finance	On November 8, Discussions with the Ministry of Finance on the amount of the budget request of 434 million SDG After discussion, Ministry of Finance approved 350 million SDG out of 434 million SDG
Around November, the Ministry of Finance submits a budget proposal to the Council of Ministers	-
Around November, after consultation with the Council of Ministers, the budget proposal is submitted to the Parliament.	-
Around December, Discussion and approval by the Parliament	In February 2023, the government's general budget is approved and 350 million SDG is approved for the NRP No budget allocation due to the government's financial difficulties before the outbreak of armed conflict in April 2023, and no budget allocation after the outbreak of armed conflict

Table 6. Local component allocated (2018-2023)

	1st Year (2018.1-12)	2nd Year (2019.1-12)	3rd Year (2020.1-12)	4th Year (2021.1-12)	5th Year (2022.1-12)	6th Year (2023.1-12)*	Total
NRP							
Operational Cost (SDG)	1,267,000	5,111,873	17,739,366	12,950,000	37,157,200	-	74,225,439
ARC							
Operational Cost (SDG)	71,200	116,200	484,000	2,990,050	4,504,000	16,270,000	24,435,450
Gezira SMoPER							
Operational Cost (SDG)	147,850	235,500	407,500	1,777,900	3,041,000	-	5,609,750
Other five SMoPERs							
Operational Cost (SDG)	-	-	5,885,580	15,657,950	14,228,300	-	35,771,830

Note: It includes not only the budget obtained by NRP from Federal Ministry of Finance, but also the original budget allocated by each organization for this Project.
* In the sixth year, information was not available from all organizations due to the armed conflict.

The 350 million SDG (approximately 614,000 USD at the official exchange rate against USD at the time) includes the costs (such as materials) for rice production for other states (South Darfur, Blue Nile, and Khartoum states), the Arab Seed Company, private companies, and the traditional sector in White Nile State. Agricultural

machinery and training costs are also included in the budget. The breakdown is shown in the table 7. The local component of the Project is 58 million SDG (approximately 102,000 USD at the official exchange rate against USD at the time).

Table 7. Breakdown of 3.5 million SDG

Item	Cost
Workers' training & capacity building	197,459,715 SDG
Providing equipment & tools and transportation	
Improving productivity (seeds production, promoting the traditional sector, supporting and rehabilitating the agricultural projects to expand on the rice-cultivated areas and purchasing the produced seeds of the farmers)	
Studies	
Local component for this Project	58,000,000 SDG
Good and services	80,000,000 SDG
Workers' compensations	14,540,285 SDG
Total	350,000,000 SDG

As for additional costs, the NRP has been flexible. In 2021, when 734,000 SDG (about 180,000 at the rate of the time) was needed for the repair of a combine harvester, NRP made a temporary budget application to the Federal Ministry of Finance and obtained approval and distribution of the budget.

On the other hand, one of the issues raised every year was the payment for the purchase of CS produced by farmers. In Sudan, the rice value chain is undeveloped, and seeds and ordinary rice produced by farmers in the Project must be purchased by the government. This purchase payment could not be disbursed in a timely manner, and this has been a problem almost every year since the first year of the Project. The table 8 summarizes the timing of payments for each year.

Table 8. Time of payment to farmers

Crop season	Time of payment to farmers
2018 (only ordinary rice in Gezira)	February 2020
2019 (only ordinary rice in Gezira)	No payment due to abandonment of cultivation
2020	January 2021*
2021	September 2022 (River Nile SMoPER paid without delay from their own budget)
2022	No payment (River Nile SMoPER and Sennar SMoPER paid without delay from their own budget)
2023	No payment

* For that year only, the payment was made through the Arab Seed Company (ASC) rather than directly from MoAF. The time of final payment to the farmers was not confirmed, but the process was completed in January 2021, calculated from the harvest volume, before the final results of the laboratory inspection.

Although the unit price per kg of CS purchase price is determined by contract with farmers prior to production, the final total price will be determined after the amount of CS production is known. CS that pass the field inspection by SA will be harvested in November or December, and the subsequent conditioning process will take time, and the seeds will not be sent for laboratory test until February of the following year after harvest. The results are then known in March or April, when the final CS production volume is finally determined. Thus, the delays are caused by the fact that it takes time to determine the final total amount, and that the budget year is crossed, etc. The delay of CS payments in 2021 was a major problem, as it led to good farmers in Gedaref State leaving CS cultivation the following year. For 2022, the Project worked with the NRP to prepare for no delays. According to the Ministry of Finance, the NRP's budget is a development budget, as opposed to a regular budget. NRP prepared a budget schedule for the disbursement of CS payments for 2022, which was agreed upon by the Development and Budget Office of the Ministry of Finance.

All financial procedures for the CS payments of 2022 were completed with the Ministry of Finance, and the CS payments were planned to be distributed and paid in three monthly installments. The first installment was scheduled to be paid in early March 2023, but the budget of Ministry of Finance was strained, with government

employees' salaries also being paid late, and the payment was not made before the outbreak of armed conflict in April 2023. Thereafter, no payments were made due to the destruction of capital functions.

2.2.5 Activity 1-5 "MoAF and NRP monitor and evaluate activities based on TOR every year."

NRP continued to monitor and evaluate seed production activities in each state from 2018. Each SMoPER submitted quarterly progress reports on its activities to the NRP, which compiled them into quarterly and annual reports. This system functioned until the outbreak of armed conflict in April 2023. NRP actively conducted monitoring throughout the cultivation season, including accompanying JICA experts on business trips to each state.

2.2.6 Activity 1-6 "MoAF, ARC HQ and CoE organize Wrap-up meeting for sharing good practices and lessons learned."

This activity was to be conducted as a forum in the original PDM, but the forum was changed to a wrap-up meeting as a more appropriate activity to share good practices and lessons learned, rather than a permanent activity at an external event. The wrap-up meetings have been conducted annually from the 2020 crop season, when CS production began, through 2023 to review rice production activities for each year. The results of the wrap-up meetings are shown in the table 9. The good practices and lessons learned compiled are shown in Appendix 6.

Table 9. Wrap-up meeting results

Date	Place	Participants	Topic
15-16 Feb. 2021	Gezira	66	Review of 2020 crop season
27-28 Feb. 2022	Gezira	65	Review of 2021 crop season
14-15 Feb. 2023	Gezira	74	Review of 2022 crop season

2.2.7 Activity 1-7 "MoAF, ARC HQ and CoE jointly compile necessary data for Seed Production Plan for 6 States."

As described in Activity 1-6, wrap-up meetings have been held since the start of CS production for the 2020 crop season. MoAF (NRP, SA), ARC, and 6 SMoPERs including CoE Gezira participated in this wrap-up meeting. The purpose of the meeting is to review the year's activities, identify areas for reflection, and plan for the next season. Preparation for the Wrap-up meeting was jointly conducted by the NRP, ARC HQ, and Gezira SMoPER (CoE Gezira), and through the participation in the wrap-up meeting, the necessary data for the next seed production plan for the 6 SMoPERs have been collected annually. After the Wrap-up meetings, the NRP and ARC took the lead in discussing and deciding on the source and specific amount of seed to be distributed to the six states the following season by the NRP, ARC, and the states.

2.2.8 Activity 1-8 "MoAF produce draft Mid-Term Plan to utilize CoE for 6 States."

Gezira State, as a center of rice cultivation in Sudan, has received support for the development of appropriate rice cultivation technologies during the implementation of the former Project from 2010 to 2016. As a result, more staff have acquired and accumulated basic rice cultivation skills than in the other five states (White Nile, Sennar, Gedaref, River Nile and Northern states). In this project, Gezira State has been designated as a Center of Excellence (CoE) to support rice cultivation, focusing on rice seed production, to further contribute to the promotion of rice cultivation in Sudan, while utilizing the results of the former Project. Gezira RPU has conducted rice seed and ordinary rice (OR) production, technical trainings for state extensionists and farmers in other 5 SMoPERs concerned and various support activities for rice production, and has accumulated valuable experiences and reflections since 2018.

Under these circumstances, this Mid-term Plan to utilize CoE (hereinafter as "Mid-term Plan") outlines specific activities that Gezira State, as a CoE, can contribute to the promotion of rice cultivation in Sudan, along with a timeline for their implementation. By sharing this Mid-term Plan with MoAF and other states, it is intended to promote rice promotion through smooth implementation of the Mid-term Plan as well as its budgetary measures. The plan consists of three main components:

(1) rice production including seed and ordinary rice in Gezira,
(2) rice training conducted by the Gezira Rice Promotion Unit (RPU) with the support of NRP, and
(3) support activities related to rice promotion, including cost estimates for their implementation.

For (1) rice production, the "CS supply system to ordinary farmers in a sustainable manner " required under Activity 3-6 has been compiled. The RPU has compiled this Mid-term Plan based on such experience and knowledge expecting to benefit the whole country of Sudan.

This plan was submitted to NRP in December 2022, and a summary of the plan was presented to MoAF and other 5 states at a wrap-up meeting held on March 14-15, 2023. Final confirmation by the NRP was to be received in 2023, but progress was interrupted by armed conflict after April 2023, but was approved by ICD in March 2024. (Appendix 7: "Mid-term Plan 2024~27").

(1) Activity for rice promotion in the Mid-term Plan

Gezira RPU and the staff have been engaged in various rice-related activities, such as production of seeds and OR, and preparation of "Seed Production Manual for Farmers", rice production trainings for agricultural extensionists and farmers, and have gained a lot of experience. The RPU has also accumulated valuable knowledge through exchanging views and information with rice stakeholders from ARC, NRP, SA of MoAF, officials from 6 SMoPERs, and private sector rice farmers. Based on such experience and knowledge, the Gezira RPU discussed, reviewed, and recognized the importance of engaging in the following activities to promote rice cultivation in Sudan.

1) Active use of the "Rice Seed Production Manual for Farmers".
2) Revision of the above manual as needed.
3) Field Days and agricultural festivals are important for introducing and promoting rice production to neighboring farmers and should be continued.
4) Support organizing and enhancing farmers' associations and farmers' groups involved in rice production.
5) Conduct rice market research and trial sales of white rice to improve cost analysis of rice production; and
6) To produce rice bi-products such as rice bread and cookies.

Field Days and agricultural festivals have been held with the support of the Project as an effective opportunity to inform not only government officials but also farmers at large that upland rice production is feasible in Sudan. In addition, at the urging of the Project, state government officials, extensionists, and some farmers from other 5 states also participated in the Field Day in Gezira State. Against this background, the situation has changed to one in which each state government takes the initiative in conducting Field Days from 2021. The Field Day is an opportunity for farmers to showcase their production techniques and results, and is useful for introducing and promoting rice production to neighboring farmers, as well as for introducing rice bi-products such as rice bread and cookies that will be served at the event. In some states, the SMoPERs attended these events to promote rice production, and it is considered necessary to continue these events regardless of the size of the event.

The table 10 summarizes the expenses required for these promotion and support activities. However, these costs are estimates as of November 2022, and actual costs will need to take into account subsequent price increases and other factors.

Table 10. Expenses for promotion and support activities (as of November 2022)

No.	Activity	Cost (SDG)
1	Field Day	3,000,000
2	Market survey, sale trials, rice products	1,000,000
Total		**4,000,000**

(2) Implementation schedule

Considering the rice cultivation calendar in Sudan, the implementation schedule for the various activities indicated in this mid-term plan was reviewed and summarized in the table 11. The scale of rice cultivation will be determined by the number of farmers who will be selected according to the selection criteria. After harvest, yield data will be analyzed to make necessary improvements in cultivation methods and support activities. The data will be shared with NRP and SMoPER officials at Wrap-up meetings. In Gezira, monthly meetings have already been held to analyze production data and discuss necessary improvements for the following season.

Table 11. Annual schedule for the activity of rice promotion

Month	1	2	3	4	5	6	7	8	9	10	11	12
Rice production												
Wrap Up training												
Confirm season's plan												
Select fields and farmers												
Compile production result												
Analyze production result												
Review next season's plan												
Consultation with NRP												
Sharing the plan with stakeholders												

(3) Necessary inputs and conditions

Inputs and conditions for the proper implementation of the various activities outlined in this mid-term plan were reviewed. Direct inputs required include ①high quality seed, ②fertilizers and pesticides for production, ③harvest cleaning facilities and warehouses, and ④agricultural and post-harvest processing machinery. Along with these inputs, it was summarized that MoAF, NRP, SMoPERs, and CoE must be strengthened in coordination.

2.3 Activities for Output 2 "Foundation Seed (FS) and Registered Seed (RS) are produced at ARC HQ."

2.3.1 Activity 2-1 "ARC HQ verifies the purity of Breeder Seed and FS."

(1) Verification of the purity of Breeder Seed (BS) of four (4) released varieties

① ARC HQ (Gezira Research Station, GRS)

Four (4) varieties "Kosti 1, Kosti 2, Wakara and Umgar" were officially released in 2010 by approval of National Variety Release Committee (NVRC). After releasing, the seeds of these varieties were utilized by each researcher respectively in ARC HQ (GRS) for conducting experiment and/or field activity without renewing it as 'BS' until this day. Therefore, it became obvious that there was no true 'BS' whose purity should be inspected and verified under the name of 'BS' in ARC HQ (GRS).

② ARC White Nile Research Station (WNRS)

Dr. Khalid, Rice breeder in WNRS, is a researcher who conducted varietal experiment for evaluating performance of several promising lines to collect data for submitting it to NVRC for official approval. He is also a coauthor of submitted paper to NVRC on released varieties. After releasing four (4) varieties, he implemented various experiments continuously through utilizing lots of 'materials' from /out of Sudan including released varieties. Then, Dr. Khalid conducted renewal of seed of released varieties and stored these seeds at WNRS up to now.

③ Conducting purity inspection

As a result of visual inspection such as presence and absence of pubescence, difference of shape, difference of color, difference of size, etc. between seed which was produced in 2013 in ARC HQ (GRS) and seed which has been stored in WNRS, seed stored in WNRS indicated significant characteristic of variety Umgar. On the basis of this result, seed sored in WNRS was considered more analogous to 'original seed' = 'BS'. Then, purity inspection on seed of these four (4) released varieties stored in WNRS was conducted (table 12).

Table 12. Result of purity inspection on BS of four (4) released varieties

Variety	Total number	Off-type	Seed	Purity (%)
Kosti 1	1,734	4	1,730	99.77
Kosti 2	1,770	10	1,760	99.44
Wakara	1,894	7	1,887	99.63
Umgar	2,161	1	2,160	99.95

Sample: 50.0g / each variety

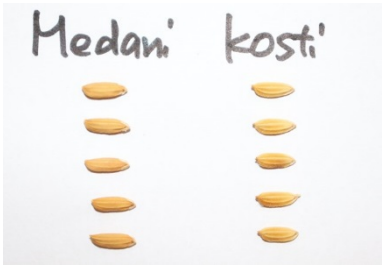
		
Seed sample of four (4) released varieties from WNRS（12/02/2018）	Difference between seed from GRS and seed from WNRS (Umgar, 13/02/2018)	Purity inspection of seed from WNRS (BS, Kosti 1, 14/02/2018)

Photo 3. Purity inspection of BS

(2) Verification of purity of FS (GRS)

Purity inspection of FS which was produced from BS in the field of ARC HQ (GRS) in the season of 2018 was conducted by Japanese Expert. The result on two (2) released varieties was in the table 13.

Table 13. Result of purity inspection on FS of two (2) released varieties

Variety	Total seed	Off-type	Seed	Purity (%)
Kosti 1	1,534	4	1,530	99.7
Umgar	1,876	14	1,862	99.3

Sample: 40.0g / each variety

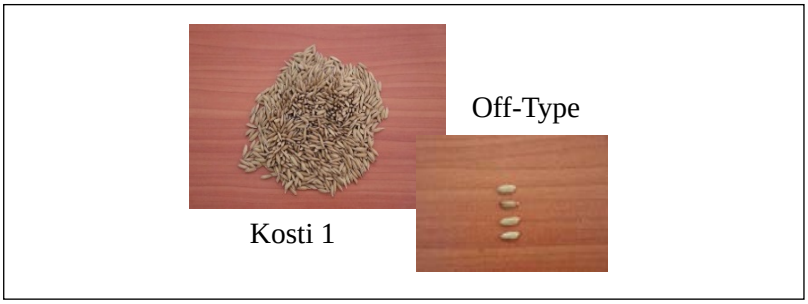


Photo 4 Purity inspection of harvested FS (Kosti 1, 16/03/2019)

Then, laboratory inspection was conducted for these two (2) varieties on purity by Seed Administration (SA) and the result was as table 14. These figures exceeded the standard by SA (minimum acceptable level on purity for 'Basic seed = FS and RS' is 98.0%).

Table 14. Result of purity inspection on FS of two (2) released varieties by SA (GRS, 2018)

Variety	Purity (%)
Kosti 1	99.9
Umgar	99.9

(3) Verification of purity of FS (WNRS)

Laboratory inspection on purity was conducted for FS which was produced in the field of WNRS in the season of 2019 by SA and the result was as table 15. These figures also exceeded the standard by SA (minimum acceptable level on purity for 'Basic seed = FS and RS' is 98.0%).

Table 15 Result of purity inspection on FS of two (2) released varieties by SA (WNRS, 2019)

Variety	Purity (%)
Kosti 1	99.8
Umgar	99.5

2.3.2 Activity 2-2 “ARC HQ selects some upland rice varieties from the released varieties.”

Through the meeting between the Project and Sudanese high officials such as Undersecretary, etc. at MoAF in January 2018 (the initial stage of the Project), both sides agreed to use some (2-3) released varieties, NERICA 4 which indicated good performance (high yield) during the former Project and some promising lines for multiplication activity in the first season (2018). Then, variety for multiplication activity need to be reconsidered and changed based on the situation of releasing new varieties in the future.

Discussion on selecting varieties for multiplication activity was conducted with C/Ps and other researchers in ARC HQ (GRS) from the viewpoints of characteristics of released varieties. Sudanese researchers recommended to select Kosti 1, Umgar and Wakara from released varieties, some varieties from NERICA variety, and some lines from promising lines which showed good result in experiment by Dr. Khalid. The Project stressed that variety Wakara is red rice and it will deteriorate the quality of grain when milling through mixing with grains of other varieties (white rice).

Finally, steering meeting of the Project with Project Manager and Project Co-Manager was held on 30/05/2018 at the Project Office. Through discussion of this meeting, varieties and promising lines for multiplication activity (FS Production) in the 2018 season were determined as follows; Kosti 1, Umgar, NERICA 4, IR11N202, INPAGO 9 in a reflection of various data and opinions.

Photo 5. Steering meeting of the Project (determination of varieties for multiplication in 2018, 30/05/2018)

Then, released varieties which will be utilized for seed production activity were determined through discussion between the Project and ARC, etc. in advance before starting cultivation at every season. Since it was intended to be provided to CS production farmers, the varieties which were multiplied in the previous season were basically continued for production activities because changing varieties would require time for extensionists and farmers to understand the characteristics of new varieties and to avoid contamination with other varieties. In particular, Kosti 1 and Kosti 2 are close in growing periods, and these rice plants in the field and seeds after harvest are so similar that even researchers have difficulty distinguishing them. Therefore, since the change from Kosti 1 to Kosti 2 and the simultaneous provision of both varieties would have the possibility of mixing the varieties in farmers' fields and require the time for understanding the characteristics in the field, the production of Kosti 1, which was multiplied in the first year and the extensionists and farmers have some understanding of its characteristics, was continued except at WNRS. In addition, Umgar was selected as a variety to be multiplied in the ARC because it was easy for farmers to distinguish it from other rice varieties due to its unique seed shape and color, especially the reddish color of the base of the plant (stem color). In the 2023 season, however, due to the armed conflict, seed production activity was conducted only at WNRS. In addition to Umgar, the new varieties Abasya (IR11N202), Kenana (IMPAGO 9), and Gezira (NERICA 3) which were newly certified (approved) were used for multiplication activity to ensure enough quantity of seed (table 16).

Table 16. Released varieties which were utilized for seed production activity at each ARC RSs in each season

State	ARC	2018	2019	2020	2021	2022	2023
Gezira	ARC HQ (GRS)	Kosti 1	Kosti 1	Kosti 1	Kosti 1	Kosti 1	
		Umgar	Umgar	Umgar	Umgar	Umgar	
White Nile	White Nile RS		Kosti 1	Kosti 1	Kosti 1	Kosti 1	Umgar
			Umgar	Kosti 2	Kosti 2	Umgar	Abasya
				Umgar	Umgar		Kenana
							Gezira
Gezira	Maatug RS			Umgar	Kosti 1	Kosti 1	
					Umgar	Umgar	
Gedaref	Rahad RS			Kosti 1	Kosti 1	Kosti 1	
				Umgar	Umgar	Umgar	
Sennar	Sennar RS			Kosti 1	Kosti 1	Kosti 1	
				Umgar	Umgar	Umgar	
River Nile	Hudiaba RS				Umgar		

2.3.3 Activity 2-3 “ARC HQ rehabilitates rice field for FS and RS production.”

Visiting of candidate field for seed production in ARC HQ (GRS) was conducted with Dr. Yassir, a rice researcher (C/P), in February 2018 at the beginning of the Project activity. It is located at around 750m in southern direction from HQ building. When visiting the field, wheat was cultivated in it. Tertiary canal was full with water and the field was managed appropriately. Water availability, especially irrigation water, was regarded as the most crucial concern on conducting upland rice seed production activities in the field of ARC HQ (GRS). There are two (2) man irrigation methods in the field of GRS. One is irrigation method by utilizing irrigation water through gravity irrigation system of Gezira scheme and the other is irrigation method by utilizing underground water which was pumped up by electricity. However, these two methods are not enough as facilities to provide sufficient water for cultivating rice in the field and the growth of rice plants sometimes were damaged by lack of water. Then, the new irrigation method was added to secure water availability in the field of GRS before JICA experts started activity in GRS. This is the method to obtain irrigation water through utilizing pipeline (distance: 7km) facility which was constructed by governmental budget. As a result of verifying hydraulic validity of this pipeline facility based on design drawing of pipeline facility and performance specification of electric pump, hydraulic validity of the pipeline facility was proved and this facility was considered as an extremely effective irrigation water supply system for the field of GRS when low-water period. It can be said that water source was secured through completion of this irrigation pipeline facility.

After completing construction of this facility, test run was conducted by Sudanese side. Through this test run, the Sudanese officials indicated that the facility had serious deficiencies (e.g. pump capacity, quality and diameter of the pipes themselves, lack of awareness of the elevation differences where the pipes run) in providing irrigation water to GRS as an additional water source (in June 2021, Mr. Fujimoto in charge of the Project at that time and Dr. Sato from JICA HQ also visited the facility, and both of them gave on-site suggestions on the problems related to the facility). Repairing and supplemental work to solve the problem were conducted continuously by Sudanese side, but this facility cannot provide irrigation water to GRS at all as of April 2023.

Therefore, from the viewpoint of water availability, the fields for seed multiplication activities in GRS should be located where irrigation water can be obtained by the gravity irrigation method of Gezira scheme. Through continued explanations and discussions by the Project and Dr. Yassir with other ARC C/Ps and field manager of GRS, priority of field selection has been given to fields of the Project with easy access to irrigation water.

In 2022, an additional electrical groundwater pump, of which only one was in operation, was installed through

ARC's budget and it expanded the irrigation potential area.

On the other hand, since 2021, rainfall tends to be "torrential" even in the rainy season of July and August, making it more important to take effective and efficient drainage measures to prevent flooding from affecting rice growth and to carry out weeding and other operations. Due to travel restrictions caused by COVID-19 and political circumstances, there has been a continued suspension of visit, prompting Dr. Yassir and the staff of ARC to remotely encourage attention to drainage measures as much as possible.

		
The end part of the completed pipeline facility. Through conducting subsequent test run, this facility cannot provide any irrigation water to GRS (14/06/2018)	Additional electrical groundwater pump was installed (29/06/2022)	Seed production field was located near the canal from Gezira Scheme (right) and the electrical pump (center) due to easy access to irrigation water (27/09/2022)

Photo 6. Irrigation facilities at ARC HQ (GRS)

2.3.4 Activity 2-4 “ARC HQ researchers and technicians cultivate BS and FS.”

The result of BS cultivation (= FS production) at the ARC HQ (GRS), which began in 2018, and the subsequent FS cultivation (=RS production) are shown in the tables below.

Through the discussion, in consideration of remarkable result on seed production in terms of quality and quantity through appropriate field management in WNRS, both sides agreed to add WNRS as the new Project activity site. Therefore, the result of seed production in WNRS is also included in the tables below.

Furthermore, plus to two these research stations, Maatug Research Station (MRS) in Gezira state, Rahad Research Station (RRS) in Gedaref state, Sennar Research Station (SRS) in Sennar state, and Hudiaba Research Station (HRS) in River Niles state conducted seed production activities, and then the result of seed production activities at these stations are also described in the tables below.

In addition, since three new varieties of upland rice were approved in 2022 and multiplication activity of the existing released variety ‘Umgar’ and its three new varieties was conducted in 2023 at WNRS, the result is also described in the tables below. It is worth mentioning that excellent yields were achieved under the difficult conditions of the armed conflict, when just carrying out seed multiplication activities, such as field preparation, sowing, field management, and harvest and post-harvest operation, was very difficult.

(1) 2018 season

Table 17. Result of FS production in ARC HQ (GRS, 1st sowing) in 2018 season

Varietiy/ Line	Area (m^2)	Sowing Date	Harvesting Date	G.P	Production (g)	M.C (%)	Yield (kg/ha)	PH (cm)	Panicle / hill
Kosti 1	65	04/07/18	15/11/2018	134	8,330	12.3	1,306.9	106	13
Umgar	65	04/07/18	19/11/2018	138	11,060	12.6	1,729.2	101	17
NERICA 4	65	04/07/18	15/11/2018	134	2,790	8.8	455.2	98	11
IR11N202	65	04/07/18	27/11/2018	146	14,945	21.2	2,106.7	104	30
INPAGO 9	65	04/07/18	19/11/2018	138	6,995	15.2	1,061.1	105	20

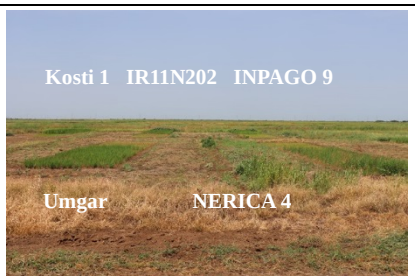
Note: G.P: Growing Period (days), M.C: Moisture Content of seed, PH: Plant Height

Table 18. Result of FS production in ARC HQ (GRS, 2nd sowing) in 2018 season

Variety/ Line	Area (m^2)	Sowing Date	Harvesting Date	G.P	Production (g)	M.C (%)	Yield (kg/ha)	PH (cm)	Panicle / hill
Kosti 1	60	18/08/18	19/12/2018	123	4,000	10.4	694.6	N/A	N/A
Umgar	60	18/08/18	19/12/2018	123	1,120	8.7	198.2	N/A	N/A
NERICA 4	60	18/08/18	19/12/2018	123	3,175	12.3	539.7	N/A	N/A
IR11N202	60	18/08/18	17/01/2019	152	1,790	16.6	289.3	N/A	N/A
INPAGO 9	60	18/08/18	19/12/2018	123	4,715	11.2	811.4	N/A	N/A

Note: G.P: Growing Period (days), M.C: Moisture Content of seed, PH: Plant Height
NB: After sowing (1st sowing), germination rate was poor, so 2nd sowing was implemented in half of the plot by dividing each plot.

Sowing operation (1st sowing, 04/07/2018)



FS production field (GRS, 13/09/2018)

Growth situation of plants of 1st sowing (Kosti 1, GRS, 13/11/2018)

Photo 7. FS production in GRS (2018)

(2) 2019 season

Table 19. Result of RS production in ARC HQ (GRS) in 2019 season

Variety/ Line	Area (m^2)	Sowing Date	Harvesting Date	G.P	Production (kg)	M.C (%)	Yield (kg/ha)	PH (cm)	Panicle/ hill
Kosti 1	700	01/07/19	17/11/2019	139	46.25	12.0	676.1	72	7
Umgar	1.050	04/07/19	17/11/2019	136	19.25	12.9	185.7	80	6
NERICA 4	350	09/07/19	17/11/2019	131	4.00	11.2	118.0	79	5
NERICA 3	350	13/07/19	17/11/2019	127	5.50	11.6	161.5	83	4
IR11N202	1.050	09/07/19	02/12/2019	146	231.00	N/A	N/A	N/A	N/A
INPAGO 9	700	13/07/19	19/11/2019	129	52.00	12.5	755.8	98	6

Note: G.P: Growing Period (days), M.C: Moisture Content of seed, PH: Plant Height
NB: The quality such as purity was kept at a certain level, but the quantity was poor due to insufficient measures against heavy rain and flood condition. It needs to be considered for the next season.

Table 20. Result of FS production in WNRS in 2019 season

Variety/ Line	Area (m^2)	Sowing Date	Harvesting Date	G.P	Production (kg)	M.C (%)	Yield (kg/ha)	PH (cm)	Panicle/ hill
Kosti 1	360	06/07/2019	14/11/2019	131	120.00	10.3	3,476.7	N/A	N/A
Umgar	360	06/07/2019	14/11/2019	131	140.00	11.1	4,020.0	N/A	N/A
NERICA 4	360	06/07/2019	14/11/2019	131	120.00	11.3	3,438.0	N/A	N/A
NERICA 3	360	06/07/2019	14/11/2019	131	130.00	10.2	3,770.7	N/A	N/A
IR11N202	360	06/07/2019	18/11/2019	135	200.00	12.9	5,626.6	N/A	N/A
INPAGO 9	360	06/07/2019	15/11/2019	132	140.00	10.7	4,038.1	N/A	N/A

Note: G.P: Growing Period (days), M.C: Moisture Content of seed, PH: Plant Height
NB: WNRS obtained enough seed in aspects of quality and quantity due to adequate drainage facility and appropriate field management. To visit WNRS for further understanding of the facility and management method is highly recommended.

		
Sowing operation was started in the field of GRS under supervision of Dr. Yassir. (01/07/2019)	Dr. Khalid and rice plants in multiplication field at WNRS (31/08/2019)	Harvesting operation (GRS, INPAGO 9, 19/11/2019)

Photo 8. FS/RS production in ARCs (2019)

(3) 2020 season

Table 21. Result of RS production in ARC HQ (GRS) in 2020 season

Variety/ Line	Area (m^2)	Sowing Date	Harvesting Date	G.P	Production (kg)	M.C (%)	Yield (kg/ha)
Kosti 1	336	2020/7/12	2020/12/1	142	60.00	13.2	1,802.3
Umgar	336	2020/7/13	2020/12/2	142	38.00	13.3	1,140.2
NERICA 4	336	2020/7/14	2020/12/3	142	38.00	13.0	1,144.1
NERICA 3	336	2020/7/14	2020/12/3	142	39.00	13.0	1174.2
IR11N202	336	2020/7/15	2020/12/7	145	65.00	13.5	1,934.5
INPAGO 9	336	2020/7/17	2020/12/5	141	25.00	14.0	748.4

Note: G.P: Growing Period (days), M.C: Moisture Content of seed

Table 22. Result of RS production in WNRS in 2020 season

Variety/ Line	Area (m^2)	Sowing Date	Harvesting Date	G.P	Production (kg)	M.C (%)	Yield (kg/ha)
Kosti 1	280	2020/7/1	2020/11/4	126	98.5	10.5	3,661.0
Kosti 2	280	2020/7/1	2020/11/4	126	122.5	10.4	4,558.1
Umgar	280	2020/7/1	2020/11/4	126	87.0	11.0	3,215.5
NERICA 3	280	2020/7/1	2020/11/4	126	111.5	10.5	4,144.2
IR11N202	280	2020/7/1	2020/11/10	132	198.0	11.3	7,293.4
INPAGO 9	280	2020/7/1	2020/11/9	131	132.5	10.7	4913.7

Note: G.P: Growing Period (days), M.C: Moisture Content of seed

Table 23. Result of RS production in other Research Stations in 2020 season

RSs	Variety	Area (m^2)	Sowing Date	Harvesting Date	G.P	Production (kg)	M.C (%)	Yield (kg/ha)
Maatug RS	Umgar	784	2020/7/12-13	2020/12/2-3	143	24.4	13.7	312.3
Rahad RS	Kosti 1	235	2020/7/8	2020/11/10-20	125	140.0	10.0	6,234.5
Rahad RS	Umgar	235	2020/7/8	N/A	N/A	90.0	10.0	4,007.9
Sennar RS	Kosti 1	350	2020/7/8	2020/11/18-23	133	100.0	9.5	3,006.6
Sennar RS	Umgar	350	2020/7/8	N/A	N/A	57.0	10.0	1,704.3

Note: G.P: Growing Period (days), M.C: Moisture Content of seed

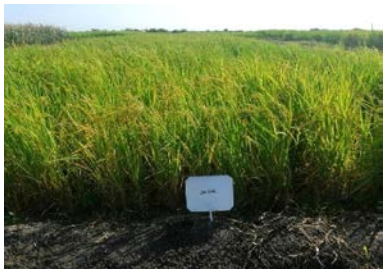
		
Extensionist of SMoPER checked rice plant (variety: Kosti 1) in the field of RRS. (16/09/2020)	Good growth of variety Umgar (98days after sowing) in WNRS (07/10/2020)	Most rice plants of the field in GRS became maturity stage. (15/11/2020)

Photo 9. RS production in ARCs (2020)

(4) 2021 season

Table 24. Result of RS production in ARC HQ (GRS) in 2021 season

Variety/ Line	Area (m^2)	Sowing Date	Harvesting Date	G.P	Production (kg)	M.C (%)	Yield (kg/ha)
Kosti 1	350	2021/7/21	2021/12/23	164	7.9	10.1	236.0
Umgar	350	2021/7/21	2021/12/23	164	10.4	10.4	309.6
NERICA 4	210	2021/7/21	2021/12/23	164	2.5	10.3	124.2
NERICA 3	210	2021/7/21	2021/12/23	164	2.6	10.2	129.3
IR11N202	140	2021/7/21	2021/12/23	164	5.1	10.5	379.1
INPAGO 9	140	2021/7/21	2021/12/23	164	2.1	10.0	157.0

Note: G.P: Growing Period (days), M.C: Moisture Content of seed

Table 25. Result of RS production in WNRS in 2021 season

Variety/ Line	Area (m^2)	Sowing Date	Harvesting Date	G.P	Production (kg)	M.C (%)	Yield (kg/ha)
Kosti 1	144	2021/7/5	2021/11/15-21	133	60.0	10.2	4,350.8
Kosti 2	144	2021/7/5	2021/11/15-21	133	61.5	10.5	4,444.
Umgar	144	2021/7/5	2021/11/15-21	133	87.0	10.1	6,315.6
NERICA 4	144	2021/7/5	2021/11/18-22	133	51.5	10.6	3,717.8
NERICA 3	144	2021/7/5	2021/11/18-22	133	54.2	10.5	3,917.1
IR11N202	144	2021/7/5	2021/11/15-21	136	93.0	11.0	6,683.6
INPAGO 9	144	2021/7/5	2021/11/15-21	136	92.0	10.6	6,641.5

Note: G.P: Growing Period (days), M.C: Moisture Content of seed

Table 26. Result of RS production in other Research Stations in 2021 season

RSs	Variety	Area (m^2)	Sowing Date	Harvesting Date	G.P	Production (kg)	M.C (%)	Yield (kg/ha)
Maatug RS	Kosti 1	150	2021/7/16	2022/1/2	170	14.0	7.8	1,000.6
Maatug RS	Umgar	150	2021/7/16	2022/1/2	170	10.3	7.8	736.2
Rahad RS	Kosti 1	200	2021/6/21	2021/11/22	154	34.0	10.1	1,777.1
Rahad RS	Umgar	200	2021/6/21	2021/11/22	154	45.0	9.8	2,359.9
Sennar RS	Kosti 1	180	2021/7/2	2021/12/1	152	45.5	10.5	2,630.7
Sennar RS	Umgar	180	2021/7/2	2021/12/1	152	45.0	10.2	2,610.5
Sennar RS	NERICA 4	180	2021/7/2	2021/12/6	157	51.0	11.0	2,932.2
Sennar RS	NERICA 3	180	2021/7/2	2021/12/6	157	45.0	10.1	2,613.4
Sennar RS	INPAGO 9	180	2021/7/2	2021/12/2	153	62.0	10.0	3,604.7
Sennar RS	IR11N202	180	2021/7/2	2021/12/5	156	35.0	10.0	2,034.9
Hudiaba RS	Ungar	180	2021/8/20	2022/1/8-11	141	42.8	9.8	2,491.0

Note: G.P: Growing Period (days), M.C: Moisture Content of seed

		
Making sowing line by 'Karack' (a forked-rake for rice drill-planting) (12/07/2021)	Umgar (101 DAS, 24/10/2021)	IR11N202. (104 DAS, 24/10/2021)

Photo 10. RS production in GRS (2021)

		
Explanation by Dr. Khalid about activity at WNRS including Seed Multiplication Activity (13/07/2021).	INPAGO 9 (70 DAS, 13/09/2021)	IR11N202 (70 DAS, 13/09/2021)

Photo 11. RS production in WNRS (2021)

		
Explanation by Dr. Jamal about activity at RRS including Seed Multiplication Activity (07/07/2021)	Umgar (49 DAS, Good growth, Head of RPU visited) (09/08/2021)	Dr. Jamal explained growth and characteristics of 2 varieties through this activity (17/10/2021)

Photo 12. RS production in RRS (2021)

		
Explanation by Dr. Mahmoud (left) about Seed Multiplication Activity at SRS (05/07/2021).	NERICA 4 (72 DAS, 12/09/2021)	INPAGO 9 (72 DAS, 12/09/2021)

Photo 13. RS production in SRS (2021)

(5) 2022 season

Table 27. Result of RS production in ARC HQ (GRS) in 2022 season

Variety/ Line	Area (m^2)	Sowing Date	Harvesting Date	G.P	Production (kg)	M.C (%)	Yield (kg/ha)
Kosti 1	320	2022/7/5	2022/11/26	144	27.0	10.3	880.1
Umgar	320	2022/7/5	2022/11/26	144	35.0	10.8	1,134.4
NERICA 4	160	2022/7/5	2022/11/26	144	3.5	10.8	226.9
NERICA 3	160	2022/7/5	2022/11/26	144	7.0	10.5	455.3
IR11N202	160	2022/7/5	2022/11/26	144	24.0	11.8	1,538.4
INPAGO 9	160	2022/7/5	2022/11/26	144	24.0	11.0	1,552.3

Note: G.P: Growing Period (days), M.C: Moisture Content of seed

Table 28. Result of RS production in WNRS in 2022 season

Variety/ Line	Area (m^2)	Sowing Date	Harvesting Date	G.P	Production (kg)	M.C (%)	Yield (kg/ha)
Kosti 1	150	2022/7/1	2022/11/5	127	40.0	10.5	2,775.2
Umgar	150	2022/7/1	2022/11/5	127	55.0	11.0	3,794.6
NERICA 4	150	2022/7/1	2022/11/5	127	57.0	10.5	3,954.7
NERICA 3	150	2022/7/1	2022/11/5	127	40.0	10.5	2,775.2
IR11N202	150	2022/7/1	2022/11/12	134	112.0	13.0	7,553.5
INPAGO 9	150	2022/7/1	2022/11/12	134	100.0	12.5	6,782.9

Note: G.P: Growing Period (days), M.C: Moisture Content of seed

Table 29. Result of RS production in other Research Stations in 2022 season

RSs	Variety	Area (m^2)	Sowing Date	Harvesting Date	G.P	Production (kg)	M.C (%)	Yield (kg/ha)
Maatug RS	Kosti 1	75	2022/7/4	2022/11/9	128	27.0	9.7	3,780.0
Maatug RS	Umgar	75	2022/7/4	2022/11/17	136	28.5	10.9	3,937.0
Rahad RS	Kosti 1	150	2022/6/21	N/A	N/A	5.1	9.0	359.8
Rahad RS	Umgar	150	2022/6/21	N/A	N/A	28.5	9.0	2,010.5
Sennar RS	Kosti 1	150	2022/7/8	N/A	N/A	8.2	9.0	578.4
Sennar RS	Kosti 2	15	2022/7/8	N/A	N/A	N/A	N/A	N/A
Sennar RS	Umgar	150	2022/7/8	N/A	N/A	10.0	9.0	705.4
Sennar RS	Wakara	15	2022/7/8	N/A	N/A	N/A	N/A	N/A
Sennar RS	NERICA 4	70	2022/7/8	N/A	N/A	N/A	N/A	N/A
Sennar RS	NERICA 3	70	2022/7/8	N/A	N/A	N/A	N/A	N/A
Sennar RS	INPAGO 9	70	2022/7/8	N/A	N/A	N/A	N/A	N/A
Sennar RS	IR11N202	70	2022/7/8	N/A	N/A	N/A	N/A	N/A

Note: G.P: Growing Period (days), M.C: Moisture Content of seed

		
There was still no irrigation water in Main canal (left. 29/06/202)	NERICA 4 (85 DAS, Heading ~ Full heading stage, Non-uniform growth, missing hills and weeds were observed) (28/09/2022)	Umgar (136 DAS, Maturity stage, Good growth, Missing hills and lodging were observed.) (18/11/2022)

Photo 14. RS production in GRS (2022)

		
Seed Multiplication Field in ARC WNRS (04/08/2022).	Dr. Khalid and Seed Multiplication Field in WNRS (04/08/2022)	Rice plants of most variety were harvested and cleaning operation was ongoing (24/11/2022)

Photo 15. RS production in WNRS (2022)

		
Seed Multiplication Field in MRS with Mr. Ahmed Elhaj (04/08/2022).	Kosti 1 (25/09/2022)	Umgar (25/09/2022)

Photo 16. RS production in MRS (2022)

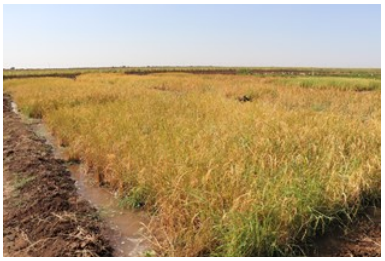
		
Seed Multiplication Field in SRS (23/11/2022).	Kosti 1 (23/11/2022)	Umgar (23/11/2022)

Photo 17. RS production in SRS (2022)

(6) 2023 season

Table 30. Result of Seed production in WNRS in 2023 season

Variety/ Line	Area (m^2)	Sowing Date	Harvesting Date	G.P	Production (kg)	M.C (%)	Yield (kg/ha)
Umgar	180	2023/7/7	2023/11/21	137	63.0	10.0	4,395.3
Abasya	180	2023/7/7	2023/11/21	137	120.0	13.0	6,744.2
Kenana	180	2023/7/7	2023/11/21	137	82.0	11.0	4,714.5
Gezira	180	2023/7/7	2023/11/21	137	75.0	9.0	4,408.9

Note: G.P: Growing Period (days), M.C: Moisture Content of seed

Although not seed production activity, varietal trials and cultivation trials were conducted at ARC Maatug Research Station (MRS) in Gezira State. These consisted of "varietal trials," which were to study the performance of varieties in terms of yield and growing period, and "cultivation trials," which were to understand optimum sowing dates and proper sowing spaces.

Photo 18. Field Day Event at MRS (01/11/2023)

2.3.5 Activity 2-5 "Seed administration improves seed inspection procedure on field and in laboratory by receiving training opportunities in inspection of rice seeds and preparing the relevant documents on seed inspection."

(1) Current Status (Organization and Personnel, etc.)

The organization chart and personnel list obtained from SA are as follows (figure 2, table 31 and 32);

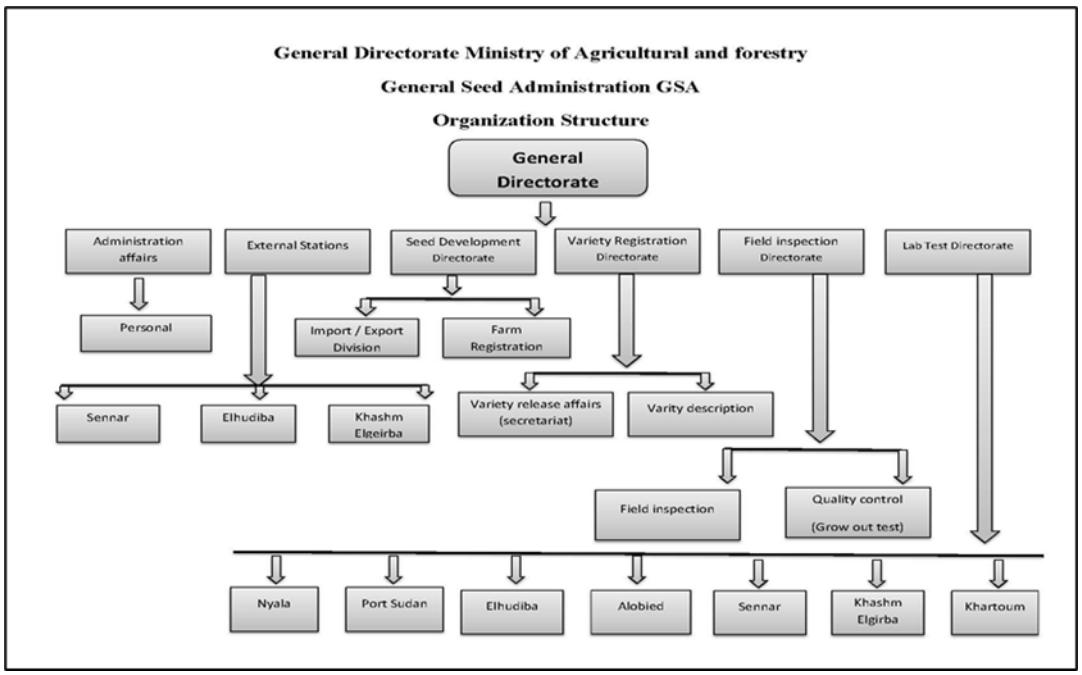


Figure 2. Organization Chart of SA

Table 31. Personnel list related field inspection

Inspector	Number
Field Inspectors	24
Total	24

Table 32. Personnel list related laboratory test

Laboratory Staff	Number
Khartoum	16
Sennar	6
Elobaied	4
Elhudaiba	4
Nyala	3
Portsudan	4
Khashm Elgierba	5
Total	42

With this organizational and personnel structure, SA has been conducting inspections of all applied-for target crops, including rice, sorghum, groundnuts, legumes, wheat, and vegetables. The major issues related to seed inspection/test and challenges of SA which were identified through project activities and through limited discussions with the newly appointed DG of SA, and Project's responses for these issues are described as below. Many of the issues listed below have become apparent, especially since the start of CS production by farmers, and the Project has responded as much as possible to the issues that have become clear. Whether or not they were realized, the main reason for the progress made in addressing them was the appointment of a new DG who was very supportive of project activities. The Project had limited opportunities to meet with the previous DGs of SA due to the pandemic of COVID-19, and despite the Project's encouragement and requests, they did not take concrete actions such as actively cooperating with project activities and sharing necessary documents such as the Seed Law. It can be pointed out that it was not easy to take concrete actions by the Project because there were not enough opportunities for early sharing of issues that the SA had regarding seed inspection methods and inspection activities, and for discussion and exchange of opinions on how to improve such issues and how to respond to them.

(2) Challenges and Response for them by the Project

1) Budget
   i) Staff salaries were being paid and no major problems were identified at the beginning of the CS production activities by farmers in 2020. However, as the activities progressed, insufficient disbursement of operational expenses (such as travel expenses and inspection materials, etc.) hindered the proper and timely inspection/test tasks.
   - Response: The Chief Adviser of the Project explained the issue to the acting Undersecretary and sought his understanding of the issue, and specifically, the Project also explained the issue to NRP, which resulted in the disbursement of the inspector's travel expenses.

2) Human resources
   i) Inspectors were dispatched from branch offices located in other states, but because inspection task was carried out with limited inspectors, it was sometimes not carried out in a timely manner, resulting in delays.
   - Response: In addition to seeking understanding in advance from each research station of ARC and each SMoPER, the importance of conducting inspection and test at proper time was explained by the Project to present DG of SA and other relevant parties such as NRP, and efforts were made to ensure that inspections and test are conducted in as timely a manner as possible.

3) Related legislation including seed law and seed inspection
   i) The revised Seed-related Law remains underdeveloped (with the revision bill regarding related laws, including seed inspection, yet to be approved). Due to the unavailability of the revision bill and detailed regulations, it was challenging to consider specific concrete "responses (actions)" for future "activities" of the Project.
   - Response: The Project had already obtained relevant legislation such as The National Seeds & Varieties Protection Act, 2010, at the start of CS production by farmers but it was explained by the current DG that the approval process for the "revised (updated) version" of the same legislation is underway. As changes or revisions in content of the document are relevant to the project activities, it was communicated that once the revision (update) is completed, the Project would appreciate sharing the information. However, ultimately, it remained unclear whether it was approved or not, and the

revised (updated) version of the related bill could not be obtained.

4) Inspection (Field inspection)
   i) Field inspections were sometimes not carried out in a timely manner.
      ✧ Influence: The start of harvesting operations in each field was delayed, which affected the quantity and quality of harvested seed.
      ✧ Causes:
         ①Shortage of budget and human resources
         ②Lack of recognition of the importance of timely implementation of inspections
   ➢ Response: As mentioned above, the issues of "budget and staffing shortages" remain as stated. In response to the "lack of recognition of the importance of timely implementation of inspection," the Project determined that there is insufficient recognition of the importance of timely harvesting. It was understood that there is also a lack of understanding regarding rice cultivation. To address this, preparations were made for training opportunities, and strong efforts were made to encourage participation in training for extensionists and farmers. Specifically, plans were made for: 1) training for SA staff on upland rice cultivation and seed production techniques, 2) participation of SA staff in training for farmers and extensionists, and 3) implementation of training for SA staff on field inspection. However, due to coups and armed conflicts, only training for SA staff (DG and inspectors) on upland rice cultivation and seed production techniques could be conducted during the wrap-up meeting (training) held on March 14-15, 2023, but training on field inspection could not be conducted.
   ii) It was unclear whether the field review was properly conducted.
      ✧ Causes:
         ①There was no unified "manual" and each inspector conducted inspection only according to the "inspection standards". Therefore, the inspection methods varied from inspector to inspector.
         ②Information (documentation) on field inspection method was not available.
   ➢ Response: Although some SA staff seemed to suggest the existence of a "field inspection manual," the current DG denied its existence, explaining that the "field inspection" was conducted by each inspector according to the SA's "Inspection Standards," which describe the isolation distance of sowing, purity, germination rate, etc. However, the inspection standards naturally contain only numerical values, and do not describe specific inspection procedures and methods. Thus, for example, some inspectors entered the field to conduct inspections, while others conducted inspections only from around the field, and the methods were not standardized at all. If there had been a manual, it would not have taken much time to check the contents of the manual and to exchange opinions with SA staff to formulate an "updated" or "revised" version. However, in the absence of a manual and in the absence of a unified inspection method, it was necessary to prepare a "manual" with SA from the beginning by referring to manuals and guidelines of other countries, for example, and through exchanges of opinions. Even so, it seemed possible to formulate a manual if the subject matter was available and, above all, if there was enough time to exchange opinions. However, due to the impact of coups and armed conflicts, there was insufficient time to conduct training to understand the current field inspection methods and share issues for improving, making it impossible to formulate a suitable manual tailored to Sudanese circumstances through further discussions. Consequently, the Project was not able to provide a more appropriate inspection method in a visible form.

5) Test (laboratory test)
   i) There were delays in conducting laboratory test.
      ✧ Influence: Because payment for seeds is made after certification of laboratory test, delays in certification affected payment.
      ✧ Causes: Delays in post-harvest operations (drying, threshing, winnowing, cleaning, etc.) in each field
   ➢ Response: In explanation by current DG of SA, it was stated that laboratory test could be conducted at any time once the harvested seed samples were prepared. However, excluding ARC fields, which are smaller in size, in other fields of farmers, the cultivation area is larger, and not only harvesting but also subsequent processing operations takes time. As a result, it is customary that sampling was conducted around February of the following year of harvest, and results of test to be determined around March to April. However, this timing sometimes poses difficulties in the payment of seed fees to farmers within Sudan's fiscal year. Therefore, it was decided by the Project to urge SA to conduct

field inspection in a timely manner and to urge each SMoPER to carry out processing operations early and complete it. The schedule below was created for explanatory purposes. However, ultimately, due to political confusion and armed conflicts, the Project did not even have the opportunity to use the same proposal for explanation.

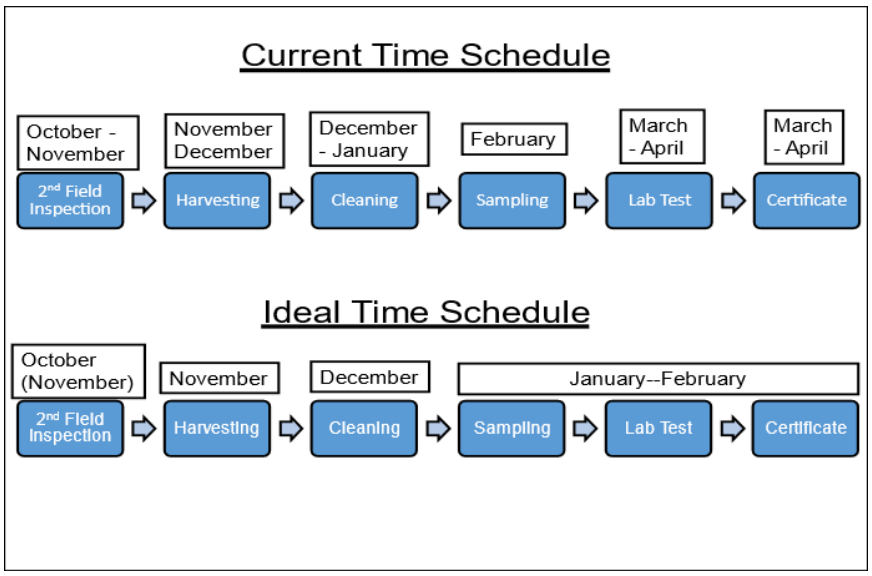


Figure 3. Current schedule and Ideal schedule on each operation and Laboratory test

ii) It was unclear whether laboratory inspections were properly conducted.

- ✧ Cause: It was supposed to be in accordance with ISTA rules, but information on methods of laboratory test was not available.

➢ Response: The current DG of SA denied the existence of a "Laboratory Test Manual." DG explained that "Lab Test" is conducted in accordance with ISTA rules. However, due to the lack of opportunities for lab visits, it was not possible to observe and understand the methods and procedures of lab test. Therefore, it was not possible to propose improvements or new methods based on the actual inspection methods.

6) Certification standard (Reasons for setting the standards and their validity, etc.)

i) There were values in the inspection standards that seemed unclear or lacking in validity.

➢ Response: Regarding the inspection standard table translated from Arabic by local consultant of the Project, an overview explanation was received from the responsible personnel of SA at that time (January 2021), focusing on the points highlighted by the Japanese expert of the Project. After that, based on the observation of field inspection procedures and results of laboratory test through seed production activities in the fields, it is thought to be required to take the time to point out, share and exchange opinions with the counterparts about any questions that arose regarding the inspection standard table, and the Project considered it a necessary and appropriate step to revise the inspection standards as necessary. However, no time was obtained by the Project to reconsider and discuss with current DG of SA about the inspection standard table based on ISTA's inspection standards, and it was not possible to conduct the necessary revisions with SA.

2.3.6 Activity 2-6 “ARC HQ prepares production manual for FS and RS.”

First, the contents and items to be included in this manual are described. The seeds targeted by this manual, which are positioned upstream in the seed multiplication flow such as Foundation Seed (FS) and Registered Seed (RS), are required to meet not only the standard of being 1) physically free of other varieties (Pure), 2) clean within the acceptable level of contamination by disease, insect damage, or foreign matter (Clean), and 3) vigorous as seed (Viable), but also 4) of genetic uniformity (Genetic purity). And the quality (genetic purity) of the BS (breeder seed), which is the original seed, is extremely important in order to produce FS and RS with high genetic purity that possess the original traits and characteristics of the variety. In discussions with Dr. Yassir, C/P of ARC Gezira Research Station (GRS), it was also agreed that 1) the content of the manual should be

beneficial to researchers, rather than a general "seed production manual" for farmers that mainly focuses on off-type control, 2) it is desirable to describe seed production methods that meet the standards and characteristics required for each category of seed multiplication flow (BS, FS, RS, CS), while taking into account the current situation and circumstances in Sudan, and 3) in the case of ARC in particular, since it is responsible for an important part of seed production (upstream seed production), it is important to have a precise seed production method that starts from BS, which is upstream from FS and RS, to promote understanding among researchers who are not aware of it, and to make a reminding role for those who are aware of it. Due to respecting these Dr. Yassir's opinions, it was decided that the manual should include information on appropriate methods of BS multiplication (production) from the viewpoint that "in order to produce FS and RS with assured quality, it is essential to first produce BS with assured quality. Therefore, we reviewed and reconsidered the structure, items to be described, and contents of the initial draft, which had begun to be structured with FS and RS production in mind.

The plan was to collaborate on the preparation of this manual based on comments and feedback from Dr. Yassir, Dr. Khalid belongs to ARC White Nile Research Station (WNRS), who is Co-Manager of the Project as well as National Rice Research Coordinator and other researchers, etc. However, the armed conflict began on April 15, 2023. With its expansion, it was not only impossible to visit Sudan and compile information and data at a critical time for the preparation of the manual, but above all, it was impossible to exchange final opinions on the contents and formulation with the main C/Ps and other concerned parties. In addition, as the armed conflict continued, when contact was made with the C/P from Japan, the first priority was to request confirmation and assurance of safety, and it became difficult to request editing work and comments on the manual. Therefore, based on the information and data obtained through the seed production activities in the field up to that point, as well as the content of discussions with C/Ps and others, the draft of the manual was prepared under the leadership of the experts. As a result, a draft was submitted at the end of January 2024, and the final version was prepared and submitted at the end of February.

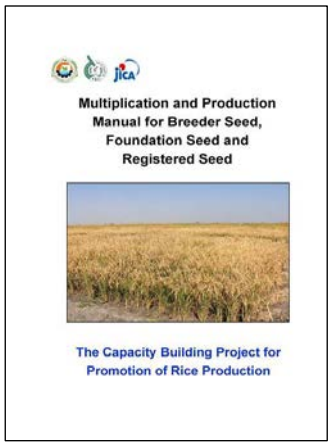


Figure 4. Cover of the manual for FS and RS

2.3.7 Activity 2-7 “ARC HQ expedites the release of new varieties including NERICA.”

In Sudan, four upland rice varieties (Kosti 1, Kosti 2, Umgar, and Wakara) were certified (approved) by the National Variety Release Committee in 2010. Since then, the Project has repeatedly approached the ARC to certify (approve) NERICA 4, which is important from the viewpoint of increasing variety options for farmers and has achieved high yield in cultivation trial and farmers’ demonstration fields, but no new varieties have been "created".

As for the certification (approval) of new varieties, an application paper had already been submitted by Dr. Khalid to the National Variety Release Committee in 2021, based on the results of the 2017, 2018 and 2019 trials (at WNRS, GRS and MRS). However, time passed without the Committee being able to hold due to lack of budget. Finaly, at the Committee in September 2022, the following three varieties were certified (approved) as new "upland rice varieties" and given variety names. Recognizing the need to establish an environment that would enable the provision of a large number of certified varieties to rice farmers as quickly as possible, the Project has approached and cooperated with ARC. The efforts of both parties have borne fruit in the form of results.

Table 33. New Released upland rice varieties

Genotypes	New Name
IR11N202	Abasya
INPAGO 9	Kenana
WAB0096 (NERICA 3)	Gezira

2.4 Activities for Output 3 "Certified Seed (CS) supply system is established for ordinary farmers in CoE."

2.4.1 Activity 3-1 "ARC HQ distributes RS to CoE."

Discussion on CS production by farmers for the 2020 season, including the distribution of Registered Seed (RS) to six states, was held on November 20, 2019, at Gezira SMoPER. The participants and the results of the discussions are as follows;

① Participants: Mr. Nakagaki (Chief Adviser, JICA Project), Mr. Matsuda (Deputy Chief Adviser, JICA Project), Mr. Goto (Expert on Seed Production, JICA Project), Dr. Hassan (Local Consultant. JICA Project), Dr. Tawhida (DG, State Ministry of Agriculture, Gezira State), Mr. Hag Attwa (Coordinator, NRP), Mr. Ashraf (Acting Head of Rice Promotion Unit, Gezira State)

② Main Results of Discussion

- Cultivation area per farmer: 0.25 feddan principally (max)
- Number of farmers: In principle, 10 farmers in Gezira and 2-3 farmers in each of the other 5 States
- Source of seed: ARC HQ (GRS) and ARC WNRS
- Training: Training on seed production (CS production) will be conducted at Gezira SMoPER in early March 2020.

Based on the above results, final coordination was made by the Project with NRP and ARC regarding the amount of seed needed and available for CS production. The final seed quantities distributed by ARC to Gezira State for the 2020 season, the first year of CS production by farmers, are as in the table 34.

Table 34. Seed distribution from ARC to Gezira State (2020)

State	Variety		Source of seed
	Kosti 1 (kg)	Umgar (kg)	
Gezira	24	4	ARC HQ（GRS）
	16	60	ARC White Nile RS (WNRS)
Total	40	64	

After the 2020 season, it was agreed through discussion with related organizations that, in principle, each state will utilize harvested seed in the previous year as seed for CS production of the following year. However, the shortage of seed for the following year due to insufficient harvest volume and the shortage against the required seed volume based on the production plan was solved by providing seed from the ARC or other states. The quantity of seed distributed from ARC to Gezira for the 2021 season is as in the table 35.

Table 35. Seed distribution from ARC to Gezira State (2021)

State	Variety		Source of seed
	Kosti 1 (kg)	Umgar (kg)	
Gezira	60	0	ARC HQ（GRS）
	100	0	ARC Sennar RS (SRS)
Total	160	0	

2.4.2 Activity 3-2 "CoE selects contracted farmers for CS production based on criteria."

The draft criteria for the selection of farmers for certified seed production prepared by the Gezira RPU were discussed and approved at a workshop attended by MoAF and SMoPER officials in January 2020. The criteria are shown in the table 36. The criteria took consideration into the damage to rice production caused by the heavy rains in 2019 and its repercussions confirmed the need to consider the actual seed production field conditions,

in particular field drainage condition. In 2021 and beyond, it was decided that the selection criteria will be discussed at the Wrap-up meeting, which is usually held in February or March every year to review the results of the previous year's rice production.

Table 36. Selection criteria of seed producing farmers

		Point	Example		
1. Farmer aspect			Farmer A	Farmer B	Farmer C
	Experience on rice cultivation	3, 4, 5	3	3	5
	Yield of other crops	3, 4, 5	3	4	3
	Willingness in seed production	1, 2, 3	2	1	2
	Cooperativeness among farmers	1, 2, 3	2	2	2
2. Field condition					
	Access to irrigation water	3, 4, 5	4	4	4
	Easiness on drainage	1, 2, 3	2	1	2
	Accessibility to road	1, 2, 3	1	3	2
	Previous crop grown	3, 4, 5	3	4	5
3. Extension officers' observation					
	Technical level of farmers	3, 4, 5	4	5	4
	Cooperativeness to officials	1, 2, 3	2	2	2
	Fairness in locality	1, 2, 3	3	1	1
TOTAL points			29	30	32

Since the approval of the criteria, Gezira RPU has continued to make substantive improvements related to the content of the criteria, rather than the items indicated in the criteria. These improvements include: promotion of information exchange among farmers on farming and cultivation techniques, more efficient field visits and guidance by extension agents, and selection of farmers to assign more than one farmer per area from 2021 onward, with the aim of increasing the number of rice farmers for further promotion of rice production. In 2021, four farmers were selected for certified seed production in Wadsawi area in Gezira Irrigation Scheme, and each farmer was assigned two feddans making the total CS fields eight feddans. In 2022, three CS farmers were selected in the same Wadsawi area, each with 2 feddans, for a total of 6 feddans. In 2023, four farmers were selected to produce 8 feddans in adjacent plots in the same area. The seed producers were selected based on their understanding of and willingness to cooperate with the rice production and promotion measures intended by the Gezira RPU using adjacent plots, as well as their cultivation techniques and irrigation and drainage conditions.

In the selection of farmers for 2021, the authority of Gezira Irrigation Scheme posted stricter rotation cultivation, and the repair and maintenance of facilities in the Gezira and Rahad irrigation schemes were delayed longer than usual, which made the selection process difficult for the Gezira RPU. In addition, in selecting the 2022 farmers, the staff of the Gezira RPU worked hard to secure a minimum of four certified seed producers, despite the fact that many farmers were concerned about delays in payment for the certified seed and ordinary rice produced in previous years. In 2023, a seed producer was selected for the third consecutive year in the Wadsawi area, which utilizes an adjacent field. Thus, it can be concluded that the farmer selection process was not based on a strict application of the above criteria, but rather on a comprehensive review of the rice farming situation.

In the process of selecting farmers for certified seed production based on the Selection Criteria, as shown in the photo below, Gezira RPU staff visited and inspected candidate farmers and target plots for CS production in Gezira, directly discussed the farmers' intentions and those of the Gezira RPU, and selected farmers based on mutual agreement between the RPU and the farmers.

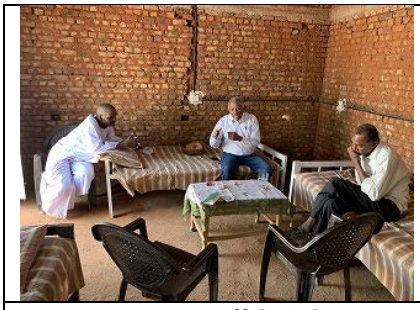
		
Interview to Mr. Daffala (white cloth)（March 4, 2020）	Irrigation canal for Mr. Aboud's field (March 5, 2020)	Mr. Alsamani (white cloth) and his field (March 5, 2020)

Photo 19. Selection of CS production farmers

As a result of the selection process, six CS farmers were selected from the Gezira state for 2020, as shown in the table 37. As this is the first year of CS production, each farmer was asked to produce CS at basically 0.25 feddan, and to steadily implement weeding, removal of different varieties, and water management, which are basic and important in seed production, and to provide thorough guidance to the extensionists concerned. Selected farmers learned the techniques in the seed production training in March 2020, and then sowed seeds in June and July for certified seed production.

Table 37. List of CS producing farmers in Gezira in 2020

	Farmer's Name	Locality	Size (feddan)	Variety	Previous crop grown	Extensionists in charge
1	Mr. Daffala Bashir	Rahad	1.25	Umgar	Cotton	Ayman Adam
			0.75	Kosti1		
2	Mr. Mohammed Aboud	Alkomour	0.25	Umgar	Chick beans	Mohammed Alsamani
3	Mr. Abuzer Ahmed Mohammed	Helewa	0.25	Kosti1	Cotton	Mohammed Alsamani
4	Mr. Mahmoun Abdallah	Wad Elasha	0.25	Umgar	Wheat	Mohammed Alsamani
5	Mr. Mohamed Abdelgadir	Abdelhakam	0.25	Kosti1	n/a	Abuodieda Ahmed
6	Mr. Mubarak Aldelrahman	Hajabdallah	0.125	Umgar	n/a	Fatherlrahman Ahmed
			0.125	Umgar	n/a	Fatherlrahman Ahmed

Seed farmers in 2021, 2022 and 2023 are shown in the tables 38-40 below. In 2021, 4 farmers produced 8 feddans in Wadsawi area, 3 farmers produced 6 feddans in 2022, and 4 farmers produced 8 feddans in 2023, utilizing adjacent plots. Two farmers in Block 10 area in Rahad Irrigation Scheme also produced at 4.8 feddans in 2021. This was planned and implemented as a response to a review meeting within the Gezira RPU and the Wrap-up meeting held in 2022, where it was discussed to further promote the exchange of farming and cultivation techniques among farmers and to aim for more efficient activities of extensionists in charge of cultivation guidance. In 2023, seed cultivation was continued by taking advantage of the experience gained so far and utilizing adjacent plots. As described in the Mid-term Plan to utilize CoE Gezira, conducting rice production including seed cultivation in adjacent fields will contribute to the development and expansion of rice farmers, efficiency of seed supply, and efficacy of technical guidance by extensionists. Furthermore, in the future, the rice market is expected to expand through the installation of rice milling machines and rice storage facilities in the area.

In Gezira, CS farmers and ordinary rice farmers had been selected from farmers in Gezira and Rahad irrigation schemes. However, in 2022, the main maintenance work in the main canal in the Gezira Irrigation Scheme was delayed, and for the first time since irrigation began, the main canal in the Gezira Irrigation Scheme ran out of water, resulting in an unusually late water distribution to the fields. In addition, farmers in the Gezira Irrigation

Scheme had originally used five fields, three of which were planted in summer, one in winter, and the remaining one as fallow land, which was then rotated in the following year. The land use method described above has become obsolete as farmers have become more liberal in their crop selection since the 2005 Gezira Act, and an increasing number of farmers have started to cultivate winter crops after summer crops. In 2021, it was decided to strictly adhere to the above-mentioned land-use method, as this had led to irrigation water shortages and soil degradation. As a result, some of the farmers' fields that had been used for rice production in previous years could no longer be used for rice production in the summer and then used as winter crop fields, for example. In the Rahad Irrigation Scheme (irrigation by pumps from the Rahad River), which is located on the opposite side of the Nile River from the Gezira Irrigation Scheme (east of the Blue Nile River), the operation of the pumps was delayed due to power supply problems, which made it impossible to plan field preparation work for rice production. Thus, the Gezira RPU encountered a situation very different from that of previous years. As a result, 8 farmers (17.8 feddans) were selected for CS production and 4 farmers (8 feddans) for ordinary rice production as shown in the table below.

A unique feature of the season 2021 is that neighboring farmer plots were selected based on recommendations from a workshop held in 2021 to promote the exchange of farming and cultivation information among farmers and to improve the efficiency of farmer guidance by extensionists (see table 38). Three farmers' plots (CS farmers #1 and #2 and one of ordinary rice farmers are within walking distance of each other, and four farmers' plots (CS farmers #5 to #8) are adjacent to each other. All farmers' plots are located in an area accessible by car from Wad Medani in about an hour's drive. This saves time for the extension agents in charge of the areas and the extension agents who travel from the RPU to provide guidance, and also allows them to provide more efficient guidance.

Table 38. List of CS producing farmers in Gezira in 2021

CS	Variety	Name of farmer	Location	Size (fed.)
1	Umgar	Mr. Abdu Elemam	Block 10, Rahad	3
2	Umgar	Mr. Mohamed Abdalla	Block 10, Rahad	1.8
3	Kosti1	Mr. Abdelgadir Abdelbagi	Abdelhakam, Gezira	2
4	Kosti1	Mr. Alsamani Daffala	Helewa, Gezira	3
5	Kosti1	Mr. Mohamed Gilani	Wedsawi, Gezira	2
6	Kosti1	Mr. Salah Abdelgadir	Wedsawi, Gezira	2
7	Kosti1	Mr. Hasen Mohamed	Wedsawi, Gezira	2
8	Kosti1	Mr. Mobashir Mohamed	Wedsawi, Gezira	2
Total				17.8

Table 39. List of CS producing farmers in Gezira in 2022

CS	Variety	Name of farmer	Location	Size (fed.)
1	Kosti 2	Alsamani Daffala	Gezira scheme	2
2	Kosti 2	Mobasher Mohamed	Gezira scheme	2
3	Kosti 2	Mohamed Gilani	Gezira scheme	2
4	Kosti 2	Hassen Mohamed	Gezira scheme	2
Total				8

Table 40. List of CS producing farmers in Gezira in 2023

CS	Variety	Name of farmer	Location	Size (fed.)
1	Kenana	Jalal Babeker	Gezira scheme	2
2	Kenana	Alsamani Daffala	Gezira scheme	2
3	Abassya	Mohammed Gilani	Gezira scheme	2
4	Abassya	Abdelmajeed Mohammed	Gezira scheme	2
5	Abassya	Husein Mohammed	Gezira scheme	2
6	Abassya	Hassen Mohammed	Gezira scheme	2
Total				12

2.4.3 Activity 3-3 “CoE provides training on CS production to contracted farmers.”

(1) 2020 season

A workshop was held on January 14, 2020, positioned as preparation for seed production training, attended by Mr. Hag Attwa, NRP, and Dr. Tawhida Babikir, DG, Gezira SMoPER, and discussed various issues and topics among participants, including extensionists and farmers from Gezira and 5 project-related states, and the following was presented.

(1) In reviewing the rice production in 2019, the following were pointed out: late delivery of fertilizer and other inputs delayed the sowing time, importance of field leveling work, non-payment to farmers, need for drainage measures during heavy rainfall, and inadequate transportation for extensionists to visit the field.
(2) In response to the above, the importance of early sowing, improvement of field leveling technology, thorough implementation of small plots, prompt payment to farmers, and allowance of transportation were identified as items to be addressed in the future.
(3) As for seed production method after 2020, discussions were made specifically on, seed production field layout, materials for identification and removal of different varieties, drainage measures, cultivation logbooks, agreements with farmers related to seed production, cost analysis of rice and seed production, and seed farmer selection criteria, and confirmed that necessary improvements would be made.

Photo 20. Training for seed production preparation (January 14, 2020)

A training for CS farmers and extensionists from Gezira state and the five target states was held on March 2-3, 2020 at Gezira SMoPER with about 50 participants. The training invited lecturers from Dr. Khalid Osman of the ARC WNRS and SA of MoAF to explain the characteristics of rice varieties registered in Sudan and the criteria and procedures for seed certification in Sudan. In addition, Mr. Goto gave an overview of seed production, and Gezira State extensionist explained important points of seed production. The practical training included manual sowing, identification of different rice varieties, and harvesting. Materials provided by outside lecturers, materials prepared by Mr. Goto, the Handbook on Upland Rice Cultivation prepared in the former Project, and other materials summarizing important points of seed production were used. Rice planted in the field in front of the Gezira RPU office was utilized for the practical training.

		
CS production training	Gezira RPU extensionist explaining different varieties	Practices on manual harvesting

Photo 21. Technical training on CS production (March 2-3, 2020)

On October 13-14, 2020, "Training on Harvesting and Postharvest Handling" was conducted, focusing on characteristics and differences among rice varieties, harvesting and postharvest handling operations, and seed certification procedures, with a total of 48 CS farmers and extensionists from all six target states participating. The training consisted of lectures on rice variety characteristics and traits by Dr. Khalid of ARC WNRS, seed certification procedures and seed storage by Ms. Wahiba of SA, MoAF, and harvest and post-harvest handling techniques, seed cleaning and storage by Mr. Ashraf of Gezira RPU. In addition, the participants visited the CS production plots and seed bank at the ARC headquarters in Wad Medani, and had practical training on manual harvesting and using a threshing machine in the plots in front of the Gezira RPU office. Ms. Nagano from JICA Sudan office observed this training.

		
Guests and lecturers	Ms. Wahiba, Seed Administration	Threshing practice

Photo 22. Training on Harvesting and Postharvest Handling (October 13-14, 2020)

(2) 2021 season

A two-day wrap-up training was held on February 15-16, 2021 at the conference hall of the Farmers Union in Gezira State with about 60 participants consisting of seed farmers engaged in seed production in 2020 and extensionists from 6 states. The purpose of the training was to discuss and share among CS farmers, extensionists, and other stakeholders regarding the seed production in Gezira and the five states, creative ideas and challenges in cultivation management, and responses to the inspection by SA. The current condition of rice millers in each state and the progress of the Project using the monitoring sheets were also reported and discussed.

The training was attended by Mr. Hag Attwa, NRP, Dr. Ayman Ibrahim Abdelgadir, DG of Gezira SMoPER, Dr. Khalid Osman, National Rice Research Coordinator and Project Co-Manager of this Project, ARC WNRS, Ms. Nafeisa Noor, DG of Gedaref SMoPER, Ms. Asmaa Osman, DG of Sennar SMoPER and Mr. Hassan Elhaj, DG of River Nile SMoPER. Arab Seed Company (ASC), which is conducting rice cultivation, also participated in the training program and reported on rice production at ASC.

During the training, in accordance with the training program, the results and challenges of CS production in 2020 in the Project target states, the results of seed production of certified and promising varieties at ARC HQ and other stations, the status of rice production in ASC, and the results of analysis among rice farmers in Gezira State were presented. Unfortunately, SA of MoAF did not participate and no presentation was made on seed inspection, but reports from each state and active comments from farmers were made, and the training was completed almost as per the program.

Regarding the results of CS production in each state, about 1,300 kg of Kosti1 and 2,300 kg of Umgar varieties were harvested in Gezira State. One of the Gezira RPU extensionist reported that about 950 kg of Kosti1 and

1,800 kg of Umgar varieties were stored after seed cleaning was done, and as issues in CS production, especially purity of RS seed of Umgar varieties, lack of irrigation water, and delay in harvest due to delay in field screening. During an inspection of Mr. Daffala's CS production field where CS was machine-harvested, a significant amount of fallen rice grains were observed. Although the moisture content of the paddy was measured before harvesting, it was reported that a wheat harvester was used instead of a rice harvester, which is difficult to adjust the amount of blowing wind of the machine. As for the lack of irrigation water and delays in harvesting, the participants agreed to enhance cooperation with related departments and agencies.

Mr. Nakagaki, chief advisor of the Project, reiterated the importance of leveling the field before seeding. Unlike weeding and removal of different varieties, leveling work is almost impossible to improve the leveling situation once sowing is done, and he advised the formation of more plots as a measure. Also, while there was some rainfall in 2020, it did not wipe out the rice as it did in 2019. He also explained that rice can grow without any problem as long as 1/3 of the body of the rice is above the water surface.

		
Speech by Dr. Ayman, DG of Gezira SMoPER	Presentation of Mr. Ibn Idris, ASC	Mr. Nakagaki, chief advisor commented

Photo 23. Wrap-up training (February 15-16, 2020)

A workshop on CS production planning was held in Gezira State on April 5-6, 2021. The workshop was attended by 80 participants from CS farmers, extensionists, NRP, ARC, and other organizations in each state. The workshop consisted of (1) confirmation of issues in CS production in farmers' fields in each state for the 2020 crop season and sharing of measures for the 2021 crop season, (2) presentations and exchange of opinions on the CS production plan for 2021 (cultivated area, number of farmers, cultivated area per farmer, etc.) and each work schedule, and (3) discussion and exchange of opinions on the improvement of farmer selection criteria and the use of the cultivation record.

Concerning (1) above, the importance of selecting appropriate farmers and fields, delays in field inspection by SA, and securing means of transportation were discussed, as well as technical issues such as the quality of seeds provided, delays in field preparation, leveling, damage caused by heavy rains, and effective weed control methods. Also presented and discussed were the appropriate sowing date in Northern State where high temperatures are expected in summer. Afterwards, using the "Upland Rice Cultivation Handbook," Mr. Goto explained the main technical points (seeds, leveling, weed control, and water management) in upland rice cultivation, including points to keep in mind, as well as points related to seed production (removal of different varieties, etc.), and confirmed these points with the participants. It was agreed that the relevant agencies (SA was not present), including the respective SMoPER, NRP, and ARC, would provide guidance and support as much as possible to address the issues raised.

As for (2) above, presentations were given by each state and opinions were exchanged. In preparing the plan, the key points were as follows,

- ✧ Each state should prepare a draft plan based on the amount of seed harvested per variety last season, taking into account human and physical capacities, etc.
- ✧ As this is the second season of CS production, the plan prepared by each state should be respected as much as possible in order to give each state a sense of responsibility. For example, there should be no "guidelines" or "limits" on the area to be cultivated per farmer.
- ✧ In addition to the production plan, a specific work plan to achieve the target yield of 1 t/feddan should also be prepared.

- ✧ SMoPER (extensionists) will obtain technical assistance, in cooperation with the respective State Research Stations (RS) of ARC.
- ✧ NRP and the Project will conduct periodic monitoring activities based on the entries made by extensionists in the Cultivation Record, etc., to monitor activities and provide necessary and possible support.

It was confirmed that there is no need to revise the criteria for selecting CS farmers in (3) above, and that the Cultivation Record will be actively utilized.

		
Presentation by Mr. Abdelgadir, Gezira RPU, on issues on last season and measures for coming season	Presentation by Mr. Nzar, Gezira RPU, on CS production plan and work schedule	Presentation by a representative of Gedaref State

Photo 24. Workshop on CS production planning (April 5-6, 2021)

(3) 2022 season

A wrap-up meeting to review the 2021 crop season was held in Gezira on March 27-28, 2022, attended by about 60 farmers engaged in CS and ordinary rice production, extensionists from the states concerned, NRP and ARC officials, etc. Ms. Nagano, a representative from the JICA Sudan office, also participated. The Gezira RPU prepared a PowerPoint presentation, explaining the results, problems, and challenges of the 2021 crop season and how to respond to them.

The main issues identified as challenges during the training were as follows

- ✓ Mixture of seed of Umgar varieties
- ✓ Lack of irrigation water
- ✓ Flood damage due to poor irrigation/drainage channels
- ✓ Delays in seed field inspections by SA
- ✓ Large expenses for weeding operations
- ✓ Low purchase price of produced rice and slow payment to farmers

In response to these issues, deeper collaboration with related organizations, including the Irrigation authorities, and advance allowances for weeding expenses were discussed. The NRP officials made efforts to purchase rice production in Sudan under the difficult financial situation of the country, and were also promoting discussions with the Ministry of Finance officials. There was a need to repair and other measures to improve the efficiency of rice harvesting.

The Gezira RPU has developed a mid-term plan for future training implementation and compiled it into the "CoE Gezira Mid-term Plan". The plan suggests that four technical training sessions and one wrap-up training session will be held annually. For each training course, the training objectives, expected dates, expected participants, etc. were specified, and the training contents, methods, and expenses were also prearranged. The training will be conducted in accordance with this training plan. The details are described in the Mid-term Plan, but for reference, the following is an outline of the first training session, which dealt mainly with techniques related to field preparation.

(1) Title: Rice Certified Seed Field Management
Overall Goal: Disseminate rice production in Gezira State
Objective (s):

1. Provide farmers with practical knowledge on rice CS establishment.
2. Exchange/transfer experiences among farmer, extensionists and researchers.
3. To establish farmer- to -farmer extension system

Time/ duration: May-June (2 day)
Place: Gezira State
No. of Participants: 50 persons (15 farmers and 5 extensionists from Gezira State, 20 farmers and 5 extensionists from other states, 3 from SA and 2 from ARC)
Cost: Attached
Output and Contents:

Expected Module Output	Subjects/Agendas	Methodology
To make farmers implement proper rice field preparation	1) Agricultural machinery for land preparation 2) Importance of land leveling	Lectures
To understand water management	1) Proper plotting 2) Irrigation and drainage	Lectures
To conduct effective use of inputs (herbicides & fertilizers)	1) Application of herbicides 2) Timing of adding urea	Lectures
To implement effective field practices	Pre-watering, plotting and land leveling	Field Practice
To share knowledge and challenges of rice establishment	Open discussion	Field Trip

(4) 2023 season

The two-day training, held on March 14 and 15 at a training hall in Wad Medani, Gezira, was attended by about 80 participants, including 24 farmers and 31 extensionists from states concerned. Three JICA experts from the Project, Mr. Nakagaki, Mr. Goto, and Dr. Yagi, and Mr. Hag Attwa (NRP, Project Manager), Director of SA, Deputy DG of Gezira SMoPER, Minister of Finance in Gezira State, Manager of Rahad Irrigation Scheme, Agricultural Bank, and other relevant officials participated. Five seed inspectors from SA also participated. The training was designed to summarize the results of the rice production plan (especially for CS) established at the beginning of the year, identify the factors for the achieved and unachieved items, prepare for the next crop season, and share the experience among the participants concerned.

The Gezira RPU prepared a format for compiling CS production results and distributed it to each state through the NRP, and state officials used the format to make presentations. However, Gedaref SMoPER did not participate because it did not produce CS this season, and no presentation was made. The Northern SMoPER did not have CS production, but reported on ordinary rice production in the state. In addition to the presentations from each state, the key points of seed production were explained by the staff of the Gezira RPU and by Mr. Goto, and the results of the cost analysis of rice farmers in Gezira were reported by Mr. Osama, Director of the RPU in Gezira. In addition, Mr. Daffala, a farmer in Rahad Irrigation area, Gezira, who has tried a ridging system for ordinary rice production in 2022, presented the work and results.

A document was prepared and discussed with the staff of the Gezira RPU for use in future Wrap-up meetings to summarize the production results, discuss improvement measures, and plan for the timing of cropping. In this document, the evaluation items are narrowed down to the area under cultivation, number of farmers, yield, and seed inspection, while the cultivation management and cooperation with related organizations are considered as a process. The processes that need to be improved were clarified and organized so that problematic processes can be improved in the next crop to lead to better results. This document was distributed to each state through the NRP for their use.

		
Overview of the training	Lecture by SA, MoAF	Mr. Daffala presenting on 2022 ordinary rice production

Photo 25. Wrap-up training (March 14-15, 2023)

The following is a summary of the various trainings conducted by the Project. Although the number of participants per training went almost as planned, the number of trainings was lower than originally planned. This was due to the restrictions imposed on the travel of JICA experts and the movement of Sudanese nationals due to the global COVID-19 crisis that began at the end of 2019, the deterioration of security in the country since April 2019 (when the Bashir regime collapsed and a transitional democratic government was formed), the disturbance in October 2021, the armed conflict in April 2023, and the armed conflict since then, among other factors.

Table 41. Summary of trainings conducted

Date	Title	No. of participants	Objectives and Contents
January 14, 2020	Workshop	About 50	Preparation for 2020 CS production
March 2~3, 2020	Training	About 50	Points of CS production technology, Manual harvesting, Identification of different varieties
October 13~14, 2020	Training	About 50	Identification of different varieties, Characteristics of rice varieties, Harvesting and postharvest technology, Procedure of seed certification
March 15~16, 2021	Wrap up	About 60	Review on 2020 CS production and CS production plan of 2021, Dealings for seed inspection, Condition of rice millers, Project progress monitoring
April 5~6, 2021	Workshop	About 60	CS production plan of 2021
March 27~28, 2022	Wrap up	About 60	Review on 2021 CS production and CS production plan of 2022
March 14~15, 2023	Wrap up	About 80	Review on 2022 CS production and CS production plan of 2023
Total 7 times		About 410	

2.4.4 Activity 3-4 “CoE supervises CS production by contracted farmers.”

(1) Season 2020

The year 2020 was the first year of CS production, and at the "Preparation for CS Production" workshop held on January 14 of the same year, it was decided that each farmer would basically produce at 0.25 feddan. The RS of the Umgar and Kosti1 varieties was provided by ARC through NRP. A total of six farmers were selected in Gezira according to the seed farmer selection criteria. One of the six, Mr. Daffala Bashir in Rahad Irrigation Scheme, produced two feddans of Kosti1 and Umgar varieties based on his experience in seed production of other crops and rice production in the former Project. The location of CS producing farmers in 2020 is shown in the appendix 8 (including ARC Medani and Maatug ARC).

Most fields were sown during June as recommended by the Project. In field preparation, the leveled fields were raked as demonstrated during the training in March 2020, and then manually sown in strips on top of the raked fields. Mr. Daffala's field in the Rahad Irrigation Scheme was a large plot, so a seeding machine was used. The fields with low germination rates were then re-seeded. While a farmer (Mr. Mohammed Aboud) showed improvement in germination rate, other (Mr. Mohammed Abdelgadir) had to give up production because of the lack of irrigation water.

Except for Mr. Abdelgadir, who gave up CS production, the other farmers took measures for water management, rodents, and termites based on advice from RPU staff, and the rice plants grew well. Weeding and fertilizer applications were made in July and August. Mr. Aboud's field was not growing well due to weeds, but after five rounds of weeding, growth was restored. When irrigation water was insufficient, irrigation was carried out by mobilizing pumps. The removal of different varieties was carried out sequentially in cooperation with each CS farmer and Gezira RPU. Mr. Daffala's rice, which is produced on a larger area than the other farmers, grew well due to proper management of the cultivation. For Mr. Mubarak, the seedlings were replanted on August 6, followed by frequent termite control.

Since then, CS production at five farmers and three feddans in Gezira State has progressed relatively smoothly, and in mid-September, officials from SA of MoAF conducted field inspections of five farmers as part of the seed certification process. Gezira RPU extensionists conducted a different variety removal operation at the CS farmers' fields along with providing guidance to the farmers.

The progress of these cultivations has been recorded as shown below (table 42). This record format was used until the end of the project in 2023, during which it was improved to include items that were not in the original format, such as the number of irrigations and the schedule for field inspections by SA.

Table 42. Cultivation record of CS production (2020)

Seed production in Gezira (2020)							as of September 3, 2020
Farmer's Name		Daffala Bashir		Mhmd. Aboud	Abdl. Mamoun	Abuzer Ahmd.	Mhmd. Abdelgadir	Mubark Abdelrahman
Location		Rahad 44		Alkomour	Wadalsha	Helawa	Abdelhakam	Hajabdallah
Size (feddan)		1.25	0.75	0.25	0.25	0.25	0.25	0.125+0.125
Variety		Umgar	Kosti1	Umgar	Umgar	Kosti1	Kosti1	Umgar
Date & Number	Land Prep.	May 10 - June 22		June 1 - June 22	June 1 - June24	June 1 - June25	June 1- June 28	June 25- July 12
	DAP App.			22-Jun	13-Jun	15-Jun	28-Jun	8-Jul
	Sowing	22-Jun	22-Jun	23-Jun	25-Jun	26-Jun	29-Jun	July 12-13
	Germination rate	95%	85%	65%→70%	80%	80%	60%	70%, 50%
	Re-sowing	no need	no need	4-Jul	5-Jul	8-Jul		20-Jul
	No. of plots	20	12	12	12	16	16	
	Herbicide	23-Jun	23-Jun	25-Jun	26-Jun	27-Jun	1-Jul	July 12-13
	Irrigation	June 23-24,		25-Jun	26-Jun	27-Jun	July 1	July 12-13
	Irrigation	July 4-6		1-Jul	30-Jun	1-Jul	7-Jul	
	Irrigation	15-Jul		11-Jul	10-Jul	8-Jul	13-Jul	
	Irrigation				11-Aug			
	Weeding	11-Jul	11-Jul	9-Jul	12-Jul	24-Jul		3-Aug
	Weeding	24-Jul	24-Jul	25-Jul	7-Aug	10-Aug		14-Aug
	Weeding	17-Aug	17-Aug	Aug 11-13	25-Aug	18-Aug		
	Weeding			Aug 18-19				
	Weeding			28-Aug				
	Termite control					9-Jul	Cancelled due to lack of irrigation water (July 26)	Jul 26, Aug 6, 13, 27
	Urea application	14-Jul	14-Jul	26-Jul	13-Jul	24-Jul		10-Aug
	Urea application	19-Aug	19-Aug	14-Aug	10-Aug	11-Aug		20-Aug
	Urea application	29-Aug			27-Aug			
	Rogueing	1-Sep			1-Sep	31-Aug		
	Remarks			Bird and rodent attack				Transplanting on Aug 26. Termintes attack

SA of MoAF, with the financial support of NRP, visited all CS production farmer fields in Gezira in October and conducted the second CS production field inspection. Subsequently, sequential harvesting was conducted at Mr. Daffala's plot on October 25-26 and at Mr. Abuzer's plot on October 28-29, and harvesting was completed at all CS production plots by November 21.

One of Mr. Mubarak's two plots did not pass the inspection, but all other farmers' fields did. As for the yield, 5 farmers except Mr. Mubarak recorded 2 to 4 tons/ha, which is considered satisfactory for the first year of CS production. The following table summarizes the results of CS production.

The causes of the low yields of Mr. Abdelgadir and Mr. Mubarak, who cancelled seed production, and future countermeasures, as well as the yields and results of this season and points to be reflected on, were discussed at the Wrap-up meeting (training) in January next year. The meeting was attended by not only CS farmers in Gezira but also extensionists of the other five states, as well as NRP and ARC.

Table 43. Result of CS production in Gezira (2020)

Farmer's Name		Daffala Bashir		Mhmd. Aboud	Abdl. Mamoun	Abuzer Ahmd.	Mhmd. Abdelgadir	Mubarak Abdelrahman	
Location		Rahad 44		Alkomour	Wadalsha	Helawa	Abdelhakam	Hajabdallah	
Size (feddan)		1.25	0.75	0.25	0.25	0.25	0.25	0.125	0.125
Variety		Umgar	Kosti1	Umgar	Umgar	Kosti1	Kosti1	Umgar	
SA Inspection		20-Oct	20-Oct	20-Oct	20-Oct	20-Oct	---	22-Oct	Oct 22, Rejected
Harvest		31-Oct	30-Oct	11-Nov	3-Nov	27-Oct	---	21-Nov	21-Nov
Just after harvesting									
Step 1 (Stage 1)	Weight (kg)	1700.0	1000.0	215.3	440.1	305.0	---	6.5	---
	Moisture content (%)	14.1	12.3	12.4	12.7	17.0	---	12.3	---
	Yield (kg/fed)	1360.0	1333.3	861.2	1760.4	1220.0	---	52.0	---
	Yield (kg/ha)	**3238.1**	**3174.6**	**2050.5**	**4191.4**	**2904.8**	---	**123.8**	---
	Yield (14%)	**3234.3**	**3237.4**	**2088.6**	**4254.8**	**2803.4**	---	**126.3**	---
Note: Specify any post-harvest processes conducted when measured the yield to make comparison and evaluation meaningful									
After cleaning									
Step 2 (Stage 2)	Drying	Yes	Yes	Yes	Yes	Yes	---	Yes	Yes
	Threshing	Yes	Yes	Yes	Yes	Yes	---	Yes	Yes
	Winnowing	Yes	Yes	Yes	Yes	Yes	---	Yes	Yes
	Cleaning	Yes	Yes	Yes	Yes	Yes	---	Yes	Yes
	Other (Manual Cleaning)	Yes	Yes	Yes	Yes	Yes	---	Yes	No
	Weight (kg)	1243.1	666.0	175.75	436.7	290.4	---	6.05	2.0
	Moisture content (%)	9.5	9.3	9.4	10.1	10.9	---	9.6	11.4
	Yield (kg/fed)	994.5	888.0	703	1746.7	1161.6	---	48.4	16
	Yield (kg/ha)	**2367.8**	**2114.3**	**1673.8**	**4158.8**	**2765.8**	---	**115.2**	**38.1**
	Yield (14%)	**2491.7**	**2229.8**	**1763.3**	**4347.4**	**2865.5**	---	**121.1**	**39.2**
Note: Specify any post-harvest processes conducted when measured the yield to make comparison and evaluation meaningful									

Sowing at Helewa area (July 2020)

Mr. Mamoun's CS field. Removing different varieties by RPU staff. (Umgar variety, Sep. 17, 2020)

Mr. Daffala's CS field of Kosti1 variety (Oct. 13, 2020)

Photo 26. CS production in Gezira (2020)

The Field Day in Gezira was held on November 3, 2020, at the field of Mr. Mamoun in Wad Alasha area, one of the CS production farmers. At his field, preparations began in early June, including leveling the production fields, and the Umgar variety was sown in 0.25 feddan on June 25, followed by re-sowing on July 5. Thereafter, regular field visits and technical guidance by Gezira RPU extensionists and daily field and water management work by the farmer resulted in a final seed harvest of 440 kg of seed (4.4 t/ha at the standard 14% water content). This was a satisfactory result for the first year's seed harvest. Discussion among RPU extensionists and Mr. Mamoun opted to hold a Field Day at the farmer's field.

About 200 people attended the Field Day on November 3, including Dr. A. Adris, Governor of Gezira State, Mr. A. Tirkawy, Undersecretary (Acting Minister) of MoAF, Dr. Aymen, DG (Acting Minister) of Gezira SMoPER, Mr. Takahashi, Chief Representative of JICA Sudan Office, and Ms. Nagano, JICA staff, and other guests. At the Field Day, the participants enjoyed demonstrations of hand harvesting and a foot-pedal threshing machine, as well as breads and snacks made from rice flour. The Field Day was well attended by the media, and a video by the Sudan News Agency (SUNA) was posted on YouTube and widely shown to the public.

(https://www.youtube.com/watch?v=M6_iLKRXTSE).

		
Speech by Undersecretary of MoAF	Undersecretary and Governor experiencing manual harvest	DG of Gezira SMoPER showing bi-products using rice flour

Photo 27. Field Day in Gezira (Nov. 3, 2020)

(2) Season 2021

Eight farmers were selected for CS production in 2021 in accordance with the selection criteria, for a total of 17.8 feddans. The Gezira RPU planned to promote rice production to neighboring farmers by placing several rice farmers, including seeds, in one area. This season, three areas, Wadsawi and Umkitera in Gezira Irrigation Scheme, and Block 10 in Rahad Irrigation Scheme, had multiple farmers. As an improvement from 2020, remote CS production fields such as those in Haj Abdallah area were dropped and fields with good accessibility from Wad Medani, where the RPU office is located, were selected. (CS production location is in the appendix 8.)

The Project recommended sowing in June, and half of the 12 farmers, including ordinary rice farmers, completed sowing in June, with the remaining 6 farmers completing sowing on July 4 and 5. Although the farmers were instructed to increase the number of small plots per unit area during the Wrap-up meeting in February 2021, they chose fewer plots due to fear of complicated water management work.

Although there were concerns about water distribution in the entire irrigation scheme this season (repair of a large irrigation canal in the Gezira Irrigation Scheme and electricity problems to operate pumps in the Rahad Irrigation Scheme), the selection of farmers' fields with few water distribution problems within the scheme was also considered to have contributed to the smooth growth of the crop.

On October 12, Mr. Goto, Mr. Matsuda, and Dr. Hassan, the Project consultant, visited the CS field of Mr. Mohammed Gilani in Wadsawi area with Mr. Ahmed, Director of the Gezira RPU. On the 20th, Mr. Nakagaki, Mr. Matsuda, Mr. Goto, Mr. Nakamura, and Dr. Hassan, together with the head of the RPU and extensionists, made another site visit. They advised the farmer to continue checking and removing different varieties in the fields. They confirmed that the second field inspection was scheduled for October 27. They also checked possible location for setting a tent for a Field Day to be conducted in this area in early November.

However, due to the disturbance on October 25, the second field inspection of Mr. Gilani’s field scheduled on October 27 by SA was not conducted. Also the Field Day was canceled. Mr. Gilani's product was accepted as seed after the passing of the first field inspection. The field was harvested after it was dried.

As for CS production in 2021, CS production was cancelled in one of the eight fields planted, but production continued in the other seven fields. The 7 fields passed the field inspection by SA. The average yield of the seven farmers was 1.17 t/ha. Two farmers harvested more than 2 t/ha and three farmers less than 1 t/ha. The harvested seeds were then sorted and cleaned, and the seeds were sampled by SA for laboratory inspection (table 44).

Table 44. Result of CS production in Gezira (2021)

Location	Gezira scheme	Gezira scheme	Gezira scheme	Rahad scheme	Rahad scheme	Gezira scheme	Gezira scheme	Gezira scheme
Locality	Abdelhakam	Mahala	Wadsawi	Block10	Block10	Wadsawi	Wadsawi	Wadsawi
Rice Variety	Kosti1	Kosti1	Kosti1	Umgar	Umgar	Kosti1	Kosti1	Kosti1
Field size (Fed.)	2	3	2	3	1.8	2	2	2
Demo or Seed	Seed	Seed	Seed	Seed	Seed	Seed	Seed	Seed
Farmer	Abdelgadir Abdelbagi	Alsamani Daffala	Mohamed Gilani	Abdu Elemam	Mohamed Abdalla	Salah Abdelgadir	Hasen Mohamed	Mobashir Mohamed
Supervisor	Mhmd. Alsamani	Mhmd. Alsamani	Nzar Omer	Akram Ali	Akram Ali	Nzar Omer	Nzar Omer	Nzar Omer
Cultivation Practices								
Land Prep.(date)	15-Jun-21	5-Jun-21	27-Jun-21	25-Jun-21	5-Jun-21	27-Jun-21	27-Jun-21	27-Jun-21
# of plot/feddan	8	8	8	8	10	10	10	10
Germination rate (%)	60	65	70	80	80	85	85	70
Sowing and DAP (date)	3-Jul-2021	4-Jul-2021	5-Jul-2021	25-Jun-2021	25-Jun-2021	5-Jul-2021	5-Jul-2021	5-Jul-2021
	Seed driller, 30kg/fed, 25cm spacing, DAP(50kg/fed)							
Plotting + canal	5-Jul-2021	5-Jul-2021	7-Jul-2021	28-Jun-2021	26-Jun-2021	7-Jul-2021	7-Jul-2021	7-Jul-2021
Irrigation	8-Jul-21	10-Jul-21	11-Jul-21	30-Jun-21	27-Jun-21	9-Jul-21	13-Jul-21	9-Jul-21
Irrigation	Cancelled	4-Nov-21	4-Nov-21	20-Oct-21	22-Oct-21	20-Oct-21	4-Nov-21	20-Oct-21
Frequency (times/week)	1/7 days	1/7 →1/5 days	1/5 days	1/6 days	1/6 days	1/5 days	1/5 days	1/5 days
Weed control (Chemical)	7-Jul-21	8-Jul-21	8-Jul-21	30-Jun	27-Jun-21	8-Jul-21	8-Jul-21	8-Jul-21
	25-Aug-21	7-Aug-21	11-Aug-21	22-Jul	19-Jul-21	11-Aug-21	11-Aug-21	11-Aug-21
	Stomp, 1liter/feddan							
Weeding(Manual, 1)	28-Jul-2021	21-Jul-2021	4-Aug-2021	2-Aug-2021	2-Aug-21	28-Jul-21	4-Aug-2021	28-Jul-21
Weeding(Manual, 2)	6-Aug-21	25-Aug-21	28-Aug.-2021	24-Aug-2021	24-Aug-21	18-Aug-21	28-Aug.-2021	18-Aug-21
Weeding(Manual, 3)	31-Aug-21	11-Sep-21	8-Sep-21	4-Sep-2021	2-Sep-21	7-Sep-21	8-Sep-21	7-Sep-21
Weeding(Manual, 4)	Cancelled	23-Sep-21	18-Sep-21			17-Sep-21	18-Sep-21	17-Sep-21
Fertilization	29-Jul	3-Aug-2021	6-Aug	3-Aug-2021	3-Aug	2-Aug-2021	6-Aug	2-Aug-2021
	1-Sep	24-Sep	17-Sep	11-Sep-2021	14-Sep	20-Aug	17-Sep	20-Aug
Harvesting	Cancelled	15-Nov		18-Nov	18-Nov-21	4-Nov-21		4-Nov-21
Inspection by SA (1)	Cancelled	*6-Oct-21*	*6-Oct-21*	*6-Oct-21*	*6-Oct-21*	*6-Oct-21*	*6-Oct-21*	*6-Oct-21*
Inspection by SA (2)	Cancelled	*Passed (Nov. 7)*	*(Nov. 7)*	*Passed (Nov. 7)*	*Passed (Nov. 7)*	*Passed (Nov. 7)*	*(Nov. 7)*	*Passed (Nov. 7)*
Inspection by SA (3)	Cancelled		Passed(Nov.30)				*Passed(Nov.30)*	
Mosture content (%)		13.8		13.7	13.5			
Notes								
Cut survey yield								
Actual Yield	Cancelled	495	1040	845	675	1878.5	560	1734
Yield ton/ha		**0.39**	**1.24**	**0.67**	**0.89**	**2.24**	**0.67**	**2.06**

Mr. Mohamed Gilani's well grown CS field in Wadsawi area (Kosti1 variety, Sep. 1, 2021)

Mr. Mohamed Abdalla's CS field in Block10, Rahad (Umgar variety, Sep. 2, 2021)

JICA experts and RPU extensionists checking CS field and farmer engage in removal of different varieties at Mr. Gilani's field (Oct. 20, 2021)

Photo 28. CS production in Gezira (2021)

(3) Season 2022

Payments to farmers for rice harvested in 2021 were still outstanding as of the end of May (then paid in September 2022), and the payments to farmers have been a problem every year since the start of this Project. Some farmers were strongly opposed to the extreme delays in payments, and there were some farmers who left rice seed production. Under these circumstances, in 2022, CS production took place in Gezira in 8 feddans, 4 from the 7 listed (see the locations in the appendix 8). Three of the 4 are farmers in Wadsawi area, where seed production has been continuous since 2020, and where continued to facilitate information sharing among farmers on cultivation and farming techniques.

The Kosti2 seed used this season was supplied by ASC. As one of the improvements in cultivation methods, the Gezira RPU increased the amount of herbicide applied after leveling the field from 1 liter per feddan to 1.25 liters per feddan. This resulted in fewer weeds and better germination (75-90%) than last year, as shown in the photo, and the RPU continued providing appropriate guidance to improve cultivation. The number of small plots

in the field has also improved from around 10 to 26 in the Wadsawi area. According to a farmer in Wadsawi, this was because "the leveling work by the tractor was not satisfactory, so there was a need to increase the number of plots to upgrade the levelness of the plots.

Among the four farmers who produced CS this season, Mr. Alsamani Daffala's field in Mahala district had to give up CS production due to prolonged flooding of the field caused by intermittent rainfall from mid to late August and the collapse of an irrigation canal. Production continued in the remaining 6 feddan plots of 3 farmers in the Wadsawi area. The farmers were satisfied with the Kosti2 seeds planted this time because of their high seed purity, low heterosis, and good growth.

The first field inspection was conducted by SA on September 27, followed by a second field inspection on October 28. Harvesting then took place in early November in the fields of three farmers and six feddans in the Wadsawi area. For harvesting, a wheel type harvester and a caterpillar harvester provided by JICA in the former Project were introduced. The wheeled harvester was used for wheat harvesting and was used in the ordinary rice production field in 2020, but it needed to be adjusted due to many harvesting losses. This time, the adjustments were made and the rice was harvested without any harvesting losses. However, there was a clear difference in the condition of the machine-harvested rice between the wheeled type and the caterpillar type, with the wheeled type having a large amount of broken rice that was threshed out after the rice had been dehulled. The farmers were eager to harvest with the caterpillar harvester, and decided to conduct only a trial harvest with the wheel-type harvester. Caterpillar harvesters need to be transported to the field, and until 2021, Gezira SMoPER did not cover the cost of transporting them, so the harvesting was done with wheeled harvesters that can be driven to the farmers' fields. A comparison of the two types of harvesters showed that the wheeled harvester is not suitable for harvesting rice, and the caterpillar harvester should be used in the future, with transportation costs budgeted for in advance.

The harvest yield was 4,000 kg/ha (667 kg/feddan=1,587 kg/ha) for 6 feddans. The harvested grains contained foreign matter such as stems, and ARC's machine was borrowed for cleaning (table 45).

Table 45. Result of CS production in Gezira (2022)

Location	Gezira scheme	Gezira scheme	Gezira scheme	Gezira scheme
Locality	Mahala	Wadsawi	Wadsawi	Wadsawi
Rice Variety	Kosti2	Kosti 2	Kosti 2	Kosti 2
Field size (Fed.)	2	2	2	2
Demo or Seed	Seed	Seed	Seed	Seed
Farmer	Alsamani Daffala	Mobasher Mohamed	Mohamed Gilani	Hasen Mohamed
Supervisor	Mohammed, A. Gader	Nzar, Ashraf	Seddig, Ashraf	Seddig, Ashraf
Cultivation Practices				
Land Prep.(date)	2022/5/15	2022/4/15	2022/5/20	2022/5/22
No. of plot/feddan	20	26	26	26
Germination rate (%)	78%	85%-90%	85%-90%	85%-90%
Pre-watering (period)				
Sowing and DAP (date)	2022/7/14	5-Jul-22	5-Jul-22	5-Jul-22
Plotting + canal	2000/7/14	2022/7/6	2022/7/6	2022/7/6
	2022/7/15	2022/7/7	2022/7/7	2022/7/7
Irrigation (1)	2022/7/16	2022/7/8	2022/7/10	2022/7/12
Irrigation (2)	2022/7/23			
Irrigation (3)	heavy rains29/7	HR'1/8/2022	HR'1/8/2022	HR'1/8/2022
Irrigation (4)	HR' 10/8/2022			
Irrigation (5)	heavy rains 13/8/2022			
Irrigation (6)	Flooding 10-25/8/2022			
Weed control (Chemical) post	2022/8/8	2022/7/29	2022/7/28	2022/7/28
Weeding(Manual, 1)		2022/8/5-6	2022/8/5-6	2022/8/5-6
Weeding(Manual, 2)		2022/8/24	2022/8/22	2022/8/23
Weeding(Manual, 3)		2022/9/1	2022/9/2	2022/9/3
Remarks	*Field affected by flooding due to heavy rains and broken in irrigation canals (10-25/8/2022) The field was cancelled*	*Continueous rains delay manual weeding*	*Continueous rains delay manual weeding*	*Continueous rains delay manual weeding*
Fertilization (1st)		*2022/8/8*	*2022/7/8*	*2022/7/8*
Fertilization (2nd)		2022/9/4	2022/9/4	2022/9/4
Rogueing (1st)		2022/10/20	2022/10/20	2022/10/20
Rogueing (2nd)		2022/10/31	2022/10/31	2022/10/31
Harvesting		2022/11/02=03	2022/11/02=03	2022/11/02=03
Inspection by SA (1)		*2022/9/27*	*2022/9/27*	*2022/9/27*
Inspection by SA (2)		*2022/10/28*	*2022/10/28*	*2022/10/28*
Inspection by SA (3)		Passed	Passed	Passed
Actual Yield		1363	1764	882.2

Discussion among RPU staff and Mr. Gilani (white cap) in Wadsawi (May 12, 2022)

Better growth parts in Wadsawi (Sep. 15, 2022)

Harvesting with caterpillar type harvester (Nov. 2, 2022)

Photo 29. CS production in Gezira (2022)

(4) Season 2023

As indicated in the Wrap-up meeting held in March, the initial plan for seed production in Gezira was to continue CS production from 2020 with a total of 8 feddans: 6 feddans for 3 farmers in Wadsawi and 2 feddans for 1 farmer in Mahala. However, 2 feddans per farmer in Wadsawi and 2 feddans per farmer in Medina Arab were added from the original plan, for a total of 12 feddans per farmer in 6 farms (the location is in the appendix 8). In Wadsawi area, as described in the Mid-term plan, the following measures was taken: (1) promoting rice production technology and information exchange among farmers, (2) promoting efficiency in providing technical guidance services by extensionists, and (3) promoting the development of a rice production system in the future.

The armed conflict in April 2023 has caused a lot of problems, including the general situation in Sudan, the living conditions of the Gezira RPU staff, the financial situation of the central and state governments, and the level of procurement of diesel and other commodities. According to the information received on July 9 and August 1 from the Gezira RPU regarding CS production, regarding the post-sowing condition, although the germination rate of Mr. Hasen Mohammed's 2-feddan plot in Wadsawi area was somewhat low and bird damage was noted in 2 farmers' 4-feddan plots, the number of plots per feddan was above the 20 recommended by the Project and was considered to be relatively progressing well. The information received was compiled in an Excel file so that the production status can be monitored and recorded, which is considered evidence that the project activities are steadily taking root. Even under difficult circumstances that showed no signs of improvement since April, such as unpaid salaries for government employees, absence of expenses for production activities, and uncertainty about whether seed inspections would be conducted, the extensionists worked closely with farmers to promote CS production.

CS production was progressed and the cultivation record and photos were shared from Gezira RPU. Mr. Jalal in Medina Arab area had tried to produce CS production in the past, but had to give up due to irrigation water problems. Mr. Alsamani in Mahala area had given up production due to drainage and irrigation water shortage problems in the past years, but this season, he had no such problems and made good progress. As mentioned in the Mid-term plan for the utilization of CoE, the Wadsawi area can be a model for CS supply system as well as a base for rice production.

The first SA field inspection was held on October 9. In Gezira SMoPER, a meeting was held on October 16 to discuss the harvest that is expected to take place as early as November. The main topic of discussion was the cost of the transportation vehicles that transport the harvesters to the fields from Wad Medani. In 2022, the Project supported the cost of the transport vehicle to bring it to the field, but in 2023, the Federal Ministry of Finance, as well as the Gezira SMoPER and the Gezira State Ministry of Finance, have no funds available. The Project received a letter from the Director of the RPU of Gezira State requesting assistance in this matter, and shared it with JICA officials at the monthly meeting in Japan held on October 23, and received JICA's approval to remit the funds.

All CS production fields were approved for field inspection by SA, which is required for CS. The inspection was conducted three times, the first on November 2, the second on November 5, and the third on November 22. The harvest was planned on November 17 at Wadsawi area. However, due to various reasons, including transportation of harvesters and payment of expenses, harvesting started on November 20.

The RSF (Rapid Support Force) invaded Wad Medani on December 15, and the staff of the RPU was evacuated to other areas including outside Gezira State. Therefore, it took some time to compile the results, but the results in table 46 below were later shared by the staff of the Gezira RPU. In the final year, despite facing various difficulties, 12 feddans yielded about 11 tons.

Table 46. Result of CS production in Gezira (2023)

Location	Gezira scheme	Gezira scheme	Gezira scheme	Gezira scheme	Gezira scheme	Gezira scheme
Locality	Madina Arab	Mahala	Wadsawi1	Wadsawi2	Wadsawi3	Wadsawi4
Rice Variety	Kenana	Kenana	Abassya	Abassya	Abassya	Abassya
Field size (Fed.)	2	2	2	2	2	2
Source of Seed	ARC, Kosti (Breeder Seed)	ARC, Kosti (Breeder Seed)	ARC, Kosti (Breeder Seed)	ARC, Kosti (Breeder Seed)	ARC, Kosti (Breeder Seed)	ARC, Medani (Breeder Seed)
Previous Crop	Onion	Onion	Bean	Bean	Bean	Bean
Demo or Seed	Seed	Seed	Seed	Seed	Seed	Seed
Farmer	Jalal Babeker	Alsamani Daffala	Mohammed Gailani	Abdelmajeed Mohammed	Husein Mohammed	Hassan Mohamed
Supervisor	Mohammed, Nzar	Mohammed, Nzar	Abdelgadir, Tarig	Abdelgadir, Tarig	Seddig, Ashraf	Seddig, Ashraf
Extensionist	Ashraf	Ashraf	Osama	Osama	Osama	Osama
Cultivation Practices						
Land Prep.(date)	April	May	May	May	May	May
# of plot/feddan	27	21	22	22	22	22
Germination rate (%)	80%	85%	75%	70%	85%	65%
Remarks	Birds Attack (Before & After Re-sowing)					Birds Attack After Sowing
Pre-watering (period)						
Sowing and DAP (date)	26.6.2023	26.6.2023	8.7.2023	8.7.2023	8.7.2023	8.7.2023
	Seed driller, 30kg/fed, 25cm spacing, DAP(50kg/fed)					
Plotting + canal	26.6.2023	2.7.2023	10.7.2023	10.7.2023	10.7.2023	10.7.2023
Irrigation (1)	27-28.6.2023	5.7.2023	12-14.7.2023	12-14.7.2023	14-16.7.2023	14.16.2023
Re-sowing	12.7.2023					
Weed control (Chemical)	27.6.2023	4.7.2023	11.7.2023	11.7.2023	13.7.2023	13.7.2023
	Stomp, 1.5 liter/feddan					
		1.8.2023			11.8.2023	11.8.2023
	2,4-D 0.5 liter/feddan					
Fertilization (1st)	3.8.2023	11.8.2023	15.8.2023	15.8.2023	18.8.2023	18.8.2023
	50 kg/Feddan					
Weeding(Manual, 1)	20.7.2023	8-9.8.2023	27.7.2023	27.7.2023	17.8.2023	18.8.2023
Weeding(Manual, 2)	2.8.2023	26.8.2023	13.8.2023	14.8.2023	27.8.2023	27.8.2023
Weeding(Manual, 3)	25.26.8.2023	2.9.2023	25.8.2023	26.8.2023	3.9.2023	3.9.2023
Weeding(Manual, 4)	1.9.2023	25.9.2023	8.9.2023	9.9.2023	9.9.2023	10.9.2023
Fertilization (2nd)	29.8.2023	5.9.2023	10.9.2023	10.9.2023	11.9.2023	11.9.2023
Harvesting	20-Nov	21-Nov	9-Dec	9-Dec	10-Dec	10-Dec
Inspection by SA (1)	9.10.2023	*9.10.2023*	*9.10.2023*	*9.10.2023*	*9.10.2023*	*9.10.2023*
Inspection by SA (2)	5.11.2023	5.11.2023	5.11.2023	5.11.2023	5.11.2023	5.11.2023
Inspection by SA (3)			22.11.2023	22.11.2023	22.11.2023	22.11.2023
Notes						
M.C %	14.8	15.4	19.3	19.8	19.9	22.6
Actual Yield (KG)	1440	600	2850	1615	2635	1785
Yield kg/fed.	720.00	300.00	1425.00	807.50	1317.50	892.50
Yield ton/fed.	0.72	0.30	1.43	0.81	1.32	0.89
Yield kg/Ha	1714.30	0.72	3.42	1.94	3.16	2.14
Yield (kg/Ha)14%	1698.35	708.28	3209.23	1807.30	2945.07	1927.80
Yield (ton/Ha)14%	1.70	0.71	3.21	1.81	2.95	1.93

Mr. Alsamani (right), CS farmer in Mahala and Mr. Nzar, Gezira RPU

Mr. Jalal's CS field in Medina Arab area (Kenana variety, Oct. 9, 2023)

Field inspection at Wadsawi area (Oct. 9, 2023)

Photo 30. CS production in Gezira (2023)

2.4.5 Activity 3-5 "CoE prepares production manual for CS."

Since this is a manual to be used by farmers, discussions among the staff of the Gezira RPU led to the use of many photos and illustrations to provide sequence and ease of understanding throughout the entire seed production process. Field preparation, field leveling, water management, weeding, heterosis identification and removal, and seed certification procedures by SA, which are especially important in seed production, are also

explained in plain language. With these considerations in mind, the following draft table of contents was adopted as a basis.

1. **Introduction**
2. **Seed Classification and quality**
3. **Seed inspection for certification (check the quality)**
   - i. Field inspection
   - ii. Lab test
   - iii. Certification
4. **Rice varieties released by ARC**
5. **Overview of Rice Seed Production**
6. **Land Preparation**
7. **Sowing**
8. **Water Management (Irrigation and drainage)**
9. **Weed and Pest Control**
   - **i. Weed control**
     - a) Chemical weeding
     - b) Hand weeding
   - **ii. Pest Control**
     - a) Termite Control
     - b) Bird Control
10. **Fertilization**
11. **Removing off types (Rogueing)**
    - i. Importance of removing off-type
    - ii. How to Identify off-type
      - a) Plant shape, plant height
      - b) Stem color
      - c) Time of heading and maturity
      - d) Panicle shape
      - e) Grain color and shape
    - iii. Timing of rogueing
12. **Harvesting**
13. **Post- harvesting**
    - i. Field Drying
    - ii. Cleaning
    - iii. Packing
    - iv. Labeling
    - v. Storing
14. **Appendix**
    - i. Seed preparation (water separation, seed dressing)
    - ii. Points for Selection Criteria
    - iii. Farm Records

Based on the experience gained in seed and ordinary rice production since the former Project until 2022, photos taken at rice production sites, and discussions at various trainings and workshops, a first draft manual was prepared. After that, it was decided to add good practices based on the advice of JICA experts, and information was collected and organized for the following five cases.

(1) Increased number of small plots in Wadsawi area
(2) Identification and removal of different varieties by farmers' collaboration in Wadsawi area
(3) Rice cultivation by several farmers using adjacent information in Wadsawi area

(4) Weed management in early growth stage by pre-watering before sowing and herbicide application in Rahad area
(5) Exchange and promotion of cultivation techniques and farming information among farmers in Wadsawi area

The RPU staff added the above case studies and photos to the manual, completed the final review process within the Project, and submitted it to NRP and the International Cooperation Department (ICD).

The method of rice production by ridging for ordinary rice production in 2022 was explained by the implementing farmers during the workshop in 2023. Discussions among workshop participants indicated that the method can be used in ordinary rice production, but that further study is needed in terms of workability of removing different varieties in seed production, where quality is important.

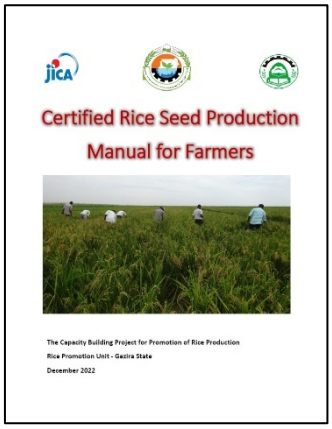


Figure 5. Cover of the manual for CS

2.4.6 Activity 3-6 “CoE prepares a plan for CS supply system to ordinary farmers in a sustainable manner.”

A seed production plan is needed as a prerequisite for seed supply. In Gezira, a rice production plan for the period 2023-2027 has been prepared and is described in the Mid-term plan. In order to make rice production more efficient and effective, Gezira State has been experimenting with the production system. In this system, ordinary rice farmers are arranged around the seed farmers, aiming to improve the efficiency of seed supply. This system has been in practice in Wadsawi area within the Gezira Irrigation Scheme since 2021, with about four farmers utilizing adjacent plots for rice cultivation after 2021 and again in 2022 and 2023, with rice cultivation in several adjacent farmer plots.

2.4.7 Activity 3-7 “CoE distributes CS to ordinary farmers.”

In Gezira, the first seed production was conducted in the 2020 crop season with 6 farmers and 3.25 feddans, using two varieties, Umgar and Kosti1. As a result, 4,320 kg of seed of the Umgar variety and 2,550 kg of seed of the Kosti1 variety were produced. For ordinary rice production in 2021, seed of the Umgar variety harvested in 2020 was distributed to four farmers and sown in plots of 8 feddans. The normal sowing rate is 35 kg per feddan, which means that 35 kg x 8 feddans = 280 kg of CS seed was distributed to ordinary farmers.

In the 2021 crop season, 17.8 feddans of 8 farmers produced seed; 4.8 feddans of 2 farmers produced the Umgar variety and 13 feddans of 6 farmers produced the Kosti1 variety. The yield was 1,520 kg for the Umgar variety and 5,705 kg for the Kosti1 variety. Ordinary rice production in 2022 used 350 kg of seed of the Kosti1 variety produced in 2021 and sown in 9.75 feddans of 4 farmers' fields, and finally yielded 4000 kg. In 2022, another 0.75 feddan was sown using 35 kg of NERICA 4 seeds stored in the warehouse of the Gezira RPR in one farmer's 0.75 feddan field for ordinary rice production.

In 2022, Arab Seed Company through NRP supplied 8 feddans (280 kg) of seed of Kosti2 variety, which was sown and produced in 4 farmers' fields. For ordinary rice production in 2023, three newly registered varieties of seed (Kenana, Abassya, and Gezira) were supplied by ARC through NRP, and one farmer produced 2.5 feddans. Although it was possible to utilize the 4,000 kg of seed produced in 2022 as Gezira State, the farmer accepted NRP's intention to cultivate the newly registered new varieties in the field.

The total amount of seeds distributed to rice farmers during the project period was 715 kg and the number of target farmers was 12 as shown in the table 47.

Table 47. Distribution of certified seed (CS)

Year	Variety	No. of farmer	Cultivation area (feddan)	Amount of distribution (kg)
2021	Umgar	4	8	280
2022	Kosti1	4	9.75	350
	NERICA 4	(1)	(0.75)	(35)
2023	Kenana	1	1	20
	Abassya	1	0.5	10
	Gezira	1	1	20
Total	5 (6)	11 (12)	20.25 (21)	680 (715)

(Numbers in bracket includes NERICA 4 variety which is not a registered seed)

The following part describes the activities of ordinary rice production using the CS.

(1) Season 2018

In 2018 and 2019, there were no RS to offer to farmers, and the rice production activities of farmers were developed using NERICA 4 rice varieties owned by CoE Gezira. In 2018, ordinary rice production took place in 28 feddans of 7 farmers (location map is in the appendix 8). The seeding started in late June and all fields were finished by mid-July. During the growing season, the cultivation conditions were monitored and information was organized and shared with all parties involved, including JICA experts. Extensionists of Gezira RPU visited the cultivated fields to check the growing conditions and provide guidance on cultivation, and farmers conducted water management, fertilization, weeding, and other operations. During the cultivation period, two farmers in the Medina Arab area had to cancel their cultivation due to lack of irrigation water caused by a problem with the main canal. Among the remaining 5 farmers' fields, Mr. Adeeb's Umgar variety field in Wad Alnaeim area suffered from flooding and termites, resulting in a small yield. The other four farmers' fields grew relatively well. Among them, Mr. Aboud's rice field was selected for the Field Day because of its satisfactory results due to proper fertilization and pest management.

Table 48. Example of cultivation monitoring (2018)

Location: Alkouner – Gezira Scheme **Locality: South of Gezira**

Variety and Farm Size: Umjar 4 Feddan. **Farmer Name: Mohammed Aboud**

Team Leader: M. Alsamani. **Team Member: Abdelgadir Bakri**

No	Activity	Date	Description
1	Land Preparation	25/5-13/6	Plowing, Harrowing, Leveling
2	Sowing & adding DAP	24/6	By seed driller- 35 Kg/fed. Spacing 25cm/ DAP 50Kg/fed.
3	Chemical (weed control)	27/6	Pre-emergence-Herbicide – Stomb (1.5 L/fed)
4	Plotting & Irrigation canal	27/6	
5	First Irrigation	28/6	
6	Re-Sowing	-	
7	Chemical (weed control)	15/7	Post emergence Herbicide – 2,4-D (0.5 L/fed)
8	Fertilization (first dose)	17/7	Urea 50Kg/fed
9	First Manual Weeding	1/8	Hand weeding.
10	Second Manual Weeding	24/8	
11	Fertilization (second dose)	28/8	

Remark.

- Rice in the heading stage, need more water.
- Farmer is first time growing rice.

		
Mr. Daffala's field of NERICA4 variety in Rahad (proper crop management is carried out) (October 2018)	Mr. Aboud's field of Umgar variety in Alkoumor in Gezira (well grown and expected harvest at the end of October) (October 2018)	Mr. Galal's field in Medina Arab, Gezira (less land levelness and faced shortage of irrigation water caused by broken main canal) (October 2018)

Photo 31. Ordinary rice production (2018)

Field Day was held on November 4, 2018 at Mr. Aboud's field. The event was attended by about 250 participants, including the Undersecretary of MoAF, Minister of Agriculture and DG of Gezira SMoPER, the Head of Gezira Irrigation Scheme, NRP National Rice Coordinator, private companies, AAAID (Arab Authority for Agricultural Investment and Development), university officials, the First Secretary of the Embassy of Japan in Sudan, the Chief Representative of JICA Sudan Office, and many guests.. The event was covered by the media, including newspapers and TV news, and is considered to have made a significant contribution to the promotion of rice production in the country of Sudan. The result of ordinary rice production in 2018 is shown in table 49.

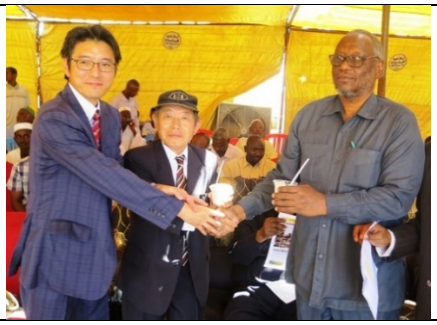
		
Mr. Nakagaki explained rice crop to Undersecretary	From the left, Mr. Takahashi (JICA Sudan Office), Mr. Nakagaki, Dr. Azhari (Undersecretary)	Explanation by Dr. Khalid (center) of ARC

Photo 32. Field Day (2018)

Table 49. Result of ordinary rice production (2018)

Location	Umalgoura/Rahad44	Alkoumor/Gezira	Wad Alasha/Gezira	Wad Alnaeim/Gezira	Wad Alnaeim/Gezira	Medina Arab 1/ Gezira	Medina Arab 2/ Gezira
Locality	Umalgora	South Gezira	South Gezira	South Gezira	South Gezira	South Gezira	South Gezira
Rice Variety	NERICA4	Umgar	Umgar	Umgar	Umgar	Umgar	NERICA 4
Field size (Fed.)	2	4	4	4	4	4	6
Demo or Seed	Seed	Demo	Demo	Demo	Demo	Demo	Demo
Farmer	Daffalla Bashir	Mohammed Aboud	Abuzer A. Mhmd.	Abdellateef A. Haj Ali	Adeeb A. Ali	Galal Babikr	Galal Babikr
Supervisor	Ayman Adam	Mhmd. Alsamani	Mhmd. Alsamani	Mhmd. Alsamani	Mhmd. Alsamani	Daffalla Saeed	Daffalla Saeed
Extensionist	Akram Nasir	Abdelgadir Bakri	Tarig Osman	Osama Hajmusa	Ashraf Abdeen	Amin Alaagib	Amin Alaagib
Cultivation Practices							
Land Prep.(date)	Jan.5 - July 7	May 25 - June 13	May 21 - June 10, June 25 - July 5	May 29 - June 11	May 28 - June 10	May 28 - July 7	May 29 - July 8
# of plot/feddan	20	7	8	7	8	20	20
Germination rate (%)	75	80	93	90 (termites damage)	80 (flood & termites damage)	85>	85>
Pre-watering (period)	June 16 - 18	-	June 13	-	-	-	-
Sowing and DAP (date)	10-Jul-2018	24-Jun-2018	18-Jul-2018	24-Jun-2018	24-Jun-2018	9-Jul-2018	9-Jul-2018
	Seed driller, 35kg/fed, 25cm spacing, DAP(50kg/fed)						
Plotting + canal	13-Jul-2018	27-Jun-2018	18-Jul-2018	28-Jun-2018	27-Jun-2018	9-Jul-2018	9-Jul-2018
Weed control	13-Jul	27-Jun	19-Jul	27-Jun	25-Jun	?	?
	Stomb (1.5L/fed)						
(Days after sowing)	*3*	*3*	*1*	*3*	*1*		
Irrigation (first)	July 13	June 28	July 19	June 30	July 2	July 9	July 9
Frequency (times/week)	every 7days for the first 2 months, every 4 days later on	every 4-5 days	every 5-6 days	every 5-7days for the first 2 months, every 4-5 days later on	every 5-7days for the first 2 months, every 4-5 days later on	every 6-7 days	every 6-7 days
Re-sowing	July 24	n/a	n/a	n/a	July 16	n/a	n/a
Weed control (Chemical)	16-Aug	15-Jul	3-Aug	17-Jul	17-Jul	6-Aug	6-Aug
	2.4D (0.5L/fed)						
(Days after sowing)	*37*	*21*	*16*	*23*	*23*	*28*	*28*
Fertilization	17-Aug	17-Jul	8-Aug	19-Jul	20-Jul	13-Sep	13-Sep
	Urea (50kg/fed)						
(Days after sowing)	*38*	*23*	*21*	*25*	*26*	*66*	*66*
Weeding	Aug. 1, Aug. 12	Aug. 1, Aug. 24	Aug. 15, Aug. 25	Aug. 1, Aug. 26	Aug. 5, Aug. 25	Aug. 11-13, Sept. 7, Sept. 17	Aug. 11-13, Sept. 7, Sept. 17
Fertilization	1-Sep	28-Aug	8-Sep	29-Aug	29-Aug		
	Urea (50kg/fed)						
(Days after sowing)	*53*	*65*	*52*	*66*	*66*	*n/a*	*n/a*
Harvesting	**25-Nov**	**4-Nov**	**2-Dec**	**4-Dec**	**8-Nov**		
(Days after sowing)	***138***	***133***	***137***	***163***	***137***		
Notes							
	Rogueing to be done in October by RPU	Field day candidate				Shortage of irrigation water from Aug. 23 to Sept. 24.	Shortage of irrigation water from Aug. 23 to Sept. 24.
Expected yield(Oct.21)	2.5 ton/ha	3.5 ton/ha	3 ton/ha	1.5 ton/ha	2 ton/ha	0.2~0.4 ton/ha	
Cut survey yield	**2.79 ton/ha**	**4.45 ton/ha (Oct. 24)**					
Actual Yield	**2588.56 kg (42 Sacks)**	**6090 kg (87 Sacks)**	**2800 Kg (40 Sacks)**	**630 Kg (9 Sacks)**	**2100 (30 Sacks)**	**Cancelled**	**Cancelled**
Yield ton/ha	**3.451**	**4.0698**	**1.8564**	**0.4284**	**1.4042**		
Productive Area Yield ton/f	**1.45**	**1.71**	**0.78**	**0.18**	**0.59**		

(2) Season 2019

According to the proposed Gezira SMoPER upland rice cultivation plan, 40 feddans (NERICA4) were to be planted as seed and 260 feddans of Umgar as ordinary rice in 2019. As a practical matter, implementation on this scale was not possible, and discussions continued with the Gezira RPU and NRP. As a result of discussions with the RPU, in 2019, ordinary rice production would take place in 15 feddans of 4 farmers as shown in the table 50 (location map is in the appendix 8). Two of the four farmers were new rice farmers. The production harvested by the ordinary rice farmers in 2018 was utilized as seed. However, as of June 11, budget and fertilizers for cultivation had not reached the Gezira SMoPER, and payments to rice farmers from the previous season had not been made. Later, the RPU of Gezira state decided to sell rice harvested last season and began to make partial payments to the farmers. Thus, there was a delay in the arrival of inputs and the consequent delay in sowing. The intermittent rainfall and poor drainage from the end of July after sowing had a significant impact on the growth of the rice plants. In the field of Mr. Alsamani in Mahala, the last of the four farmers to continue production, the field did not dry out after the rainfall, as shown in Photo, and the access road to the field was impassable. Although the farmer was able to enter the field in mid-October, the rice was not tall and healthy enough to be harvested due to the prolonged rainfall, and the crop was not expected to be harvested. After discussions among the farmers, officials of the Gezira RPU, and NRP, it was finally decided to abandon all rice cultivation in Gezira State.

Table 50. List of ordinary rice farmers (2019)

Location	Gezira	Gezira	Gezira	Rahad
Locality	Mahala	Mahala	Alkoumor	Block 9
Rice Variety	NERICA4	NERICA4	NERICA4	NERICA4
Field size (fed.)	5	4	4	2
Farmer	Mr. Alsamani Daffala	Mr. Daffala Ahmed	Mr. Mhmd. Abuzer	Mr. Daffala Bashir
Supervisor	Mhmd. Alsamani	Mhmd. Alsamani	Mhmd. Alsamani	Ayman Adam

		
Mr. Daffala's field in Block 9, Rahad (completely inundated by heavy rainfall. Sep. 12, 2019)	Main road (front) and field (back) in Mahala, Gezira (Oct. 8, 2019)	Mr. Alsamani's field in Mahala, Gezira (many missing hills and poor growth. Oct. 8, 2019)

Photo 33. Ordinary rice production (2019)

As shown in the table 51 with regard to rainfall, the rainfall in Wad Medani, and Rahad Irrigation Scheme (Um El Qura) received about 1.5 to 2 times more rainfall than in previous years. The Rahad Irrigation Scheme area received 10 days of rainfall in August, with a maximum daily rainfall of 40 mm. This intermittent rainfall made drainage of rice production fields difficult to drain due to the inflow of wastewater from other fields and area. This has made weeding and access to the plots impossible, since the plots were selected in relatively low-lying areas due to concerns about lack of irrigation water based on the experience of rice production in 2018.

Table 51. Rainfall data (mm) in Gezira and neighborhood (2019)

Rainfall Data (mm)											
State/Location	Jan=March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Total
Long term average（Climate-data.org）											
Sennar	0.0	0.0	20.5	66.1	99.2	135.9	84.5	13.7	0.2	0.0	420.1
White Nile	0.0	2.8	16.1	15.8	106.0	137.4	61.1	18.4	1.3	0.0	358.9
Khartoum	0.0	0.0	3.0	5.0	41.0	62.0	20.0	4.0	0.0	0.0	135.0
Gezira (Medani)	**0.0**	**2.0**	**13.0**	**30.0**	**107.0**	**123.0**	**52.0**	**14.0**	**1.0**	**0.0**	**342.0**
2019年（Locations in Gezira）											
Um El Qura	0.0	0.0	6.1	44.8	34.3	215.8	78.4	58.5			437.8
South Locality	0.0	0.0	0.0	54.5	86.2	140.6	53.5	33.6			368.4
Wad Medani	**0.0**	**0.0**	**13.8**	**64.4**	**90.0**	**180.7**	**61.9**	**76.9**			**487.6**
East Locality	0.0	0.0	4.4	39.0	41.2	194.2	21.1	36.6			336.3
Hasahisa	0.0	0.0	0.0	48.7	95.9	223.6	58.4	2.9			429.5
El Kamlin	0.0	0.0	0.0	36.0	0.0	98.0	32.0	25.0			191.0
El Managil	0.0	0.0	0.0	34.5	132.5	138.5	91.0	6.6			403.1
Average	0.0	0.0	3.5	46.0	68.6	170.2	56.6	34.3			379.1

(3) Season 2020

Beginning in 2020, the Gezira RPU staff was to provide guidance and supervision to CS production farmers in addition to ordinary rice farmers. Ordinary rice farmers were selected as shown in the table 52 (the location map is in the appendix 8). Field preparation was conducted from mid-May to early June, followed by sowing from June 30 to July 15. However, two of the five farmers failed to control weeds in the early planting period, resulting in cancellation of the rice production. Other farmers also experienced unsatisfactory results due to problems with termites, birds, and poor drainage throughout the growing season. In addition, restrictions were imposed on movement within the country due to the COVID-19 in Sudan. This also restricted field guidance by extensionists to the ordinary rice production fields. Furthermore, since this 2020 was the first year of CS production, the extensionists were not able to visit the ordinary rice production fields and provide guidance, and thus were unable to conduct proper monitoring of cultivation.

Table 52. List of ordinary rice producing farmers (2020)

No.	Name	Variety	Size (feddan)	Area
1	Mr. Gaffer Hakheet Yousif	NERICA 4	2	South Gezira, Huda
2	Mr. Abdelrareem Hassan Abdelraheem	NERICA 4	2	South Gezira, Wad Alasha
3	Mr. Nasereldea Hasan Taha	NERICA 4	2	South Gezira, Huda
4	Mr. Abdelgadir Abdelbagi Ibrahim	NERICA 4	2	South Gezira, Talha
5	Mr. Tarig Mohammed Hassan	NERICA 4	2	South Gezira, Wad Alasha
	Total		10	

The results of ordinary rice production in 2020 are shown in the table 53: two areas in Huda faced a shortage of irrigation water and failed weed control, which resulted in their production being canceled midway through cultivation. The remaining three farmers' fields were successfully harvested despite damage from termites; the three farmers harvested a total of 3,123 kg with an average yield of 1.24 ton/ha.

Table 53. Result of ordinary rice production in Gezira (2020)

Farmer's Name		Gaffer Bakheet Yousif	Abdelrareem Hassan Abderaheem	Nasereldea Hassan Taha	Abdelgadir Abdelbagi Ibrahim	Tarig Mohammed Hassan
Location		Huda	Wad Alasha	Huda	Talha	Wad Alasha
Size (feddan)		2	2	2	2	2
Variety		NERICA 4	NERICA 4	NERICA 4	NERICA 4	NERICA 4
Date & Number	Land Prep.	15-May	June 5 - July 1	15-May	June 15 - July 5	June 5 - July 1
	DAP App.	30-Jun	14-Jul	30-Jun	15-Jul	15-Jul
	Sowing	30-Jun	14-Jul	30-Jun	15-Jul	14-Jul
	Germ rate	poor	70%	poor	delayed germination	70%
	Herbicide (pre-emergence)	2-Jul	15-Jul	2-Jul	16-Jul	15-Jul
	Herbicide (Post-emergence)		13-Aug		14-Aug	13-Aug
	Weeding	Canceleld due to aggressive weeds	15-Aug	Canceleld due to aggressive weeds	17-Aug	15-Aug
	Weeding		23-Aug		22-Aug	24-Aug
	Weeding		25-Sep		27-Sep	
	Terminate control		20-Aug		30-Aug	
	Urea application (1st)		16-Aug		18-Aug	16-Aug
	Urea application (2nd)		12-Sep		9-Sep	24-Aug
	Urea application (3rd)		26-Sep			
	Zinc application				11-Sep	
Remarks		Shortage of irrig water, aggresive weeds, bird attack	Rains on July 18, 19	Shortage of irrig water, aggresive weeds, bird attack	Rains on July 18, 19	Attack by termites and weeds
Harvest		N/A	15-Nov	N/A	16-Nov	15-Nov
Yield		N/A	1550kg/2fed	N/A	615kg/2fed	958kg/2fed
Yield (ton/ha)			**1.85**		**0.73**	**1.14**

(4) Season 2021

In 2021, ordinary rice production was developed in 4 farmers and 8 feddans, as shown in the table 54 (the location map is in the appendix 8 with the 2021 CS farmer map). This ordinary rice production used Umgar variety seeds produced in 2020. The RPU of Gezira State has adopted a strategy of allocating several rice farmers in the same area to promote rice production, and in 2021, three farmers were deployed in the Umkitera area of the Rahad Irrigation Scheme. In addition, Mr. Ali Mokhtar's field in Block 10 of the Rahad Irrigation Scheme was within the walking distance to the field of Mr. Abu Eleman, a CS farmer.

However, the number of small plots were fewer than the one in CS producing fields. The germination rate was also not sufficient, and reseeding was necessary. In addition, the spread of COVID-19, financial difficulties

of the Sudanese government, and the disturbance by the military on October 25 exacerbated the chaotic situation in the country. The political and economic impact, as well as the problems of irrigation water distribution and stricter regulations on land use, resulted in the cancellation of all ordinary rice production as the cultivation did not reach harvest due mainly to water management problems.

Table 54. Result of ordinary rice production in Gezira (2021)

Location	Rahad scheme	Rahad scheme	Rahad scheme	Rahad scheme
Locality	Block 10	Umkitera	Umkitera	Umkitera
Rice Variety	Umgar	Umgar	Umgar	Umgar
Field size (Fed.)	2	2	2	2
Demo or Seed	Demo	Demo	Demo	Demo
Farmer	Ali Mokhtar Abdelbagi	Babiker Mohamed Ali	Hashim Mostafa Abdalla	Abdelrahim Abbas Mohamed
Supervisor	Akram Ali	Akram Ali	Akram Ali	Akram Ali
Cultivation Practices				
# of plot/feddan	6	6	6	6
Germination rate (%)	65%	80%	70%	80%
Sowing and DAP (date)	25-Jun-2021	26-Jun-2021	26-Jun-2021	26-Jun-2021
	Seed driller, 30kg/fed, 25cm spacing, DAP(50kg/fed)			
Weed control	03-Aug-21	08-Aug-21	25-Aug-21	
Irrigation (first)	28-Jun-21	30-Jun-21	30-Jun-21	30-Jun-21
Harvesting	**Cancelled**	**Cancelled**	**Cancelled**	**Cancelled**

Mr. Abdelrahim Mohamed's ordinary rice field at Umkitera area, Rahad (Umgar variety, need weeding) (July 2021)

Mr. Hashim Abdalla's ordinary rice field at Umkitera, Rahad (Umgar variety, need resowing and weeding) (July 2021)

Mr. Ali Mokhtar's ordinary rice field at Blcok 10, Rahad (Umgar variety, need resowing and weeding) (July 2021)

Photo 34. Ordinary rice production (2021)

(5) Season 2022

In 2022, ordinary rice production was carried out by 4 farmers and 10.5 feddans as shown in the table 55 (the location of ordinary rice production farmers is shown in the appendix 8, 2022 CS production farmer map). The rice production in Hasahisa and Kamlin areas was selected by the Gezira RPU aiming to expand the rice production area, the farmers' strong desire to try rice production and the fact that several farmers were engaged in rice production in Kamlin area, although it is remote from Wad Medani. Mr. Daffala was to grow NERICA 4 and Kosti1 varieties at 0.75 and 1.75 feddans, respectively, for a total of 2.5 feddans. The Gezira RPU decided to increase the conventional seeding rate of 35 kg to 40 kg/feddan to secure enough germination and avoid reseeding.

Table 55. List of ordinary rice farmers (2022)

OR	Variety	Name of farmer	Location	Size (fed.)
1	Kosti1	Fatalrahman Mohammed	Gezira scheme	2
2	Kosti1	Baderaldeen Ahmed	Gezira scheme	4
3	Kosti1	Gamal Ahmed	Gezira scheme	2
4	Kosti1	Daffalla Bashir	Rahad Scheme	2.5
				10.5

Hasahisa area is located 10km north-west from Wadsawi area where CS production is being carried out. In the Mr. Fatalrahman's field, the number of plots is 22 per feddan, which was a relatively good level of field evenness. In September, the front side of the field was about to start emergence, although it was 10 days to 2 weeks behind normal growth. However, the backside of the field was cracking, because of lack of proper water management at the fields, as a result the crop was almost completely exhausted. It was thought that the long rainfall during the early growth stage and subsequent failure of water management may have had an impact. His area was last irrigated on November 11 and was waiting for field drying for harvest. The staff concluded that the main cause was failure of water management. There was almost no harvest.

In the Kamlin area had post-germination irrigation water problems (water distribution was reportedly stopped for about 10 days), which prevented the herbicide applied from working and left the fields overgrown with weeds. The herbicide was re-applied a few days ago, and no broadleaf weeds were observed, but narrow-leaf weeds were significant. RPU staff instructed the farmer to thoroughly weed the field by hand and instructed them to visit the field again to check the condition of the field after the weeding operation. However, two farmers' 6-feddan fields in Kamlin area were abandoned in September due to overgrowth of weeds.

Mr. Daffala's field in the Rahad area was broadcasted and then ridged as shown in the photo. Germination conditions were good, weed-free, and the field was properly managed. According to him, "When the seeding machine was not available, the method of broadcasting remained, and the leveling of the field before seeding was not satisfactory, so we decided to make ridges. This method of cultivation is similar to wheat cultivation, and so far we have had satisfactory growing conditions." The farmer consulted with extensionists to improve the cultivation method, and the case was carefully monitored.

His field was last irrigated on October 27, and field drying proceeded. However, field drying did not proceed as expected due to adjacent farmland being plowed and irrigated and water leakage from the canal in the field on the opposite side near the canal. As a result, harvest took place on November 13, and the moisture content of the paddy was 17.7% at harvest.

The yield after converting paddy moisture content was 3.36 t/ha (=1.37 t/feddan) at Kosti1 and 2.35 t/ha (=0.99 t/feddan) at NERICA 4, as shown in the table below. The results for NERICA4 were relatively satisfactory, in spite of a slight decrease in yield due to water leakage from an adjacent waterway.

In the case of Mr. Daffala's field, the farmer paid special attention to field preparation prior to sowing. Specifically, he flooded the field before sowing and applied herbicide for better weed control before sowing. In fact, the farmer's field had fewer weeds during the growing season than other farmers' fields, and appropriate weed management was being carried out not only in this season but also in other seasons. The seed was then sown at a rate of 40-45 kg/feddan and the field was ridged in the same manner as wheat cultivation. However, the height of the ridges was lower than in wheat cultivation. Compared to conventional rice cultivation by leveling the field and setting up small plots, this is considered to be a labor-saving method. The ridging work was the same as in wheat cultivation, and the tractor operator was probably familiar with this work. There was no significant difference in the subsequent cultivation management between the previous method and the ridging method. As for harvesting, one of the issues was field drying. Even though there was water leakage from adjacent fields and waterways, it took some time for the fields to dry compared to the leveled fields. The crop was harvested with a caterpillar harvester, and its operator conducted a site visit prior to the harvest to confirm that there were no problems due to the ridging. This should be kept in mind when applying this cultivation method in the future.

Table 56. Result of ordinary rice production in Gezira (2022)

Location	Rahad scheme		Gezira scheme	Gezira scheme	Gezira scheme
Locality	Block 9		Hasahisa	Kamlin	Kamlin
Rice Variety	Kosti1	NERICA4	Kosti1	Kosti1	Kosti1
Field size (Fed.)	1.75	0.75	2	4	2
Demo or Seed	Demo	Demo	Demo	Demo	Demo
Farmer	Daffalla Bashir		Fatalrahman Mohammed	Baderaldeen Ahmed	Gamal Ahmed
Supervisor	Akram Ali, Aymen		Fathi, Tarig	Seddigr, Nzar	Seddig Nzar
Cultivation Practices					
Land Prep.(date)	20/5/2022		22/5- 15/6/2022	15/5/2022	20/5/2022
# of plot/feddan	n/a		20	20	28
Pre-watering (period)	20/5/2022				
Sowing and DAP (date)	13/7/2022		29/6/2022	16/6/2022	16/6/2022
	Seed driller, 35kg/fed, 25cm spacing, DAP(50kg/fed)				
Plotting + canal	13/7/2022		1-Jul-2022	23/6/2022	23/6/2022
Weed control (chemical)	13/7/2022		2-Jul-2022	23/6/2022	23/6/2022
Irrigation (first)	14/7/2022		3-Jul-22	26/6/2022-6/Jul-22	26/6/2022-6/Jul-22
Frequency (times/week)			1/week		
Re-sowing			2022/12/7		
Weed control (Chemical)	29/7/2022		26/7/2022	26/7/2022	29/7/2022
Weeding manual (1st)	1-2/8/2022		22-28/7/2022	31/7-3/8/2022	
Weeding manual (2nd)	20/8/2022		16-18/8/2022	18-19/8/2022	
Remarks	*Good establishment*		*rice was affected by termites*	*2 Fed. Out of 4 fed. was cancelled due to weed infestation (6/8/2022). 2 Fed. Was cancelled due to weed infestation*	*4 Fed. Was Cancelled due to weed infestation (6/8/2022)*
Fertilization (1st)	3/8/2022		19/8/2022	20/8/2022	
Fertilization (2nd)	16/8/2022 (foliar)				
Fertilization (3th)	23/8/2022				
Harvesting	**13/11/2022**	**13/11/2022**			
Notes					
MC(%)	**17.7**	**17.7**			
Actual Yield (kg)	**2465**	**580**			
Yield ton/ha	**3.41**	**2.45**			
Productive Area	**7226.00**	**2364.00**			
Productive Area Yield ton/f	**1.43**	**1.03**			
Yield ton/ha (@14%)	**3.26**	**2.35**			
Yield ton/fed (@14%)	**1.37**	**0.99**			

Mr. Daffala's ordinary rice field in Rahad (NERICA4 variety, July 28, 2022)

RPU staff checking rice at Rahad (Sep. 20, 2022)

Spreading grains on aplastic sheet for drying in Rahad (Nov. 13, 2022)

Photo 35. Ordinary rice production (2022)

(6) Season 2023

The original plan for ordinary rice production in 2023 was for 16 feddans by 8 farmers, but the armed conflict in April 2023 and the subsequent political and economic turmoil had changed the plan significantly. As a result,

one farmer was producing the rice; Mr. Daffala in Rahad Irrigation Scheme, with 2.5 feddans of 3 varieties (for location in the appendix 8, in the 2023 CS production map). Seeds were broadcasted, so it was expected that he was cultivating with ridging method as he did last year. Last year, he sold the harvested rice at a nearby market, and the same method would be used again this season. The germination rate was good, the farmer has excellent production technology, and production is progressing well under proper field management.

However, due to the December 15 invasion of RSF into Wad Medani, the Gezira RPU staff were evacuated to other places including other states and it took some time to compile the result. The Gezira RPU staff then shared the result in table 57 below. Harvesting was conducted on December 2, with a yield of 4,080 kg at 2.5 feddans (about 3.9 tons per hectare). It was not possible to confirm even if sales were made, but good results were obtained under difficult conditions.

Table 57. Result of ordinary rice production in Gezira (2023)

Location	Rahad scheme	Rahad scheme	Rahad scheme
Locality	Block 9	Block 9	Block 9
Rice Variety	Kenana	Abassya	Gezira
Field size (Fed.)	1	0.5	1
Previous Crop	Cotton	Cotton	Cotton
Demo or Seed	Demo	Demo	Demo
Farmer	Daffalla Bashir	Daffalla Bashir	Daffalla Bashir
Supervisor	Akram Ali	Akram Ali	Akram Ali
Extensionist	Ayman Adam	Ayman Adam	Ayman Adam
Cultivation Practices			
Land Prep.(date)	April	April	April
# of plot/feddan	19	19	19
Germination rate (%)	90%	90%	90%
Sowing and DAP (date)	12.7.2023	12.7.2023	12.7.2023
	Broadcasting, 35kg/fed, 25cm spacing, DAP(50kg/fed)		
Plotting + canal	11.7.2023	11.7.2023	11.7.2023
Weed control (Chemical)	13.7.2023	13.7.2023	13.7.2023
	Somp 1.5 L/fed.		
Irrigation (first)	14.7.2023	14.7.2023	14.7.2023
Weed control (Chemical)	2,4-D 0.5 L/fed.		
Fertilization Foilar (N)	*31.7.2023*	*31.7.2023*	*31.7.2023*
	1 (L/fed.)		
Weeding (Manual1)	*30.7.2023*	*30.7.2023*	*30.7.2023*
Weeding (Manual2)	*7.8.2023*	*7.8.2023*	*7.8.2023*
Weeding (Manual3)	1.9.2023	1.9.2023	1.9.2023
Fertilization (1st Dose)	9.8.2023	9.8.2023	9.8.2023
Fertilization (2sd Dose)	30.8.2023	30.8.2023	30.8.2023
	Urea (50Kg/fed.)		
Harvesting	**2-Dec**	**2-Dec**	**2-Dec**
Notes			
Actual Yield	**1870**	**1275**	**935**

	
Mr. Daffala and his field in Rahad (photo obtained on Oct. 19, 2023)	Mr. Daffala's field in Rahad (photo obtained on Oct. 19, 2023)

Photo 36. Ordinary rice production (2023)

2.4.8 Activity 3-8 "CoE submits next year plan/proposal for CS production including budget to NRP in a timely manner."

The production plan for 2020 was 20 feddans of CS and ordinary rice together. This plan, along with the budget required for its production, was prepared by the Gezira RPU at the end of 2019 and submitted to NRP. In view of the importance of quality in seed production, it was decided to produce seeds on a small scale (0.25 feddan/farmer), and the actual production was 6 farmers and 3.25 feddans.

The 2021 rice production plan was prepared by the Gezira RPU at the end of December 2020, submitted to NRP, and shared with JICA experts. The 2021 plan called for 20 feddans of CS and 80 feddans of ordinary rice, for a total of 100 feddans. The 2021 proposal was not on a realistic scale and was coordinated among NRP, the Project and the RPU of the Gezira state, and finally resulted in seed production by 8 farmers at 17.8 feddans. The following format (table 58) was used in discussions within the RPU to determine the number of farmers involved in seed and ordinary rice production, the area under cultivation, the amount of seed required, and the target yield.

Table 58. Format of production plan

CS and Grain Production Plan (2021) Date: _____, March 2021

Name of state: _____

CS Production

	Size of each farmer's field (feddan) (A)	Number of farmer (B)	Total area (feddan) (AxB)	Amount of seed needed (kg) (35kg/feddan)	Target yield (kg/feddan)	Variety	Name of farmers
Example 1	*0.25*	*2*	*0.5*	*17.5*	*1100*	*Kosti1*	*Mr. Masashi, Mr. Hamada*
Example 2	*0.5*	*1*	*0.5*	*17.5*	*1200*	*Umgar*	*Mr. Matsumoto*
			0	0			
			0	0			
			0	0			
			0	0			
			0	0			
Total		0	0	0			

Grain production

	Size of each farmer's field (feddan) (A)	Number of farmer (B)	Total area (feddan) (AxB)	Amount of seed needed (kg) (35kg/feddan)	Target yield (kg/feddan)	Variety	Name of farmers
Example 1	*2*	*2*	*4*	*140*	*1300*	*Kosti1*	*Mr. Yagi, Mr. Goto*
Example 2	*1*	*1*	*1*	*35*	*1500*	*Umgar*	*Mr. Takeshi*
			0	0			
			0	0			
			0	0			
			0	0			
			0	0			
			0	0			
Total		0	0	0			

The 2022 production plan, along with its budget, was also prepared and submitted to NRP at the end of 2021. The plan was also presented at a Wrap-up meeting in March 2022 and shared with NRP and other 5 states officials.

For the 2023 production plan, the Gezira RPU prepared the Mid-term Plan, which included a production plan through 2027, as well as the necessary budget. The production plan for 2023 was shared with stakeholders at the March 2023 Wrap-up meeting, along with the draft Mid-term plan.

2.5 Activities for Output 4 "The issues of rice marketing are identified based on trial sales of milled local rice in Gezira State."

2.5.1 Activity 4-1 "CoE conducts profitability analysis for rice production and other main crops."

(1) Comparison of profitability of rice and major crops production

To confirm the superiority of rice production in the Gezira state, CoE Gezira selected six major agricultural products (rice, wheat, groundnuts, cotton, sesame, and sorghum) and compared their profitability. Production information for these agricultural products is compiled annually by the SMoPER Planning Department; the CoE used this information to calculate production costs, output, revenue (sales), and return per unit area (1 feddan) and to analyze the profitability of each crop production. The results were shown in the table below. Production costs did not include general and administrative expenses. The profitability rate was calculated as Return on Sales (RoS).

Table 59. Cost, revenue, net return and profitability rate (RoS, %) comparison of rice, wheat, groundnuts, cotton, sesame and sorghum production per feddan

No.	Crop	Cost (SDG)	Yield (kg)	Total Revenue (1,000 SDG)	Net Return (1,000SDG)	Profitability Rate (RoS) %
1	Rice	59,750	1,000	189	129.25	68.39
2	Wheat	57,140	1,200	96	38.86	40.48
3	Groundnuts	50,880	850	102	66.12	64.82
4	Cotton	93,830	1,413	160	66.17	41.36
5	Seasame	20,250	250	80	59.75	74.69
6	Sorghum	27,540	1,500	92.5	64.96	70.23

The CoE assesses from the table 59 and the figure 6 that rice was the most profitable and productive grain, but when comparing its profitability rate, it was not being produced as effectively and profitably as sesame and sorghum.

One reason for this relatively low profitability rate may be that rice production in the Gezira region has a shorter history than sesame and sorghum. As rice cultivation technology improves and becomes more rationalized, future growth in the profitability rate can be expected.。

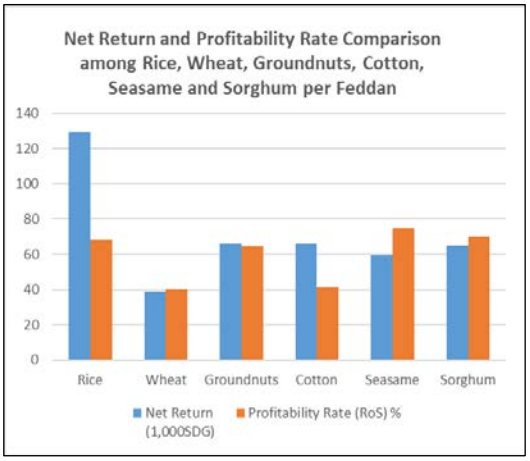


Figure 6. Net return and profitability rate comparison among six main crops per feddan

(2) Application of profitability analysis to improve rice cultivation

The application of this profitability analysis was inspired by the "Cost Analysis of CS Production in 2020-2021" presented by CoE Gezira at the wrap-up meeting. For the 2020 crop season, five farmers were engaged in CS production in six plots, and CoE Gezira calculated and compared production costs, output, revenue, and profits for each of the six production plots (cases), and identified the most profitable farmer (case). The cost of 16 different types of rice cultivation operations in each plot were compared and analyzed, and mechanization was recommended to reduce costs by replacing costly manual labor with relatively inexpensive mechanized labor.

In the first place, profitability analysis is an index analysis that measures the ability of a company to generate profits from its structural aspect. Then we can identify the farmers who practiced the most effective and profitable farming. The JICA expert suggested this point and urged calculation of the rate of return. The table below is an addition to the table presented by CoE Gezira at the wrap-up meeting with the calculated profitability rate.

Table 60. Cost analysis of CS farmers per feddan by SMoPER, and profitability rate

No. of Case	Variety	Cost (SDG/fed.)	Yield (kg/fed.)	T.Revenue (SDG/fed.)	Net Return (SDG/fed.)	**Profitability Rate**
1	Kosti1	112,650.0	1,220.0	219,600.0	106,950.0	**49**
2	Umgar	111,150.0	1,762.0	317,160.0	206,010.0	**65**
3	Umgar	98,150.0	861.2	155,016.0	56,866.0	**37**
4	Kosti1	46,850.0	1,333.3	240,000.0	193,150.0	**80**
5	Umgar	46,349.9	1,360.0	244,800.0	198,450.1	**81**
6	Umgar	105,649.9	52.0	9,360.0	-96,289.9	**-1029**
Total		520,799.8		1,185,936.0	665,136.2	
(Ave. w/out No.6)		83,030.0	1,307.3	235,315.2	152,285.2	**65**

The farmer identified by the CoE as the most profitable was case No. 2. However, the profitability rate for No. 2 was lower than that of No. 5, the second most profitable case. This means that case No. 5 effectively

achieved higher production with less cost, indicating that it was a more profitable farming operation.

In addition to the above, the expert also tried to suggest ways to promote rice farming improvement based on the costing table published by CoE Gezira. This is an application of the method of determining the actual status of management by looking at individual expenses as a percentage of sales (Cost to Revenue). In the case of rice cultivation, it is possible to determine the actual status of farming by calculating the ratio of each operation's cost to revenue. When this is then graphed and compared to other farmers, the differences in performance become clear.

If we overlay the data of No. 5 (Best Farmer), which had the highest profitability rate, or best performance, with the data of the other farmers in the group, we can see what needs to be improved and streamlined based on the differences between them. The figure 7 "visualizes" the difference between the actual rice cultivation of No. 2 and No. 5 in the table 60 by this method. In this way, each farmer in the group can easily learn from the Best Farmer and contribute to improving the farming practices of the group as a whole.

CoE Gezira expressed interest in the application of these profitability analyses and invited staff from units other than RPU to participate in a workshop to learn this application. The CoE then promptly incorporated this method into the 2021 crop year, applying profitability analysis in addition to traditional cost analysis, which was presented at the wrap-up meeting.

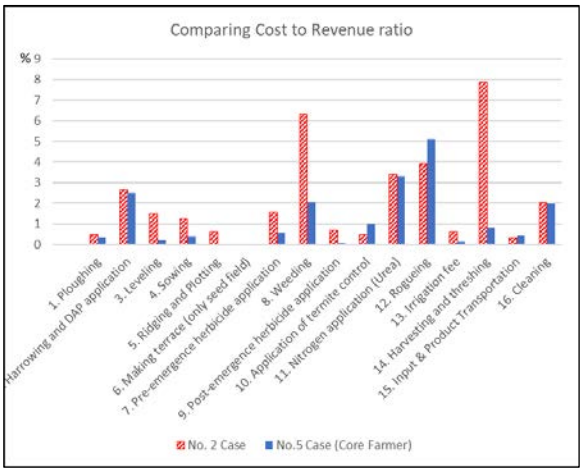


Figure 7. Compare the ratio of each work cost to revenue in cases of 2 different farmers (No. 2 and No. 5).

2.5.2 Activity 4-2 “CoE conducts market survey for milled local rice and imported rice.”

(1) Market survey of rice in Wad Medani and Khartoum

CoE Gezira conducted a rice market study in 2018 in the city of Wad Medani, Gezira. Then, in September 2022, the CoE conducted the market survey in Khartoum, which had not been conducted before, in addition to Wad Medani. The following tables (61 and 62) summarize the results. The Khartoum survey was conducted by NRP staff.

Table 61. Survey result of wholesales and retails in Wad Medani market

No.	Name of shop	Type	Name of rice	Origin	Form	Amount of each	Price SDG/kg	Amount of sale kg/mon.
1	Mourouj 0912358492	Wholesale	Golden parboiled rice	India	Sack	20kg/sack	375	3,000
					Pack	1kg/10pc/pack	420	4,000
			White Short Grain Rice	China	Sack	25kg/sack,	460	5,000
					Pack	1kg/10pc/pack	550	3,000
2	Sega 0912290805	Wholesale	Long grain rice	India	Sack	20Kg/sack	365	30,000
3	Talha 0119202442	Retail	Mourouj	India	Sack	20kg/sack	450	-
			White Short Grain Rice	China	Sack	25kg/sack,	480	2,500
					Pack	1kg/10pc/pack	650	2,500
4	Mahgoub Elhaj 0994793480	Retail	Alselsela	India	Sack	20kg/sack	375	6,000
5	Adel 0122749663	Retail		India	Bulk	1kg/bulk	600	300
				Egypt	Bulk	1kg/bulk	700	400
6	Elsheikh Elnageeb 0123939656	Retail	Marlinat International (Mid-grain)	China	Sack	25kg/sack	460	1,250
			Golden parboil rice	India	Sack	20kg/sack,	375	1,300
7	Hassan Ibrahim 0922308984	Retail	Haba Haba	Egypt	Pack	1kg/10pc/pack	500	1,000
			Al Farasha	Egypt	Pack	1kg/10pc/pack	500	1000

Table 62. Survey result of wholesale and retails in Khartoum market

No.	Name of shop	Type	Name of rice	Origin	How they sell	Amount of each	Price SDG/kg	Amount of sale kg/mon.
1	Mohammed Osman 0912936198	Wholesale	Basmati	India	Pack	1kg/20pc/box	1,600	1,600,000
2	Nadir Abdelkareem 0912858897	Retail	Long Grain	India	Pack	1kg/bulk	600	12,000
			High Quality	China	Pack	1kg/bulk	700	17,500
3	Mohammed Mustafa 0902502506	Retail	White Short Grain Rice	Egypt	Pack	1kg/10pc/pack	600	90,000
4	Center41 0917891294	Retail	Small Grain	Egypt	Sack Pack	1kg/10pc/pack	550	110,000
5	Haramain	Retail	Small Grain	India	Pack	1kg/10pc/pack	550	82,500

In the 2018 Wad Medani survey, imported rice originated from Thailand, India, and Egypt, while domestic

rice was only from White Nile State. On the other hand, in the 2022 survey, no domestic rice was found, and Chinese rice was more commonly found in the imported rice. According to recent FAO data, Sudan's domestic rice production in 2021 was 25,000 tons and imported milled rice was 90,113 tons.

(2) Institutionalization of rice market survey

In conducting the above survey, the CoE formulated a survey form and methodology, recorded the names of the surveyed wholesale and retail store owners and their contact information, including telephone numbers, and made it possible to conduct regular rice market surveys by calling each store from its office in Gezira State. The CoE would therefore conduct market surveys in May and October each year to provide rice farmers with this information.

2.5.3 Activity 4-3 “CoE continues to manage and improve cultivation methods and pre-harvest techniques as necessary by utilizing “Handbook on Upland Rice Cultivation.””

(1) Improvement of rice production technology

In Gezira State, seed growers and extensionists have jointly utilized a "cultivation record" (see table 63). This is a format for recording the dates of operations such as field preparation, seeding, fertilization, irrigation, weeding, and removal of different varieties, as well as the agricultural inputs used. The farmers are visited by the extensionists to check the growth conditions, and the cultivation conditions are recorded by interviewing the farmers directly and exchanging information on issues and other problems. If it is not possible to visit the farmer's field in person, information is exchanged and recorded by telephone or other means. In utilizing this format, the RPU improved it by adding items such as the number of small plots per feddan and seed field inspection by SA.

The number of small plots was less than 10 per feddan at the beginning of the Project, but exceeded the Project's recommendation of 20 in 2023, thanks to the guidance of extensionists and farmers' understanding. In the pre-sowing field preparation, the amount of herbicide applied was increased from the previous 1.0 L/feddan to 1.25 L/feddan in 2022. This is not a uniform increase in the amount of herbicide applied, but rather an improvement in cultivation techniques that has been achieved through exchanges of opinions with farmers in response to the conditions on the ground.

Table 63. Cultivation record for rice production

Rice Seed Production and Ordinary Rice Cultivation Record Rice variety:

Area: _____ feddan Farmer: Locality: _____, Gezira

	Activity	Date	Material and amount used	Cost	Remarks
1	Seed preparation				
2	Ploughing				
3	Ridging (optional)				
4	Pre-watering (optional)				
5	Harrowing and DAP application				
6	Organic incorporation (optional)				
7	Leveling				
8	Sowing				
9	Ridging and Plotting				
10	Making terrace (only seed field)				
11	Pre-emergence herbicide application				
12	Manual weeding (1st time)				
13	Application of termite control				
14	Fertilization (1st dose)				
15	Manual weeding (2nd time)				
16	Fertilization (2nd dose)				
17	Post-emergence herbicide application				
18	Manual weeding (3rd time)				
19	Fertilization (3rd dose)				
20	Rogueing (1st time)				
21	Rogueing (2nd time)				
22	Rogueing (3rd time)				
23	Rogueing (4th time)				
24	Harvesting and threshing				

In response to the low germination rate of 73% for seeds produced in Mr. Daffala's field in 2020 in the results

of the inspection by SA of MoAF, the Gezira RPU also conducted a germination test. The results, as shown in the table 64, were still low for rice germination. It is considered that the staff contributed to the improvement of technology by conducting the test on their own.

	
Germination test for Kosti1 variety (July 9,2021)	Germination test for Umgar variety (July 9,2021)

Photo 37. Germination test

Table 64. Germination test result

Variety	Repetition 1	Repetition 2	Repetition 3	Average
Umgar	78.0	85.0	78.0	80.3
Kosti1	82.0	81.0	83.0	82.0

(2) Repair of a combine-harvester

In 2021, the Project supported the RPU and Agricultural Mechanization Department in identifying the broken parts and ways to properly repair and to secure about 1 million SDGs on the Sudanese side for the repair of a combine harvester owned by Gezira SMoPER. Given the sustainability of the project after its completion, the following points were taken into consideration in discussions with NRP and the SMoPER.

- Emphasis on complaints from seed-producing farmers that the harvest losses incurred in 2020 and their impact on future project activities
- Clarifying the deadline for securing the budget and completion of repair work (Expected harvesting dates calculated based on rice sowing dates and actual growth conditions were provided)
- Clarify the reasons for selecting of parts to be repaired on a priority basis.
- Involvement of RPU and Agricultural Mechanization staff in a series of activities, with a view to project's sustainability.

		
Auger of combine-harvester after repair work	Replaced auger that was particularly damaged	Engineers of the Mechanization department inspected the conditions of the machine after the repair work

Photo 38. Repair work of combine-harvester

(3) Performance test of combine harvesters

The combine harvester used in 2021 was suspected as one of the causes of the CS produced in 2021 having a germination rate below the seed certification standard. Therefore, in 2022, a performance comparison test with a different type of combine harvester was conducted with RPU.

As a result, rice harvested by the crawler-type combine harvester contained about 10% more “matured paddy (paddy that was neither hulled nor broken)” than that harvested by the wheel-type combine harvester while the one harvested by the wheel type contained more brown rice, and broken brown rice (table 65, figure 8).

Products harvested by crawler type combine harvester

Products harvested by wheel type combine harvester

Photo 39. Harvested products by two different combine harvesters

Table 65. Composition of harvested products by two different combine harvesters

Component	Harvester (Crawler type)				Harvester (Wheel type)			
	Weight (g)	Weight (%)	Number	Number (%)	Weight (g)	Weight (%)	Number	Number (%)
Matured	37.6	80.3%	1,106	69.0%	35.6	72.2%	1,107	63.8%
Immatured	5.1	10.9%	223	13.9%	3.8	7.7%	174	10.0%
Empty	1.3	2.8%	209	13.0%	0.4	0.8%	56	3.2%
Brown rice (head rice)	0.5	1.1%	27	1.7%	2.9	5.9%	126	7.3%
Broken rice*	0.3	0.6%	15	0.9%	4.6	9.3%	250	14.4%
Other green foreign matter and dust	1.5	3.2%	n.a.	n.a.	1.6	3.2%	n.a.	n.a.
Damaged grains	0.5	1.1%	23	1.4%	0.4	0.8%	21	1.2%
	46.8	100.0%	1,603	100.0%	49.3	100.0%	1,734	100.0%

* two broken rice in the sample was counted as one broken rice. (original numbers was 30 grains and 500 grains respectively)

Note: Variety name: Kosti 2, Location name: Wedsawi locality in Gezira state, Date of harvest: 2nd November 2022, Sample volume: 50 grams.

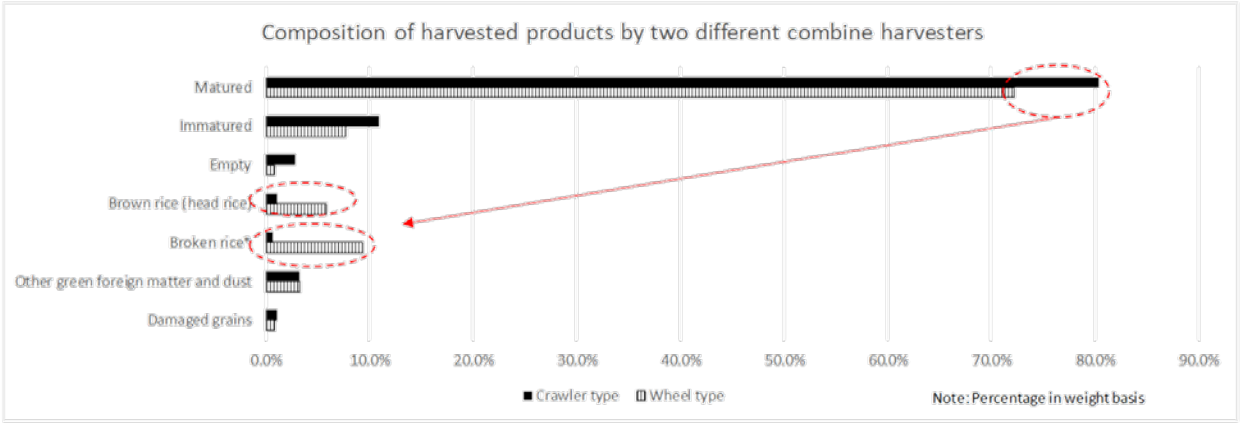


Figure 8. Composition of harvested products by two different combine harvesters

A 10% difference in production means, for example, a difference of about 320,000 SDG in sales if the yield per feddan is 1.0 ton/feddan, the area planted is 8 feddan, and the seed purchase price is 400 SDG/kg. The rent for the trailer needed to transport the crawler-type combine harvester from RPU office to the rice production field was 300,000 SDG per round trip in 2022. From the above, it can be concluded that the use of the crawler

type is superior from both cost and quality perspectives for a certain scale of production. Needless to say, this difference is not due to differences in the driving system of the machines, but to differences in their internal mechanisms such as the threshing drum, sieving system, and so on.

Furthermore, a germination rate test was conducted using the aforementioned harvests. A comparison of germination rates on the ninth day after 24-hour soaking (DAS9) showed that the crawler type recorded more than 90% germination rate, while the wheel type was lower at 83-84%, falling below the "90% or more germination rate," which is considered one of the CS certification criteria (table 66, figure 9).

Based on the above, the RPU will include the cost of crawler-type combine harvesters and the trailer rent required to transport in its annual budget.

Table 66. Result of germination test

Treatment	Germination rate (%)									Affected by fungus by
	DAS 1	DAS 2	DAS 3	DAS 4	DAS 5	DAS 6	DAS 7	DAS 8	DAS 9	DAS 9 (%)
1 Manual harvest, under shed	0%	0%	0%	6%	54%	87%	96%	98%	99%	0%
2 Manual harvest, without shed	0%	0%	0%	2%	42%	93%	97%	97%	97%	0%
3 Wheel harvester, under shed	0%	0%	0%	3%	22%	73%	82%	84%	84%	5%
4 Wheel harvester, without shed	0%	0%	0%	3%	52%	76%	81%	82%	83%	5%
5 Crawler harvester, under shed	0%	0%	0%	1%	44%	82%	88%	90%	90%	2%
6 Crawler harvester, without shed	0%	0%	0%	2%	47%	87%	93%	94%	94%	0%

Note: DAS: Days After Soaking 24hrs in water before starting germination test.

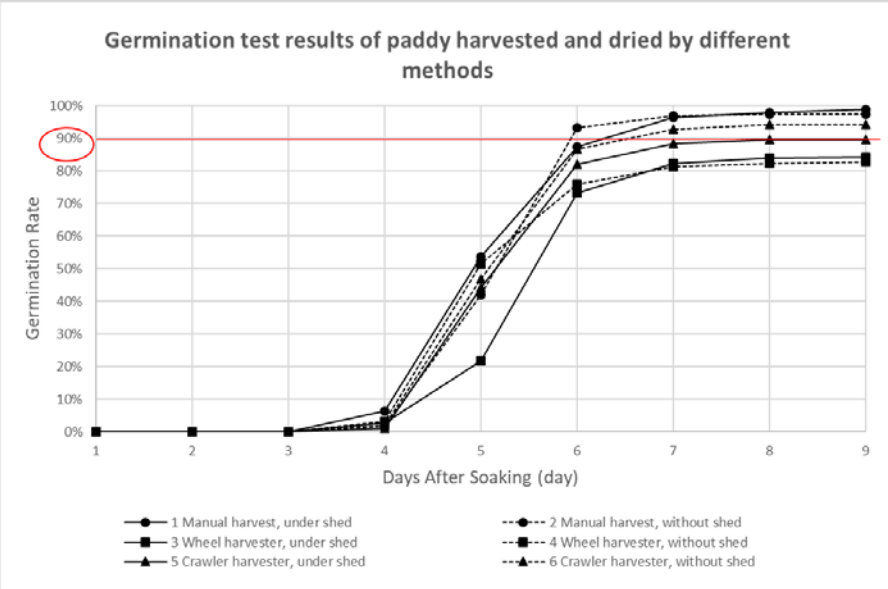


Figure 9. Result of germination test

(4) Identification of the time of rice crack occurrence

RPU and the expert periodically investigated the occurrence of rice cracks as a basic material for considering future on-time harvesting. The following figure 10 is a scatter plot with the number of days after sowing (DAS) on the horizontal axis and the percentage of broken and cracked rice on the vertical axis.

Except for a variety called Umgar, which is a relatively late maturing variety, it was observed that about 10% of the rice was cracked between 100 and 110 days after sowing, and about 50% was cracked or broken around 120 days after sowing. In 2022, an inhomogeneous heading period of rice was observed, forcing the rice to be harvested after the optimum harvest period. Uneven irrigation water and fertilizer application due to insufficient field leveling and weed growth are thought to be one factor in inhomogeneous growth, and if these factors are improved, it may be possible to harvest before the heavy cracks occur.

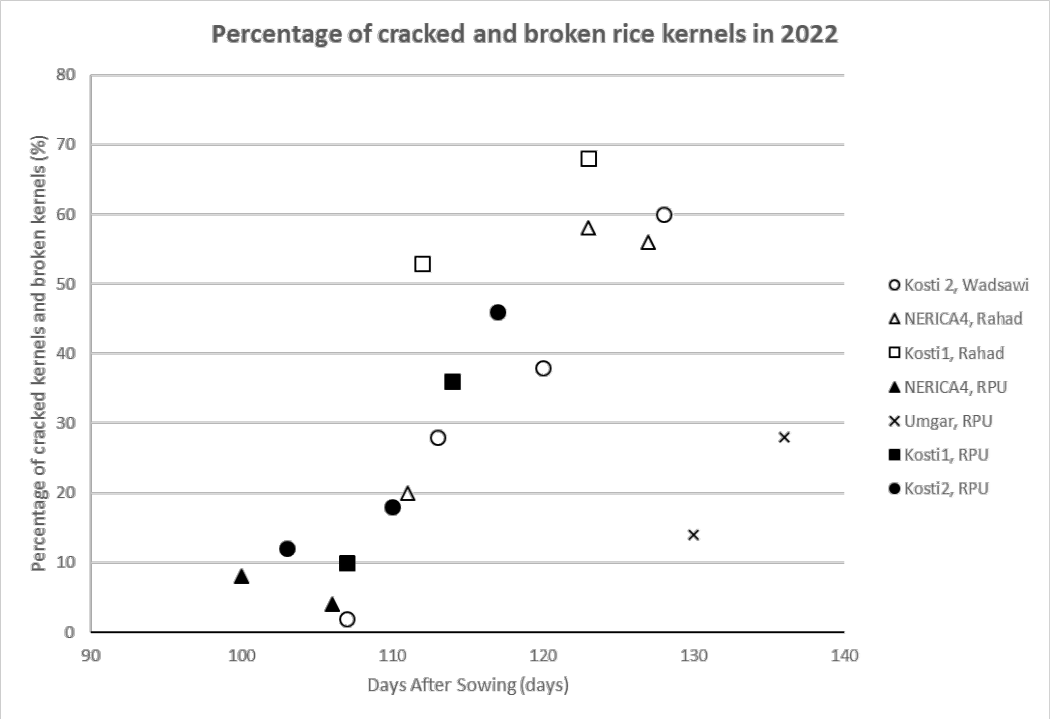


Figure 10. Correlation of cracked/broken rice kernels and growth period in 2022

2.5.4 Activity 4-4 "Rice milling techniques of extension workers are strengthened."

(1) On the Job Training for milling machine operators

Majority of extensionists had few knowledge on rice milling machines, less opportunity to handle rice milling machines and less experience on the maintenance of the machines. On-the-job training (OJT) was provided to strengthen the skills of extensionists who operate and maintain the rice milling machines. The total persons-days given OJT from 2020 to 2022 was 13 extensionists, 4 private operators, and 6 locality officers while the total persons-days of trainers was 25 RPU staff. No training was conducted in 2020 due to influence of the COVID-19.

		
Guidance was given on how to separate husks and other impurities from paddy in Rahad.	Well cleaned storage by extensionists in Hasahisa	Replacing damaged air tube on the milling machine in Haj Abdhula
		
Guidance was given on adjusting roll clearance in Hosh	Showing de-husked brown rice to the locality officer in Fadashi	Cleaning work after milling operation in Fadashi

Photo 40. OJT provided to milling machine operators

(2) Result of Rice Milling

As a result, the rice broken percentage consisting of the sum of the large, medium, and small broken rice ranges between 54 to 93% with an average of 73% (table 67). In 2022, the rice was harvested at about 20% grain moisture content which was known as appropriate for harvesting and dried to around 14% which was optimum for milling. However, it was observed that more than 80% of the rice was cracked or broken before milling, resulting in a low percentage of head rice.

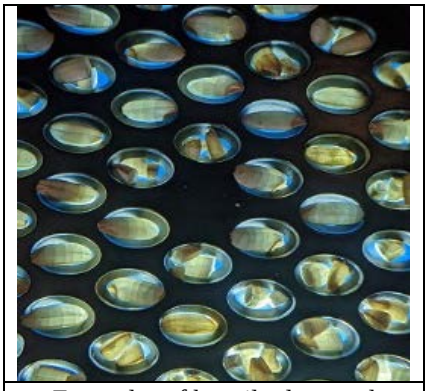

Examples of heavily damaged samples

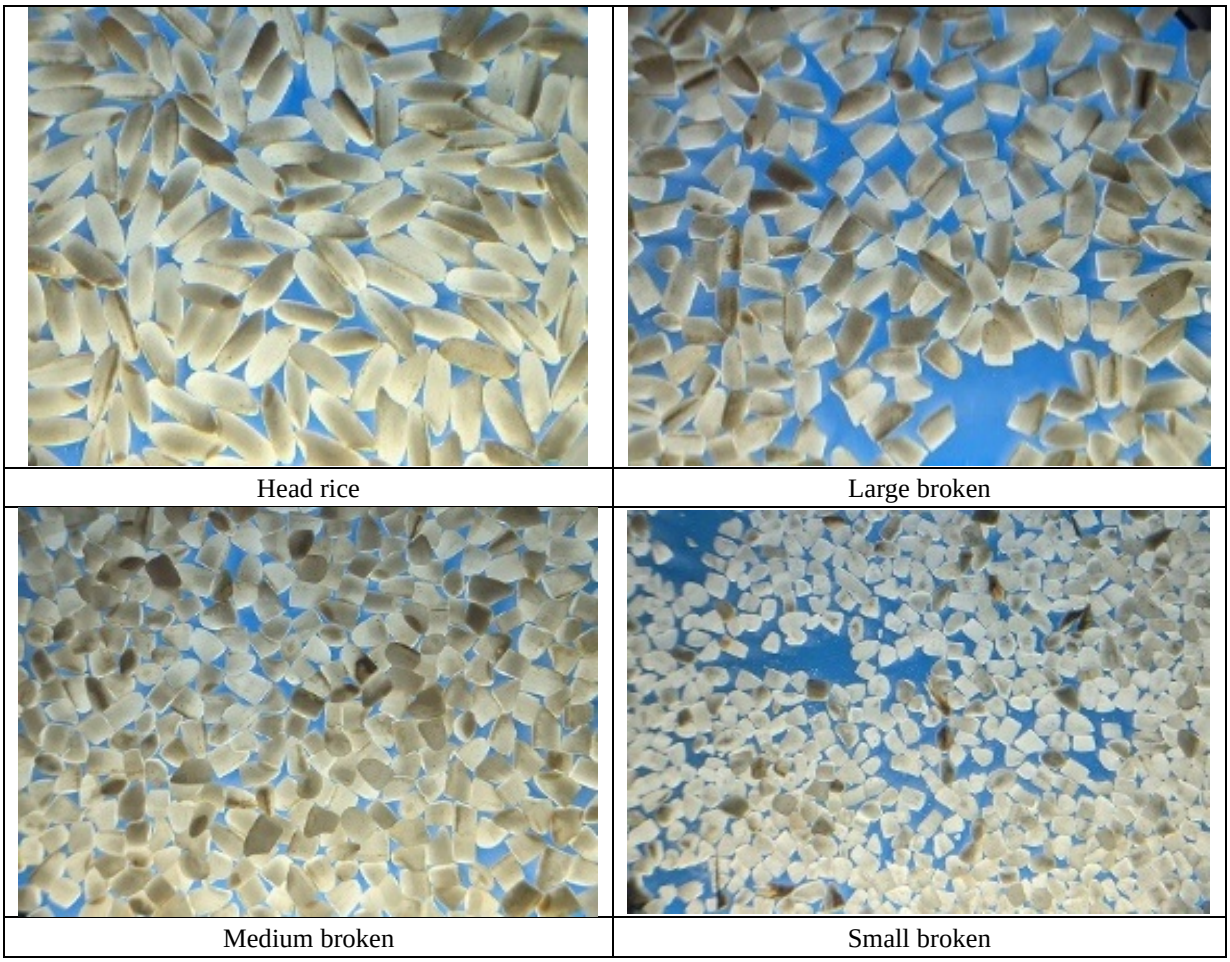
Photo 41. Examples of samples with heavily cracked and broken brown rice

The results of milling in 2022 confirmed that even if the grain moisture content was low like 9%, the incidence of broken rice can be relatively controlled if the rice crack ratio is low. For example, the grain moisture content of variety Kosti 1 harvested in Hosh locality in 2021 was less than 9% which was very low but the percentage of cracked and broken kernels were relatively lower and the broken rice ratio after milling was also lower than the others.

Table 67. Result of rice milling

Locality	Variety	Year of harvest	Paddy moisture content and its component (%)						Milling recovery (%)	White rice component (%)					
			Average moisture content	Complete Kernel	Heavy crack	Light crack	Broken rice	Other varieties		Head rice	Large broken	Medium broken	Small broken	Damaged	Paddy
Hosh	Kosti 1	2021	< 9.0	48	2	42	8	-	65.2	41.0	16.3	22.4	20.0	-	-
Hosh	Kosti 1	2021	< 9.0	-	-	-	-	-	62.8	45.4	15.0	18.2	20.4	0.4	0.6
Hasahisa	NERICA 4	2022	13.7	12	78	0	10	-	68.2	25.8	11.6	29.0	30.6	0.8	2.2
Hasahisa	NERICA 4	2022	14.9	30	50	10	10	-	59.2	24.2	12.4	29.8	31.4	1.6	0.6
Hasahisa	Kosti 1	2021	< 9.0	12	28	6	54	-	60.0	37.6	13.6	15.4	31.8	0.6	1.0
Haj Abdhula	Umgar	2021	around 9.0	6	34	8	34	18	63.1	2.8	13.8	19.8	59.2	0.2	3.8
Haj Abdhula	Umgar	2021	< 9.0	12	30	4	46	8	63.2	22.0	16.6	22.0	36.2	0.4	0.8
Haj Abdhula	Kosti 1	2021	around 9.0	4	42	6	48	-	70.5	2.4	11.8	20.0	60.8	0.2	4.4
Rahad	NERICA 4	2022	14.2	30	62	2	6	-	-	18.4	6.4	12.8	54.8	0.6	2.2
Rahad	NERICA 4	2022	-	-	-	-	-	-	-	20.6	11.2	17.8	49.0	0.0	0.6
Average				19	41	10	27	-	64.0	24.0	12.9	20.7	39.4	0.5	1.8

Note: Average rice broken rate in 2020 was about 60%.



Head rice | Large broken

Medium broken | Small broken

Photo 42. Classified white rice

Although the evaluation indicator set in the PDM, "less than 45% of broken rice ratio" was not achieved, capacity building of extensionists through OJT was taken place. For example, a comparison of pre-and post-OJT milled rice quality in the Rahad in 2022 showed significant improvements, especially in the contamination of straw and paddy in the white rice.

Rice milled by operator before OJT in Rahad

Rice milled by the operator after OJT in Rahad

Photo 43. Comparison of the milled rice quality before and after the OJT

2.5.5 Activity 4-5 "CoE establishes operation and management structure of rice milling machines"

(1) Operation and Maintenance Structure of Rice Milling Machine

A structure for the operation and management of rice milling machines had been established to some extent in the former Project phase and kept updated throughout this project period (figure 11). In general, extensionists and private operators were assigned in each locality to operate and maintain rice milling machines. Post-harvest experts in RPU provided OJT, supervision, and assistance to them. Qualities of rice such as grain moisture contents, crack percentage, and rice broken percentage was analyzed by post-harvest experts in cooperation with other technical staff in Gezira SMoPER.

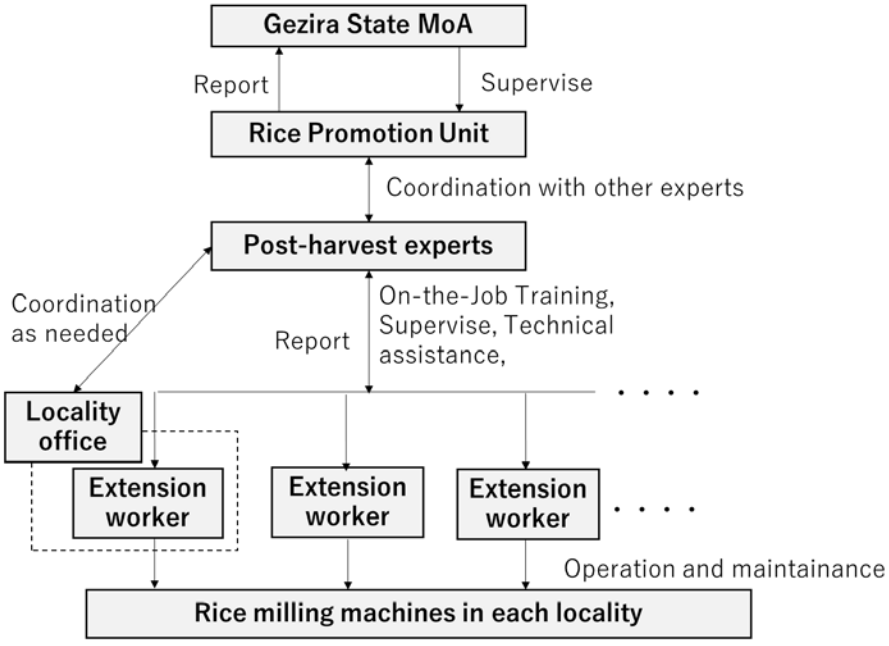


Figure 11. Structure of O&M of rice milling machine

(2) Assessment of extensionists' competence and understanding on O&M of rice milling machine

In 2022, the RPU staff assessed extensionists' understanding of how to operate and maintain the milling machine by having them operate the machine during the interview.

It was confirmed that the extensionists who were interviewed had been appointed as the person in charge of O&M and practiced for more than three years, and about half of them had participated in technical training programs in Japan and third countries. While most extensionists indicated that they were confident in the operation of their machines, some perceived a lack of understanding of maintenance and repair. Therefore, from the following year on, RPU is planning to take this feedback into consideration when they conduct the OJT

(table 68).

Table 68. Assessment of extensionists' competence and understanding on O&M of rice milling machine

Locality	Haj Abdhula	Rahad	Hosh	Hasahisa
Self-confidence of O&M	Yes	Yes but not for maintenance and repair	Yes	Yes, but need further understanding
Technical assessment [out of 10 points for each question]				
(a) Identification of machine parts and their functions	9	6	8	8.5
(b) What to do for the machine before operation	9	6	9	8.5
(c) What to do for paddy before the operation	10	7	9	9
(d) How to adjust belts	9	8	8	7.5
(e) How to adjust rubber rolls (husking)	9	9	9	7.5
(f) How to adjust resistant weight (milling)	9	8	9	7.5
(g) What to do if you have clogging problem	8	7	8	7.5
(h) What to do if you have an electricity problem	9	8	9	9
(i) What are the products of milling operation and its portion out of the whole paddy	9	5	9	8
(j) What to do after finishing the milling operation	9	7	9	9
Demanded training program	Trouble shooting	Replacement of spare parts	Maintenance	Maintenance

Note: Of the evaluation scores, 8 or more are at a level where the work can be delegated. Scores of 7 to 5 indicate a certain level of understanding- but require some training or assistance. Scores of 4 or less indicate an insufficient understanding.

2.5.6 Activity 4-6 "CoE prepares a plan for trial rice sales."

This activity was conducted and reported in the first two years of the project period which consisted of 1) product concept development, 2) discussions with the Chamber of Commerce and Industry, 3) trial production of rice-flour mixed bread and consumer preference survey, 4) rice-flour costing, 5) rice-flour sales promotion, and 6) survey of target customers (confectionery factories, etc.).

2.5.7 Activity 4-7 "CoE conducts trial rice sales."

In the trial sales of rice from Gezira, four types of products has been sold: whole/headed rice, broken rice, rice flour, and rice granules, with a total of approximately 3.4 tons sold to date (table 69).

Table 69. Results of trial sales of rice products

No.	Type of rice product	Amount sold (kg)
1	Whole/headed rice	1,827.5
2	Broken rice	200.0
3	Rice flour	460.0
4	Rice granule	943.0
	Total	3,430.5

Due to the hot and dry climate in Sudan, a problem from the beginning of the Project was the high rate of broken rice (about 70%) when rice was milled from paddy rice. While CoE was making efforts to reduce the rate of broken rice, the development of distribution and consumption of broken rice seemed to be an issue when examined from the rice value chain. Broken rice suited the tastes of some Nigerian citizens and was consumed, but its price was quite low (30-40% of headed rice) and its consumption was limited. Therefore, an attempt was made to find new customers by further processing broken rice into rice flour and granules. One of these was the trial production and sales of rice-flour mixed bread.

(1) Trial production and sales of rice-flour mixed bread and consumer preference survey

During the first two years of the project period, 2018-19, four prototypes of rice-flour mixed bread were made with rice flour and wheat flour, which had achieved reasonable results. From time to time, this rice-flour mixed bread has been tried, but these were traditional handmade disc-shaped breads baked in a kiln, not the mechanical, round, puffed Western breads baked in a modern electric oven.

Photo 44. Trial sales of rice flour mixed bread (Western bread). Price 100 SDG/2 pieces (2022)

Therefore, in 2022, the ratio of rice flour to wheat flour was changed from the 40:60 ratio applied to traditional bread to 15:85, while other recipes remained unchanged, and a bread factory was commissioned to make and sell a prototype Western bread. The results of a preference survey of citizens (figure 12) conducted on the same day and the following day confirmed that the rice-flour mixed bread was preferred over the conventional bread in terms of both taste and appearance. This made it possible to produce both traditional and Western breads with rice-flour mixtures. Although the recent surge in wheat prices can be said to be a tailwind, farmers can flour even broken rice and sell it to bakeries for a profit equivalent to that of headed rice, even if they have to pay for flouring. In addition to the already proven rice granules, the demand for rice flour had also been confirmed, and the situation was very promising to increase consumption of broken rice. The rice value chain in Gezira State was complete here.

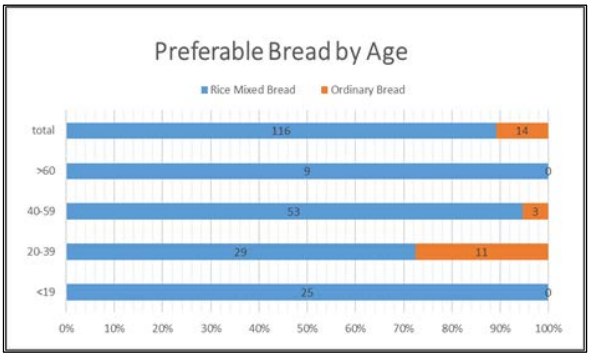


Figure 12. Results of consumer preference survey, comparing rice-flour mixed bread with conventional bread

(2) Trademark registration of Gezira Rice

CoE Gezira filed an application to register the “Gezira Promise” trademark for Gezira-produced rice with the Patent Office in Khartoum at the end of 2019. The application was accepted, but the approval process was subsequently delayed due to the COVID-19 disaster, and as of the end of 2022, the public review was still ongoing and approval had not yet been granted.

2.5.8 Activity 4-8 “CoE identifies and compiles issues of rice marketing through trial rice sales.”

There are two major challenges to marketing rice in Sudan: first, the market itself: CoE Gezira (Gezira SMoPER) is not a marketing-focused organization, but a government agency, which has limited its ability to sell rice after purchasing it from farmers. In the future, the key to the spread of rice production in Sudan will be the maturation of the market. In this Project, some farmers also tried to sell common rice on their own. Establishing a distribution system that allows farmers to sell directly to the market, rather than relying on government agencies to buy it, is one of the keys to expanding rice production.

Another is the existence of broken rice. In Sudan, broken rice is a constant problem due to the high temperatures and excessive aridity. The Project has found a way to effectively utilize broken rice to address this issue. As mentioned above, CoE Gezira tested and sold four types of rice: whole rice, broken rice, rice flour, and rice granules. The fact that demand was confirmed for rice flour and rice granules, which are processed from broken rice, showed that rice production is effective even under Sudan's harsh climatic conditions.

2.6 Activities for Output 5 "The production of CS is started in 5 States (Sennar, Gedaref, White Nile, River Nile and Northern)."

2.6.1 Activity 5-1 "Each SMoPER of 5 States selects CS production farmers based on criteria."

(1) 2020 season

NRP informed the selection criteria of CS producing farmers to project target states, and each SMoPER then embarked on selecting CS production farmers based on the criteria. In February 2020, Mr. Hag Attwa, NRP coordinator, Japanese experts (Mr. Goto and Dr. Yagi) and Dr. Hassan, Project consultant, visited all 5 states and explained CS production activity, and confirmed the selection of CS producing farmers and their fields. As a result, total of 10 farmers, 2 farmers each from 5 states, were selected. The selected farmers and extensionists from each state attended the seed production training on land preparation, sowing, field management such as weeding, fertilization, water management, removing of off-type plants, harvest, etc. which was conducted on March in Gezira state.

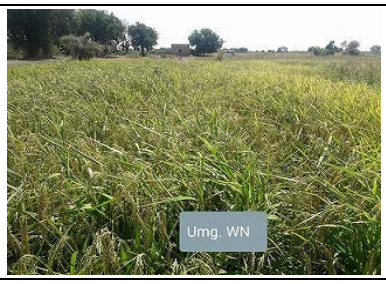
The results of CS production by farmers in five states in 2020 season were as in the table 70.

Table 70. Result (yields, etc.) of CS production by farmers in five states (2020)

State	Gedaref		Sennnar		White Nile		River Nile		Northern	
Farmer's Name	Ibrahim Abdelraman	Ahmed Alarabi	Alhassan Abdallah	Alnour Aliesa	Osman Mohammed	Abdelbagi Alhassan	Alnajir Khalifa	Altaib Siddig	Abdallah Mahmoud	Mustafa Salih
Location	Al Fau	Al Fau	Kassab	Kassab	Jablenn	Kosti	New Manaser	Alryab	Dongola/Zawrat	Dongola/Garada
Size (feddan)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Sowing	23/06/20	28/06/20	28-30/06/20	27-29/06/20	26/06/20	25/06/20	16/07/20	18/07/20	05/07/20	05/07/20
Variety	Kosti1	Umgar	Kostil	Umgar	Kosti1	Umgar	Umgar	Kostil	Kostil	Umgar
SA Inspection (1)	16/09 (Not passed)	16/09 (Not passed)	---	---	---	---	---	---	---	---
SA Inspection (1)(2)	21/10/20	21/10/20	18/09/20	18/09/20	19/09/20	19/09/20	24/09/20	24/09/20	24/09/20	24/09/20
SA Inspection (2)(3)	04/11/20	04/11 (Not passed)	22/10/20	22/10 (Not passed)	23/10 (Not passed)	23/10/20	29/11/20	29/11/20	02/11/20	02/11/20
SA Inspection (3)(4)		11/11/20	---	09/11/20	08/11/20	---	---	---	---	---
Harvest	28/10-04/11	22-25/11/20	16-24/11/20	30/11/20	09-16/11/20	08-18/11/20	06-21/12/20	08-21/12/20	15-17/11/20	14-21/11/20
Weight (kg)	235.8	83.0	320.0	55.3	216.0	263.0	262.0	246.0	36.3	9.85
MC (%)	15.3	10.0	9.1	15.2	9.8	9.8	15.0	17.0	9.0	9.0
Yield (kg/fed, 14%)	928.7	347.4	1,352.9	218.1	906.2	1,103.4	1,035.8	949.7	153.6	41.7
Yield (kg/ha, 14%)	2,211.3	827.2	3,221.3	519.3	2,157.6	2,627.1	2,466.2	2,261.1	365.8	99.3

Mr. Abdallah's CS production field in Northern state. (30/9/2020)

Mr. Altaib and his CS production field in River Nile state. (9/10/2020)



Mr. Alhassan's CS production field in White Nile state. (18/10/2020)

SA Inspectors checking Mr. Alnour's CS field in Sennar state. (28/10/2020)

SA inspectors checking Mr. Alarabi's CS field in Gedaref state. (4/11/2020)

Using pedal-type thresher for the harvested rice at Mr. Alnour's field in Sennar state (30/11/2020)

Photo 45. CS production in five states (2020)

(2) 2021 season

The results of CS production by farmers in five states in 2021 season were as in the table 71.

✧ In the four states except Gedaref state, many fields were abandoned due to lack of irrigation water, flooding caused by heavy rains (improper drainage), and overgrowth of weeds (delay in weed operation). Although these are the issues the Project pointed out every year, the Project once again pointed out and advised the participants to confirm the field environment (especially water availability) as much as possible in advance, as well as to select fields and farmers appropriately.

Table 71. Result (yields, etc.) of CS production by farmers in five states (2021)

【Gedaref State】

State	Gedaref			
Farmer's Name	Ahmed Alarabi	Ibrahim Abdelraman	Altayeb Mohammed	Alttayif Altayeb
Location	Al Fau	Al Fau	Al Fau	Al Fau
Size (feddan)	2	2	2	2
Sowing	17/06/21	17/06/21	17/06/21	17/06/21
Variety	Umgar	Kosti 1	Kosti 1	Kosti 1
SA Inspection (1)	05/10/2021 （Not passed）	5/10/2021 (Passed)	5/10/2021 (Passed)	5/10/2021 (Passed)
SA Inspection (2)	06/11/2021 (Passed)			
Field Day				23/10/2021
Harvest	21/11/2021	25/10/2021	01/11/2021	23/10/2021
Weight (kg)	1,567.0	1,218.0	511.0	2,629.0
MC (%)	16.4	9.8	11.1	11.8
Yield (kg/fed, 14%)	761.6	638.7	264.1	1,348.1
Yield (kg/ha, 14%)	1,813.4	1,520.8	628.8	3,209.8

【Sennar State】

State	Sennnar						
Farmer's Name	Alnadhif Malik	Abdalla Musa	Alnour Ali Easa	Mhmd. Elhassan	Siraj Abdalla	Omer Ayoub	Abdel Aziz
Location	Kassab	Kassab	Kassab	Kassab	Maiurno	Maiurno	Aleksar
Size (feddan)	1	1	2	2	2	2	2
Sowing	04/07/21	04/07/21	03/07/21	03/07/21	20/06/21	20/06/21	15/07/21
Variety	Umgar	Umgar	Kosti 1	Kosti 1	Kosti 1	Kosti 1	Wakara
				Cancelled	Cancelled	Cancelled	
SA Inspection (1)	03/10 (Not passed)	03/10 (Not passed)	03/10 (Not passed)	---	---	---	03/10 (Not passed)
SA Inspection (2)	08/11 (Not passed)	08/11 (Not passed)	08/11 (Not passed)	---	---	---	08/11 (Not passed)
SA Inspection (3)	04/12 (Passed)	04/12 (Passed)	04/12 (Passed)	---	---	---	04/12 (Passed)
Harvest	01-03/01/22	01/06/22	01-03/01/22	---	---	---	01/06/22
Weight (kg)	364.0	120.0	323.0	---	---	---	600.0
MC (%)	10.3	10.6	9.7	---	---	---	11.1
Yield (kg/fed, 14%)	379.7	124.7	169.6	---	---	---	310.1
Yield (kg/ha, 14%)	904.0	297.0	403.8	---	---	---	738.4

【White Nile State】

State	White Nile							
Farmer's Name	Osman Mohamed Ahmad and Hamza Osman	Mohamed Abaker	Abaker Saied	Salih Ali	Altaip Osman	Bashir Mohhamed	Mohammed Nour	Khalifa Hamad
Location	ALhadiab (North)	ALhadiab (North)	ALhadiab (North)	ALhadiab (North)	ALhadiab (North)	ALhadiab (North)	Alkawa	ALhadiab (South)
Size (feddan)	0.5	0.25	0.25	0.25	0.25	0.25	1	1 / 1
Sowing	01/07/21	01/07/21	01/07/21	01/07/21	01/07/21	01/07/21	08/07/21	02/07/21
Variety	Umgar	Umgar	Umgar	Umgar	Umgar	Umgar	Wakara	Umgar / Kosti 2
							Cancelled	Cancelled
SA Inspection (1)	30/09 (Not passed)	30/09 (Not passed)	30/09 (Not passed)	30/09 (Not passed)	30/09 (Not passed)	30/09 (Not passed)	---	---
SA Inspection (2)	25/10 (Not passed)	25/10 (Not passed)	25/10 (Not passed)	25/10 (Not passed)	25/10 (Not passed)	25/10 (Not passed)	---	---
SA Inspection (3)	05/12 (Passed)	05/12 (Passed)	05/12 (Passed)	05/12 (Passed)	05/12 (Passed)	05/12 (Passed)	---	---
Harvest	28/12/21	28/12/21	28/12/21	29/12/21	28/12/21	28/12/21	---	---
Weight (kg)	17.0	17.5	10.5	2.0	1.0	8.5	---	---
MC (%)	13.4	12.3	13.6	13.8	11.2	12.3	---	---
Yield (kg/fed, 14%)	34.2	71.4	42.2	8.0	4.1	34.7	---	---
Yield (kg/ha, 14%)	81.5	170.0	100.5	19.1	9.8	82.6	---	---

【River Nile State】

State	River Nile					
Farmer's Name	Ali Ahmes Msad	Abd Elazim Ahmed	Altaib Abd Elgadeer	Abd Elmgeed Mhmd.	Naser Eldeen Osman	Bakree Khider
Location	Aliab	Aliab	Aliab	Aliab	Atbara	Atbara
Size (feddan)	0.5	0.5	0.5	0.5	2	2
Sowing	14/07/20	14/07/20	14/07/20	14/07/20	05/08/21	26/08/21
Variety	Kosti 1	Kosti 1	Kosti 1	Kosti 1	Umgar	Kosti 1
					Cancelled	Cancelled
SA Inspection (1)	17/10 (Not passed)	17/10 (Not passed)	17/10 (Not passed)	17/10 (Not passed)	---	---
SA Inspection (2)	11/11/2021 (Passed)	11/11/2021 (Passed)	11/11/2021 (Passed)	11/11/2021 (Passed)	---	---
Harvest	12/12/2021	12/12/2021	12/12/2021	12/12/2021	---	---
Weight (kg)	214.5	466.5	561.0	562.0	---	---
MC (%)	17.0	16.0	17.0	17.0	---	---
Yield (kg/fed, 14%)	414.0	911.3	1,082.9	1,084.8	---	---
Yield (kg/ha, 14%)	985.8	2,169.8	2,578.2	2,582.8	---	---

【Northern】

State	Northern				
Farmer's Name	Khalid Modathir	Mudoh Abdeen	Abdalla Mohammed	Atalla Fudal	Hassan Osman
Location	Dongola	Porgug	Merowe	Merowe	Merowe
Size (feddan)	1	0.5	1 / 2.5 = 3.5	0.5 / 1.5 = 2.0	2
Sowing	10/08/21	11/08/21	18/08/21	19/08/21	22/08/21
Variety	Umgar	Umgar	Umgar / Wakara	Kosti 1 / Wakara	Wakara
	Cancelled	Cancelled	Cancelled	Cancelled	
SA Inspection (1)	---	---	---	---	19/10 (Not passed)
SA Inspection (2)	---	---	---	---	14/11 (Not passed)
SA Inspection (3)	---	---	---	---	07/12/2021 (Passed)
Harvest	---	---	---	---	01-11/01/22
Weight (kg)	---	---	---	---	682.0
MC (%)	---	---	---	---	10.0
Yield (kg/fed, 14%)	---	---	---	---	356.9
Yield (kg/ha, 14%)	---	---	---	---	849.7

		
Discussion between farmers and RPU with the Project on CS production in the field of Gedaref State (07/07/2021)	Clean and no weed (same as on the left field, 07/07/2021) Field Day Event was conducted in this field on 23/10/2021 for this season.	Rice growth was good, but there are a lot of weeds (17/10/2021).

Photo 46. CS production in Gedaref State (2021)

		
Harvest demonstration by combine-harvester operated by State Governor and VIPs (23/10/2021)	Neighboring farmers rejoiced to see the harvested rice (23/10/2021).	Final speech by State Governor (23/10/2021)

Photo 47. Field Day Event in Gedaref State (2021)

		
Exchange of opinion on CS production between farmers and RPU with the Project at Kassab in Sennar State (05/07/2021)	Field of Mr. Mohmmed Elhassan (Variety: Kosti 1, 2 feddan, Kassab) (12/09/2021)	Field of Mr. Alnour Ali Easa (Variety: Kosti 1, 2feddan, Kassab) (12/09/2021)

Photo 48. CS production in Sennar State (2021)

		
CS field (Variety: Umgar, 3feddan, there were lots of higher and lower places in the plot, and seed was sown by broadcasting (12/07/2019)	Plot size was small, but water cannot be irrigated uniformly in the plot because of uneven leveling (12/07/2021)	Sowing operation was completed without removing residues of previous crop (12/07/2021)

Photo 49. CS production in White Nile State (2021)

(3) 2022 season

The results of CS production by farmers in five states in 2022 season were as in the table 72.

- ✧ Farmers in Gedaref State did not conduct CS production in 2022 due to non-payment of last year's harvest seed payment.
- ✧ For Northern State, since head of RPU informed that the seed sown during this season had no lot number and means that the seed had not passed laboratory test and inspection by SA, the Project decided to consider the activity of this season as normal seed production activity, not CS production, and removed it from this production list.

Table 72. Result (yields, etc.) of CS production by farmers in five states (2022)

【Sennar State】

State	Sennar		
Farmer's Name	Alnour Ali Eyssa	Abdalla Mosa	Alnadhif Malik
Location	Kassab	Kassab	Kassab
Size (feddan)	5	2	3
Sowing	05/07/22	06/07/22	05/07/22
Variety	Kosti 2	Umgar	Kosti 1
SA Inspection (1)	29/09/22 (Passed)	29/09/22 (Passed)	29/09/22 (Passed)
SA Inspection (2)	05/11/22 (Passed)	05/11/22 (Passed)	05/11/22 (Passed)
Harvest	19/11/22	06/12/22	08/12/22
Weight (kg)	913.0	130.0	278.0
MC (%)	11.3	10.6	10.1
Yield (kg/fed, 14%)	188.3	67.6	96.9
Yield (kg/ha, 14%)	448.4	160.9	230.6

【White Nile State】

State	White Nile		
Farmer's Name	Omer Haroon	Mammon Haroon	Rauda Osman
Location	Kosti	Kosti	Kosti
Size (feddan)	1.0	1.0	0.7
Sowing	18/07/22	18/07/22	15/07/22
Variety	Umgar	Kosti 1	Kosti 2
SA Inspection (1)	29/09/22 (Passed)	29/09/22 (Passed)	29/09/22 (Passed)
SA Inspection (2)	07/11/22 (Passed)	07/11/22 (Passed)	07/11/22 (Passed)
Harvest	13/11/22	13/11/22	13/11/22
Weight (kg)	1,100.0	1,200.0	700.0
MC (%)	13.0	13.0	14.0
Yield (kg/fed, 14%)	1,112.8	1,214.0	1,000.0
Yield (kg/ha, 14%)	2,649.5	2,890.4	2,381.0

【River Nile State】

State	River Nile				
Farmer's Name	Ata Elfadeel (Abd El Fadeel)	Abd Almageed Moh (Abdul Majeed)	Abd Alazim Ahmed (Abdul Azim)	Ali Ahmed Masad (Ahmed Musaed)	Alfadel (El Fadel)
Location	Alyab	Alyab	Alyab	Alyab	Alyab
Size (feddan)	1.0	1.0	1.0	1.0	1.0
Sowing	26/07/2022	25/07/2022	25/07/2022	25/07/2022	25/07/2022
Variety	Kosti 1	Kosti 1	Kosti 1	Kosti 1	Kosti 1
SA Inspection (1)	11/11/22 (Passed)	11/11/22 (Passed)	11/11/22 (Rejected)	11/11/22 (Not passed)	11/11/22 (Passed)
SA Inspection (2)	---	---	30/11/22 (Passed)	30/11/22 (Passed)	---
Harvest	28/11/22	27/11/22	30/11/22	30/11/22	26/11/22
Weight (kg)	831.0	551.0	60.0	1,602.0	1,143.1
MC (%)	19.0	19.0	18.0	18.0	18.0
Yield (kg/fed, 14%)	782.7	519.0	57.2	1,527.5	1,089.9
Yield (kg/ha, 14%)	1,863.5	1,235.6	136.2	3,636.9	2,595.1

		
Bigger amount of Urea than usual amount was applied as topdressing for recovering growth of rice plants (01/09/2022)	Weeding operation by farmers and RPU (22/09/2022)	Starting maturity stage at CS production field (Variety: Kosti 2, 5feddan) at Kassab (29/10/2022).

Photo 50. CS production in Sennar State (2022)

		
CS production filed at Kosti, Good growth, Fertilizer (Urea) application conducted by farmer (10/08/2022).	Visiting CS production filed by NRP staff and discussion with RPU (15/09/2022)	Head of RPU (right), Mr. Ogasawara (center) and Dr. Hassan (right) (07/11/2022)

Photo 51. CS production in White Nile State (2022)

	
CS production filed at Alyab, (04/10/2022).	Farmers, RPU and NRP staff in CS production filed at Alyab, (04/10/2022).

Photo 52. CS production in River Nile State (2022)

(4) 2023 Season

The results of CS production by farmers in five states in 2023 season were as in the table 73.

- ✧ It is noteworthy that CS production activities were conducted in Sennar, White Nile, and River Nile states amidst a situation in which it was difficult to secure a budget for activities, including salaries and other labor costs, materials, vehicle fuel costs, etc. under the unstable security situation since the armed conflict between the SAF and RSF began on April 15.
- ✧ In Gedaref State, the Project was initially informed that farmers were not carrying out CS production due to the problem of non-payment of CS production fees, and were instead producing ordinary rice. When the Project was able to contact extensionists of RPU, he confirmed the following facts; The Rahad scheme, which is an irrigation scheme using electricity pumps, has been used for CS production as well as rice production in Gedaref State, but due to the armed conflict, the electricity supply to the scheme is limited and thus the use of irrigation water is also limited. Therefore, because of the limited use of irrigation water, farmers mainly cultivated sorghum, which is both edible and marketable, and abandoned rice production.

- ✧ In Sennar State, due to delays of conducting field inspection, the fields that did not pass the inspection were too close to harvest to deal with weeding and removal of off-type plants, and ultimately this one field did not pass the inspection.
- ✧ Two fields in River Nile State were stopped to conduct CS production due to heavy rain.
- ✧ In Northern State, the extensionist informed the Project that CS production was to be started by one farmer, and the Project has been trying to collect information. However, not only the Japanese expert but also Dr. Hassan, the local consultant, lost contact with the extensionist, making it difficult to confirm that seeding had even taken place.
- ✧ Since December, the RSF invaded Gezira State and many C/Ps in Gezira moved to other areas and states. The invasion also affected Sennar and other states, making it impossible to contact C/Ps and other local concerned persons, and some yield-related data could not be collected (in red).
- ✧ Although the Project received informed that harvest operation was completed, the situation in all areas the was tense and the Project was unable to obtain any photos of activities in the field.

Table 73. Result (yields, etc.) of CS production by farmers in five states (2023)

【Sennar State】

State	Sennar			
Farmer's Name	Mr. Alnour Ali Eyssa	Mr. Yousif Omer	Mr. Faroog	Mr. Siraj
Location	Kassab	Kassab	Maiurno	Maiurno
Size (feddan)	1.0	0.5	1.0	0.5
Sowing	13/07/23	13/07/23	17/07/23	17/07/23
Variety	Abasya	Gezira	Kosti 2	Kenana
SA Inspection (1)	19/10/23 (Passed)	19/10/23 (Passed)	19/10/23 (Passed)	19/10/23 (Passed)
SA Inspection (2)	30/11/23 (Passed)	30/11/23 (Not passed)	30/11/23 (Passed)	30/11/23 (Passed)
Harvest	08/01/24	---	07/01/24	07/01/24
Weight (kg)	421.0	---	912.0	397.0
MC (%)	10.0	---	10.0	10.0
Yield (kg/fed, 14%)	440.6	---	954.4	830.9
Yield (kg/ha, 14%)	1049.0	---	2272.4	1978.4

NB: Because moisture content (MC) of seed was not able to be measured, yield was calculated at 10% of MC tentatively.

【White Nile State】

State	White Nile			
Farmer's Name	Mr. Habib Ali	Mr. Mansur Ali		
Location	Kosti	Algezira aba		
Size (feddan)	1	0.5	0.5	0.5
Sowing	18/07/22	18/07/22		
Variety	Umgar	Umgar	Abasya	Kenana
SA Inspection (1)	02/10/23 (Passed)	02/10/23 (Passed)		
SA Inspection (2)	11/12/23 (Passed)	11/12/23 (Passed)		
Harvest	17/12/23	17/12/23	17/12/23	17/12/23
Weight (kg)	1,300.0	600.0	600.0	400.0
MC (%)	14.0	14.0	14.0	14.0
Yield (kg/fed, 14%)	1,300.0	1,200.0	1200.0	800.0
Yield (kg/ha, 14%)	3,095.2	2,857.1	2,857.1	1,904.8

【River Nile State】

State	River Nile			
Farmer's Name	Ali Ahmed	Abd Fadial Sidige	Abd Elmgid Ibrahim	Al Fadal Ahmid
Location	Aliab	Aliab	Aliab	Aliab
Size (feddan)	1.0	1.0	1.0	1.0
Sowing	27/07/23	25/07/23	25/07/23	25/07/23
Variety	Kosti 1	Kosti 1	Kosti 1	Kosti 1
SA Inspection (1)	02/10/23 (Passed)	---	---	02/10/23 (Passed)
SA Inspection (2)	13/11/23 (Passed)	---	---	13/11/23 (Psaaed)
Harvest	10/01/23	---	---	10/01/23
Weight (kg)	1,275.0	---	---	1,870.0
MC (%)	10.0	---	---	10.0
Yield (kg/fed, 14%)	1,334.3	---	---	1,957.0
Yield (kg/ha, 14%)	3,176.9	---	---	4,659.5

2.6.2 Activity 5-2 "Extension workers and contracted farmers from 5 States receive trainings for CS production at CoE organized by MoAF."

The following trainings for CS production were conducted at Gezira SMoPER, and extensionists and contracted farmers from five states attended.

① Workshop for CS production (only for extensionists and farmers in Gezira State)

✧ Date: January 4, 2020

✧ Contents:

- Explanation and confirmation of important points on rice seed production (field layout of seed production, identification of off-type plants, effective measures on drainage, etc.).
- Discussion of draft contract paper of seed production and selection criteria for contracted seed production farmers, etc.

✧ Participants: total 47; extensionists (Gezira State): 29, farmers (Gezira State): 7

② Training on Seed production

✧ Date: March 2-3, 2020

✧ Contents:

- Lectures: Explanations on key points of seed production were provided by external lecturers from SA and ARC, and experts of the Project, etc., through using upland rice cultivation handbook and other materials.
- Practice: Sowing operation, Identification of off-type plants, Harvest operation, etc.

✧ Participants: total 69; Gezira state (extensionists: 19, farmers: 9), five states (extensionists: 5, farmers: 21)

③ Training on harvest and post-harvest

✧ Date: October 13-14, 2020

✧ Contents:

- Lectures:
  - Agronomical traits and characteristics of rice by Dr. Khalid (ARC WNRS)
  - Certification procedure and conservation of rice seed by Ms. Wahiba (SA)
  - Harvest and post-harvest techniques, seed processing and storage by Mr. Ashraf (Gezira SMoPER)
- Observation: Seed production field and Genetic resources conservation & Research centre at GRS
- Practice: manual harvesting and threshing operation at the field located in front of RPU office

✧ Participants: total 61; Gezira state (extensionists: 19, farmers: 10), five states (extensionists: 5, farmers: 10)

④ Wrap-up training (meeting) on CS production in 2020 season

✧ Date: 5-16/02/2021

✧ Contents:

- Presentation
  - Summary of achievements and challenges for CS production in 2020 in each state.
  - Results of seed production of released varieties and promising lines at ARC RSs
  - Result of rice production at Arab Sudanese Seed Company (ASSC)
  - Profitability analysis on rice production farmers in Gezira State

✧ Participants: total 66; Gezira state (extensionists: 13, farmers: 11), five states (extensionists: 8, farmers: 10)

⑤ Workshop on CS production for 2021 season

✧ Date: 05-06/04/2021

✧ Contents:

- Identification and confirmation of challenges in CS production in farmers' fields in each state in 2020 and sharing of concrete measures for the 2021 season
- Presentation and exchange of opinions regarding the CS production plan for 2021 (cultivation area, number of farmers, cultivation area per farmer, etc.) and each operation schedule
- Exchange of opinions on improvement of CS farmer selection criteria, implementation of FFS, and use of Cultivation Record, etc.

✧ Participants: extensionists: 15 (from six states), farmers: 40 (from six states),

⑥ Training on Rice Seed Production

✧ Date: 21-22/09/2021

✧ Contents: To learn techniques related to rice seed production (especially identification and removal of off-types) through lectures and practical training.

✧ Participants (from only Gezira State): extensionists: 5, farmers: 12

⑦ Wrap-up training (meeting) on CS production in 2021 season

✧ Date: 27-28/03/2022

✧ Contents:

- Sharing of progress and results of CS (seed) production by each SMoPER and ARC for 2022 season
- Clarification of technical and operational issues and confirmation of lessons learned and concrete actions for next season

✓ The details of the "results," "issues to be resolved," and "concrete measures and actions for the next season," including plans for the next season, were not shared. Therefore, the experts of the Project reviewed the activity of 2021 season through discussions and field observation with concerned parties (persons) in each state during the following month. Based on the discussions, exchanges of opinions, and field observation, the Project discussed the 2022 cultivation plan with the relevant parties and confirmed the measures to be taken to solve the issues.

✧ Participants: total 65; Gezira state (extensionists: 17, farmers: 9), five states (extensionists: 7, farmers: 16)

⑧ Technical training to strengthen capacity for pre-harvest processing and timely harvesting

✧ Date: 25-26/10/2022

✧ Contents:

- Lectures:
  - Characteristics of each variety and Identification method of Off-types (by ARC)
  - The importance of removing off-types and harvesting at proper time (by RPU, Gezira SMoPER)
  - Field inspection, etc. (by SA)
- Practice:
  - Rouging operation in the field of ARC and seed production fields

✓ In addition to a question-and-answer session between lecturers and participants, there was also an active exchange of opinions among farmers from each state and among RPU staffs including extensionists from each state, to promote understanding.

✧ Participants: total 58; Gezira state (extensionists: 16, farmers: 9), five states (extensionists: 8, farmers: 17)

⑨ **Wrap-up training (meeting) on CS production in 2022 season**

✧ Date: 14-15/03/2023

✧ Objective: This meeting (training) is to summarize the results of CS production activity, especially for the production plan which was formulated at the beginning of the year, and to identify the factors for items that were achieved or not achieved, discuss countermeasures for the next season, and share experiences and recognitions among the concerned parties.

✧ Contents:

- RPU of Gezira SMoPER prepared the format, and each SMoPER used it to present results, challenges, etc.
- RPU of Gedaref SMoPER did not attend meeting because CS production activity was not conducted.
- In Northen State, CS production activity was not implemented, but RPU reported on rice production activity in the state.
- Presentation of the results as well as key technical points of seed production was explained (by RPU of Gezira SMoPER and experts of the Project).
- RPU of Gezira SMoPER reported the results of the profitability analysis of rice farmers in Gezira State.
- SA introduced its activities and shared summary of results of laboratory test.
- Mr. Daffala, a farmer from Rahad Irrigation Scheme (Gezira State), who conducted ordinally rice production by ridging and furrowing method, presented his achievements.

✧ Participants: total 74; Gezira state (extensionists: 25, farmers: 9), five states (extensionists: 6, farmers: 15)

2.6.3 Activity 5-3 “ARC RSs distributes RS to 5 SMoPERs.”

(1) 2020 season

As noted under Activity 3-1, on November 20, 2019, discussion was held at the Gezira SMoPER regarding CS production by farmer for the 2020 season. Based on the discussion, final coordination was made by the Project with NRP and ARC regarding the amount of seed required and available for CS production. The final seed quantities distributed by ARC to the five states for the 2020 season, the first year of farmers' CS production, are as in the table 74.

Table 74. Seed distribution from ARC to five (5) States (2020)

State	Variety		Source of seed
	Kosti 1 (kg)	Umgar (kg)	
Sennar	8	8	ARC White Nile RS (WNRS)
Gedaref	8	8	ARC White Nile RS (WNRS)
White Nile	8	8	ARC White Nile RS (WNRS)
River Nile	8	8	ARC White Nile RS (WNRS)
Northern	8	8	ARC White Nile RS (WNRS)
Total	40	40	

(2) 2021 season

As already mentioned in "Activity 3-1", after the 2020 season, all concerned parties agreed in principle to use harvested seed in the previous season as seed for CS production in following season, and if there was a shortage, the ARC or other states would provide the seed. The seed quantities distributed by ARC to five states for the 2021 year were as in the table 75.

Table 75. Seed distribution from ARC to five (5) States (2021)

State	Variety		Source of seed
	Kosti 1 (kg)	Umgar (kg)	
Sennar	57	0	ARC Sennar RS (SRS)
Gedaref	28	13	ARC Rahad RS (RRS)
White Nile	0	0	
River Nile	0	0	
Northern	0	0	
Total	85	13	

(3) 2022 season

Seed quantities distributed by ARC to five states for the 2022 season are as in the table 76.

Table 76. Seed distribution from ARC to five (5) States (2022)

State	Variety		Source of seed
	Kosti 1 (kg)	Kosti 2 (kg)	
Sennar	9	0	
Gedaref	0	0	
White Nile	35	35	ARC White Nile RS (WNRS)
River Nile	0	0	
Northern	0	0	
Total	35	35	

2.7 Other Activities

2.7.1 Procurement and Provision of Equipment

In addition to the stone remover machine and some measuring equipment for ARC that had been planned from the beginning of the Project, the Project also procured additional equipment, such as motorcycles for the extensionists to guide farmers on their field visits, to address issues that came to light as the activities proceeded. The list of equipment procured is shown in appendix 3.

2.7.2 Public Relations

To publicize the Project, a tri-fold pamphlet (in English and Arabic) was prepared at the beginning of the Project to introduce the Project, and a newsletter (in English) was also published from October 2018 to October 2020, from the first to the fourth issue. In conjunction with the newsletter publication, articles on the JICA website were also updated. We also made effective use of media such as national TV, internet news site (Sudan News Agency: SUNA), and newspapers to develop publicity. Although it was not possible to track all the newspapers, the Project team was able to obtain at least as much media exposure as shown in the table below.

Table 77. Result of public relations through media

Date	Media	Contents
Nov. 4, 2018	National TV, Newspaper, SUNA	Conducting Field Day in Gezira state
Oct. 3, 2019	National TV	Meeting between Mr. Nakagaki and Federal Minister of Agriculture
Nov. 4, 2019	National TV, Newspaper	Conducting Observation Programme at WNRS
Nov. 3, 2020	National TV, SUNA, YouTube	Conducting Field Day in Gezira state
Nov. 9, 2020	National TV	Conducting Field Day in White Nile state
Nov. 11, 2020	National TV	Conducting Field Day in Sennar state
Nov. 30, 2020	National TV	Conducting Field Day in River Nile state
Feb. 23, 2021	National TV	Meeting between Mr. Nakagaki and the Governor of White Nile State
Mar. 1, 2021	National TV	Meeting between Mr. Nakagaki and the Governor of River Nile State
Oct. 23, 2021	National TV, SUNA	Conducting Field Day in Gedaref state

However, after the October 25, 2021 disturbances detained the prime minister and brought the military to power, the Project was instructed to refrain from public relations activities for fear that such activities might be perceived as support for that military regime, as the rest of the world was against such a regime change. Accordingly, public relations activities for the Project were suspended.

2.7.3 Invitation Programme in Japan

The invitation program took place as follows.

- Date and No. of invitee: September 16 - 21, 2019 (Arrival and Departure from Japan), 8 persons
- Objectives:
  - To understand budget management through the high quality seed production support system by a Japan's local government
  - To learn high quality seed production and inspection system for constant seed supply
  - To observe high quality rice seed production on site in the fields (isolation, cultivation calendar and method) and paddy rice production from certified seed
- Visited Destination: JICA Headquarters, Ministry of Agriculture, Forestry and Fisheries in Japan、Department of Agriculture and Forestry, Ibaraki Prefecture, Ibaraki Agricultural Center, Ibaraki Prefectural Agricultural and Forestry Promotion Corporation, JA (Japan Agricultural Cooperatives) Yasato
- Main Outcome: This Invitation Program was able to provide an opportunity to re-consider Sudan's rice policy. The objective and goal of the programme were clarified by the dialogue among stakeholders. Invitees took deep impression and speculation through the filed reconnaissance like rice field, processing facilities and retail markets. Particularly, the invitees were able to observe rice harvesting in a field. In the rice field some Japanese extensionists made explanation to invitees about rogueing with in-person performance. It was able to show the invitees the strictness and endeavor for rice seed production in Japan.

		
Visit to JICA HQ (17/09/2019)	Observation of laboratory (19/09/2019)	Visit to farmer's field (20/09/2019)

Photo 53. Invitation Programme in Japan

2.7.4 Training in the Philippines

This training was conducted through coordination between the Project and IRRI based on visit and discussion at IRRI by Mr. Nakagaki (Chief Advisor of the Project) and Prof. Ahmed (ARC) in April, 2019

① Objective: To deepen and acquire knowledge and techniques on rice seed, rice cultivation, seed multiplication, inspection method, and rice breeding through practice and lectures of this training.
② Date: from 25/11/2019 to 29/11/2019
③ Implementation organization: The International Rice Research Institute (IRRI), Philippines
④ Participants: 6 researchers from ARC, 1 staff from NRP, 1 staff from SA

		
Participants at IRRI (26/11/2019)	Microscopic observation of samples of disease organisms and nematodes, etc. in Seed Health Unit (26/11/2019)	Completion ceremony of the training at IRRI. (29/11/2019)

Photo 54. Training in the Philippines

2.8 Input Results

A total of 12 experts were engaged in this Project, for a total of 129.41 man-months. A total of 95 C/Ps were assigned to the Project. The JICA experts assignment result is shown in appendix 3. The total cost of equipment was 10,645,000 JPY (appendix 4). Details of the training conducted under the Project are shown in appendix 5.

Chapter 3 Achievement of Project Purpose

3.1 Revision of PDM

The PDM (Ver. 0) attached in the R/D had blank indicators, which were to be revised to appropriate numerical indicators according to the results of the baseline survey and activities in the first half of the Project. However, due to repeated political upheavals and COVID-19, JICA experts were unable to go to the field for a long period of time. Since the implementation of activities was the top priority during the experts' stay in Sudan, the revision of indicators was delayed. However, discussions with JICA and the C/P side proceeded, and the revision was made to Ver. 1 in time for the R/D revision in September 2023. Subsequently, the PDM was revised to Ver.2 by setting indicators for the overall goal in consideration of the situation at the end of the Project The PDM from Ver.0 to Ver.2 is shown in appendix 1.

3.2 Achievement of Evaluation Indicators

3.2.1 Achievement of Outputs

(1) Output 1

The coordination system of stakeholders in rice promotion at the Federal and State levels is established.

Indicator 1-1. Annual M&E Report on rice promotion based on activities set in TOR is produced every year.

The indicator is judged “nearly achieved[2].” As a part of the relevant monitoring activities, NRP formulates annual reports after harvesting to share the review and extension of rice cultivation with other stakeholders. Furthermore, the Project held a total of five JCCs and a total of two TSC: on June 12, 2018 (1st JCC), November 10, 2018 (2nd JCC and 1st TSC), November 27, 2019 (3rd JCC), July 5, 2022 (4th JCC), September 22, 2022 (2nd TSC) and September 26, 2022 (5th JCC).

In addition to that, the Project held a total of Wrap-up meeting or review meeting on January 14, 2020 (review meeting), from February 15 to February 16, 2021 (1st Wrap-up meeting), from March 27 to March 28, 2022 (2nd Wrap-up meeting) and from March 14 to March 15, 2023 (3rd Wrap-up meeting) so as to review seed and rice cultivation in the previous year.

Furthermore, consultant of Capacity Building and Monitoring hired by the Project conducted internal monitoring and shared the results of field trips. He conducted 26 different site visits in 2019, 57 in 2021; 34 in 2021, and 35 in 2022. After the armed conflict in April 2023, in particular, RSF invasion to Gezira State in December 2023, organized monitoring activities were not conducted while the relevant data and information such as cultivated area, operation data and yields were collected as much as possible. (Nearly achieved)

Indicator 1-2. Rice Development Forum is held once every couple of years for reporting and discussing the status of rice cultivation to a wide range of people in the public and private sectors involved in rice cultivation in Sudan.

The indicator is judged “not to be achieved.” Due to the political turmoil and pandemic of COVID-19, the Project did not succeed in holding Rice Development Forum twice (scheduled in February 2020 and February 2022). Instead of them, the Project held Wrap-up meeting session in 2020 and 2022. The Project held Wrap-up meeting three times: February 15 to 16 in 2021 (the first Wrap-up meeting), March 27 to 28 in 2022 (the second Wrap-up meeting) and March 14 to 15 in 2023 (the third Wrap-up meeting), where project stakeholders appropriately shared the current status and problems through reporting and discussion by concerned 6 states with limited participation of the private sector, on seed production and ordinary rice cultivation in Sudan, as a result, expected impact and effects of holding the Rice Development Forum had been achieved to some extent.

After that, in response to the convergence of COVID-19, the Project scheduled to hold Rice Development Forum in June 2023. In armed conflict between SAF and RSF in April 2023, the plan was cancelled in the end. The Project has never held Rice Development Forum. (Not achieved)

[2] Annual M&E reports, including monitoring activities, has not been confirmed since 2022 due to the outbreak of armed conflict in the country, and was evaluated as "nearly achieved."

Indicator 1-3. Good practices, lessons learned on rice promotion is compiled based on Wrap-up Meeting held by organizations involved in rice crop promotion every year.

The indicator is judged “achieved.” Good practices and lessons learned were compiled each year during the three Wrap-up meetings. It was noted that experts in charge of marketing and post-harvest have successfully operationalized and validated the downstream part of the rice value chain as a trial case, which could become one of the good practices. Promotion of the "Gezira Promise" brand of rice, development of new sales channels such as confectionery companies (Baraka and Borai), and sales of rice flour to rural women's schools[3] were also considered promising good practices for the project. The good practices obtained were compiled into a summary of good practices and lessons learned on rice crop promotion. (Achieved)

[Achievement of Output 1]

In spite of a number of turmoil within the country including the armed conflict in April 2023, and the COVID-19 pandemic in 2020-2021, project activities regarding Output 1 had been continued until the April 2023. According to the achievement of the three indicators, two indicators out of the three are “achieved” or “nearly achieved.” Output 1 is evaluated to be “mostly achieved.”

(2) Output 2

Foundation Seed (FS) and Registered Seed (RS) are produced at ARC HQ.

Indicator 2-1. Field inspection[*5] by Seed Administration is conducted more than 2 times/plot/variety on time at the flowering stage of rice plant and at harvesting stage, which is indispensable to maintaining seed quality.
*5 Seed Inspection is required to conduct at least twice at the flowering stage of rice plant and at harvesting stage for each seed plot for each variety.

The indicator is judged to be “nearly achieved.” The number of field inspections conducted by SA and the number of target plots (ARC seed plots and farmers' seed production plots) are shown in the table 78.

Table 78. Number of Field Inspections, Number of Plots and Percentage of Passed Plots

	2018	2019	2020	2021	2022	2023	Total
Number of Field Inspections (flowering stage)	2	2	25	40	24	16	109
Number of Field Inspections (harvesting stage)	2	2	31	54	19	20	128
Number of Field Inspections (Total)	4	4	56	94	43	36	237
Number of Plots in Total	2	2	26	44	24	16	114
Passed Plots (FI twice or more)	2	2	26	42	16	16	104
Passed Plots (FI only once or none)	0	0	0	2	8	0	10
Percentage of Passed Plots through passed SI twice or more	100.0%	100.0%	100.0%	95.5%	66.7%	100.0%	**91.2%**

Basically, two or more field inspections were conducted in target seed plots. The percentage of plots through two or more field inspections appropriately (flowering and harvesting stages) was 91.2%, which indicates that the indicator is judged to be "nearly achieved." Some of field inspections were not conducted due to being unable to travel caused by heavy rain or other weather conditions and a lack of traveling budget for SA. (Nearly achieved)

[3] Women Rural School is an organization for women extensionists which does not have a school building, but serves as a recipient organization for training and other activities. Extensionists (instructors) are expected to play a role in technology extension for women in rural areas to improve their income, nutrition status, and other skills. The Project conducted a cooking demonstration/workshop with rice recipes for the school in December 2018 so as to improve women extensionists’ knowledge in nutrition and gender.

Indicator 2-2. ARC produces and retains FS for RS production. RS production reaches 230kg/year respectively.

The indicator is judged to be "achieved." Amounts of FS and RS at ARC HQ (GRS) and WNRS are shown in the table 79.

Table 79. Amount of FS and RS at ARC Research Stations

Year	2018	2019	2020	2021	2022	2023	Total
FS	24.51kg	260kg	-	-	-	-	284.51kg
RS	-	65.5kg	406.00kg	226.81kg	157.00kg	340kg	1064.31kg

The indicator is judged to be "achieved" since the target figures (230kg/year) were fulfilled in the last year. In three years out of the five years from 2019 to 2023, seed production at ARC fields reached 230kg. The total amount of RS production reached 1064.31kg for the past five years and the average of RS production reached 177.39kg/year. (Achieved)

Indicator 2-3. Purity of produced FS and RS is more than 99.0% respectively.

The indicator is judged to be "nearly achieved." Produced seeds (FS and RS) passed seed inspection done by SA, which indicated that the purity of produced seeds reached more than 98%. As indicated in the table 80, in the past four years out of six years from 2018 to 2023, purity of produced seeds reached more than 99%. Estimates based on the criteria used for laboratory examination are substituted for the data for 2021 and 2023 in which detailed data were not available due to the COVID-19 pandemic and the armed conflict between the SAF and RSF, respectively. (Nearly achieved)

Table 80. Purity of FS and RS

Year	2018	2019	2020	2021*	2022	2023*
Purity of FS and RS	99.9%	99.9%	99.7%	98.0%	99.6%	98.0%

*Estimate by Laboratory Test

[Achievement of Output 2]

In spite of a number of turmoil within the country including the armed conflict in April 2023, and the COVID-19 pandemic in 2020-2021, project activities regarding Output 2 had been continued. According to the achievement of the three indicators, three indicators out of the three are "achieved" or "nearly achieved." Output 2 is evaluated to be "mostly achieved."

(3) Output 3

Certified Seed (CS) production system is established for ordinary farmers in CoE.

Indicator3-1. Purity of produced CS is more than 98.0%.

The indicator is judged to be "achieved." Seeds (CS) subject to seed inspection had been produced since 2020 in Gezira State. Produced seeds by contract farmers passed seed inspection done by SA, which indicates that the purity of produced seeds reached more than 98%. (Achieved)

Indicator 3-2. More than 6 farmers produce CS annually at more than 6 feddan paddy fields as a whole at the termination of the project.

The indicator is judged to be "achieved." CS has been produced in Gezira State since 2020. The numbers of farmers who produce CS and cultivated area (actual number for CS production and selected number) are shown in the table 81.

Table 81 (1). Number of Farmers and Cultivated Area (Actual Number of Farmers who Cultivated CS)

Year	2020	2021	2022	2023	Total
Number of Farmers	5	7	3	6	21
Cultivated Area	3 feddan	15.8 feddan	6 feddan	12 feddan	36.8 feddan

Table 81 (2). Number of Farmers and Cultivated Area (Selected Number)

Year	2020	2021	2022	2023	Total
Number of Farmers	6	8	4	6	24
Cultivated Area	3.25 feddan	17.8 feddan	8 feddan	12 feddan	41.05 feddan

Based on actual numbers and cultivated area, the indicator is judged to be "achieved" since the target figures (6 students and 6 feddans) were fulfilled in the last year. The number of farmers who produced CS reached six in two of the four years from 2020 to 2023 and the average number for that period reached 5.25/year. The cultivated area reached 6 feddans in three out of the past four years from 2020 to 2023 while the total cultivated area reached 36.6 feddans and the average cultivated area for that period reached 9.2 feddans/year. (Achieved)

Indicator 3-3. Number of ordinary farmers who receive CS reaches more than 10/year and more than 10feddan/year at the termination of the Project.

The indicator is judged "not to be achieved" since the outbreak of the armed conflict between SAF and RSF in April 2023 made it physically difficult to cultivate ordinary rice enough in Gezira State, especially in 2023. CS has been produced in Gezira since 2020, ordinary farmers who receive CS had been selected since 2021. The number of ordinary farmers who received CS and cultivated areas are shown in the table 82.

Table 82. Number of Farmers who Received CS and Cultivated Area

Year	2021	2022	2023	Total
Number of Farmers who Received CS	4	4	1	9
Cultivated Area	8 feddan	10.5 feddan	2.0 feddan	20.5 feddan

There is no year when more than ten ordinary farmers received CS for cultivated area more than 10 feddans each year. (Not achieved)

Indicator 3-4. Amount of CS distributed to ordinary farmers reaches more than 350kg/year at the termination of the Project.

The indicator is judged "not to be achieved." CS has been produced in Gezira since 2020, CS had been distributed to ordinary farmers since 2021. The amount of distributed CS is shown in the table 83.

Table 83. Amount of CS Distributed to Ordinary Farmers

Year	2021	2022	2023	Total
Amount of CS distributed	280 kg	367.5 kg	70 kg	735 kg

The indicator is judged "not to be achieved" since the amount of distributed CS did not reach 350kg in the last year. In one year out of the three years from 2021 to 2023, the amount of distributed CS reached 350kg. The total amount of distributed CS amounted to 735kg for the past three years and the average amount for that period reached 245kg/year. Even on average, the target (350 kg/year) were not fulfilled, and the amount of CS distributed was not fulfilled to 350 kg/year every year. The sharp decline in CS distributed for 2023 was due to the armed conflict between SAF and RSF in 2023, which reduced the number of farmers who produced CS, as a result, the amount of CS distributed was also decreased. (Not achieved)

Indicator 3-5. CS production manual in Gezira State is approved by MoAF.

The indicator is judged to be "nearly achieved." Extensionists of RPU in Gezira State and the JICA expert in charge (upland rice cultivation) formulated the draft of CS production manual, which is designed for farmers' use, consulting through a series of discussions between them. After that, they submitted the finalized draft to the MoAF in January 2023 and the document is still awaiting approval/authorization. The final draft of the manual was approved by MoAF in April 2024, even though the due approval process is currently suspended due to the armed conflict between SAF and RSF in April 2023. (Nearly achieved[*])

[*]The indicator is judged to be "Nearly achieved" since the manual draft was already formulated and the armed conflict between SAF and RSF occurred in April 2023, which is the situation where one of the important assumptions for the achievement of Outputs does not meet.

[Achievement of Output 3]

In spite of a number of turmoil within the country including the armed conflict in April 2023, and the COVID-19 pandemic in 2020-2021, project activities regarding Output 3 had been continued. According to the achievement of the three indicators, three indicators out of the five are "achieved" or "nearly achieved." Output 3 is evaluated to be "Partly achieved."

(4) Output 4

The issues of rice marketing are identified based on trial rice sales* in Gezira State. (*) Rice sales indicates both of sale of broken rice and milled local rice.

Indicator 4-1. Reports on Profitability Analysis and Market Survey are circulated to MoAF and 5 States.

The indicator is judged to be "nearly achieved." The JICA expert in charge and C/Ps submitted the final report of Report on Profitability Analysis and Market Survey in January 2023 to MoAF/NRP. Due to the armed conflict between SAF and RSF in April 2023, the due process for the circulation to other 5 states is currently suspended. (Nearly achieved*)

*The indicator is judged to be "nearly achieved" since the report draft was already formulated and the armed conflict between SAF and RSF occurred in April 2023, which is the situation where one of the important assumptions for the achievement of Outputs does not meet.

Indicator 4-2. Broken rice ratio of milled local rice decreases from 72.9% to 45%.

The indicator is judged "not to be achieved" since high broken ratio is due to the high cracked/broken rice kernels before milling (including broken rice before milling) caused by dry climatic in Sudan according to the analysis by the expert in charge. Broken rice ratio of milled rice for Fadasi, Hasahisa, Rahad 44 and Umbarona on average is decreased from 72.90% in 2018 to 61.0% in 2019. Average of difference in broken rice ratio of milled rice for the RMU between 2018 and 2019 is -11.9 %. Results of rice milling in 2022 show that rice broken ration that is defined as the ratio consisting of sum of large, medium, and small broken rice ranges between 54% to 93 % with average of 73 %. (Not achieved)

Indicator 4-3. Report on good practices and lessons learned on trial rice sales is circulated to MoAF and 5 States.

The indicator is judged to be "nearly achieved." The JICA expert in charge and C/Ps already formulated the first draft on October 9, 2022 and finished the second draft for circulation within the JICA experts and C/Ps. After that, RPU Gezira submitted a finalized report to NRP by December 2022. Due to the armed conflict between SAF and RSF in April 2023, the due process for the circulation to other 5 states is currently suspended. (Nearly achieved*)

*The indicator is judged to be "nearly achieved" since the report draft was already formulated and the armed conflict between SAF and RSF occurred in April 2023, which is the situation where one of the important assumptions for the achievement of Outputs does not meet.

[Achievement of Output 4]

In spite of a number of turmoil within the country including the armed conflict in April 2023, and the COVID-19 pandemic in 2020-2021, project activities regarding Output 4 had been continued. According to the achievement of the three indicators, two indicators out of the three are "achieved" or "nearly achieved." Output 4 is evaluated to be "Mostly achieved."

(5) Output 5

The production of CS is started in 5 States (Sennar, Gedaref, White Nile, River Nile and Northern).* *) Output 5 is aimed to achieve the overall goal.

Indicator 5-1. A total of 40 extensionists, (At least 4 extensionists in each of 5 States) who received training in CS production and extension conducted by the project, have been deployed.

The indicator is judged "not to be achieved." The total number of trained extensionists in the five states from 2020 to 2023 reached 32 and the average number reached 8/year (table 84). A total of 40 extensionists and at least four extensionists in each of the five states were not assigned to the Project. (Not achieved)

Table 84. Number of Extensionists in the Five States Trained

Year	2020	2021	2022	2023	Total
Number of Extensionists Trained	10	8	8	6	32

Indicator 5-2. Amount of seeds distributed from ARC RCs to 5 SMoPERs reaches more than 140kg/year at the termination of the Project.

The indicator is judged to be "achieved." Amount of distributed seeds to the five states from ARC HQ is shown in the table 85.

Table 85. Amount of Seeds Distributed from ARC RCs to 5 SMoPERs

Year	2020	2021	2022	2023	Total
Amount of Seeds Distributed	80kg	98kg	70kg	215kg	463kg

The indicator is judged to be "achieved" since the target figures (140kg/year) were fulfilled in the last year. In one year out of the four years from 2020 to 2023, amount of distributed seeds reached 140kg. The total amount of distributed seeds amounted to 463kg for the past four years and the average area for that period reached 115.75 kg/year. (Achieved)

Indicator 5-3. Number of contracted farmers for CS production in 5 States reaches more than 10/year at the termination of the Project.

The indicator is judged to be "achieved." The numbers of contracted farmers for CS production (actual number of farmers who produce CS and selected number) are shown in the table 86.

Table 86 (1). Number of Contracted Farmers for CS Production (Actual number of Farmers who Produce CS)

Year	2020	2021	2022	2023	Total
Number of Contracted Farmers	10	19	11	7	47

Table 86 (2). Number of Contracted Farmers for CS Production (Selected Number)

Year	2020	2021	2022	2023	Total
Number of Contracted Farmers	10	30	11	10	61

In all of the four years from 2020 to 2023, number of contract farmers reached 10. The average number of contract farmers amounted to 11.75 farmers/year. Meanwhile, the number of actual seed production farmers did not reach 10 in 2023. In 2023, two out of contract farmers gave up producing CS because of flooding by heavy rain and one of them could not pass the seed inspection done by SA. Even though the armed conflict occurred in 2023, which does not meet one the important assumptions for the achievement of Outputs, the number of contract farmers reached 10. (Achieved)

Indicator 5-4. Area of CS production in 5 States reaches more than 10 feddan/year at the termination of the Project.

The indicator is judged to be "nearly achieved." Area of CS production in the five states is shown in the table 87.

Table 87. Area of CS Production

Year	2020	2021	2022	2023	Total
Area of CS Production	2.5 feddan	19.75 feddan	17.7 feddan	7.0 feddan	46.95 feddan

The target figures (10 feddan/year) were not fulfilled in the last year. In two years out of the four years from 2020 to 2023, area of CS production reached more than 10 feddan. The Project limited area of CS production

per farmer to 0.25 feddan/year since 2023 was the first year of CS production. A few of states gave up producing CS due to the armed conflict in 2023, which is the condition when important assumptions for the achievement of output did not meet. The total area of CS production amounted to 46.95 feddan for the past four years and the average area reached 11.74 feddan/year. Therefore, the target was fulfilled in terms of the average area of CS production which indicates that the indicator is finally judged to be "nearly achieved." (Nearly achieved)

[Achievement of Output 5]

In spite of a number of turmoil within the country including the armed conflict in April 2023, and the COVID-19 pandemic in 2020-2021, project activities regarding Output 5 had been continued since 2020 until the termination of the Project. According to the achievement of the four indicators, three indicators out of the four are "achieved" or "nearly achieved." Output 5 is evaluated to be "Mostly achieved."

3.2.2 Achievement of Project Purpose

1. Project Purpose

The institutional and technical capacity[*1] of Federal Ministry of Agriculture and Forests (MoAF), Agricultural Research Corporation headquarters (ARC HQ)[*2], and Center of Excellence located in Gezira State (CoE)[*3] for the implementation of rice promotion is improved.

*1 The institutional capacity indicates skills and experience in management, planning, assessment and coordination with other institutions, while the technical capacity indicates skills and techniques in rice & rice seed cultivation, seed supply & distribution, marketing, post-harvest, etc.

*2 ARC HQ indicates ARC Headquarters in Gezira State and ARC White Nile Research Station in White Nile State headed by the National Rice Research Coordinator in charge of management, BS production, release of new varieties, etc.

*3 CoE stands for SMoPER/Gezira which serves for the purpose of rice promotion in 6 States.

Indicator 1. Draft Mid-Term Plan to utilize CoE for 6 States by MoAF is circulated to MoAF and 6 SMoPER.

The indicator is judged to be "achieved." Once the framework of the Mid-term plan to utilize CoE for 6 states was finalized in May 2022, a draft of the plan was developed by RPU Gezira and the JICA expert in upland rice cultivation. The plan consists of training plan in the six states, the seed production plan and the development of plots focused on good practices, etc.

RPU Gezira completed reviewing the draft within the Project and submitted it NRP and ICD of MoAF in January 2023. After that, MoAF gave authorization to the document and successfully distributed it to MoAF and six SMoPERs. (Achieved)

Indicator 2. Seed Production Plan for 6 States is produced with the cooperation of MoAF, ARC HQ and CoE.

The indicator is judged to be "nearly achieved." Seed production plans for the six states are shown in the table 88. (Proposed areas does not necessarily match the actual cultivated areas since they are proposed at the planning stage.) The five states except Gezira State started to formulate seed production plans in 2020. In 2022 and 2023, Gedaref State only considered formulation of plans and did not actually formulate the plans. As a result of discussions with those involved, the state decided to focus on ordinary rice production and sales with specific farmer(s) to not to formulate seed production plan in 2022 and 2023. (Nearly achieved)

Table 88. Seed Production Plan for 6 States

Year	2018	2019	2020	2021	2022	2023	Total
Gezira State	12 feddan	40 feddan	2.75 feddan	20 feddan	8 feddan	12 feddan	94.75 feddan
Sennar State	-	-	0.5 feddan	10 feddan	10 feddan	2 feddan	22.5 feddan
White Nile State	-	-	0.5 feddan	5 feddan	2.7 feddan	2 feddan	10.2 feddan
River Nile State	-	-	0.5 feddan	4 feddan	5 feddan	4 feddan	13.5 feddan
Gedaref State	-	-	0.5 feddan	8 feddan	0 feddan	0 feddan	8.5 feddan
Northen State	-	-	0.5 feddan	2 feddan	0.5 feddan	1 feddan	4.0 feddan
Total	12 feddan	40 feddan	5.25 feddan	49 feddan	26.2 feddan	21 feddan	153.45 feddan

Indicator 3. Purity of FS and RS at ARC HQ maintains more than 99.0%.

The indicator is judged to be "nearly achieved." Produced seed (FS and RS) passed seed inspection done by SA, which indicates that the purity of the produced seed reached more than 98%. As presented in the table 89, the purity of them exceeded 99% in four out of the past six years from 2018 to 2023. Estimates based on the criteria used for laboratory examination are substituted for the data for 2021 and 2023 in which detailed data were not available due to the COVID-19 pandemic and the armed conflict between the SAF and RSF, respectively. (Nearly achieved)

Table 89. Purity of FS and RS

Year	2018	2019	2020	2021*	2022	2023*
Purity of FS and RS	99.9%	99.9%	99.8%	98.0%	99.6%	98.0%

*Estimate by Laboratory Test

[Achievement of the Project Purpose]

It is worth mentioning that in spite of a number of on-going/past challenges in the country, including the armed conflict in April 2023 and the global epidemic of COVID-19 from 2020 to 2021, the project activities regarding Outputs 1 to 5 in the field were continued by C/Ps with remote support of JICA and JICA experts. According to the achievement of the three indicators, three indicators out of three are "achieved" or "nearly achieved." Furthermore, Outputs 1, 2 and 4 are "mostly achieved" except Output 3, which is evaluated that the project purpose is "mostly achieved" rather than "partially achieved" in conclusion. (Output 5 is not included for the achievement of the Project Purpose because it is an output set to achieve the overall goal.)

3.2.3 Perspective for Achievement of the Overall Goal

1. Overall Goal

The rice production is promoted in 6 States (Gezira, Sennar, Gedaref, White Nile, River Nile and Northern).

Indicator 1. MoAF of the Sudanese Government maintains its structure of the NRP and Directorate of International Cooperation and institutional structure to coordinate activities of ARC, SA, and the relevant states.

An information sharing system between MoAF and state governments was established in consultation with JICA before the outbreak of armed conflict in April 2023. Monthly meetings were held in the capital, Khartoum while monthly meetings were organized at the state level as well, initiated by DG of ICD, MoAF. In addition, the consultant hired by the Project paid periodical monitoring visits. The overview of monthly meetings at the federal and state levels are shown in the table 90.

Table 90. Monthly Meeting at the Federal and Regional Levels

Federal/State	Date/Month and Year
MoAF including NRP	November 29, 2022, January 23 and 10 April, 2023
Gezira State	March 2023.
Sennar State	February 23, March 5, April 5 and May 14, 2023
White Nile State	February 15 and March, 2023
River Nile State	March 2023.

After the armed conflict occurred in April 2023, it was impossible for C/Ps to hold monthly meeting or a similar opportunity except Sennar State. After the RSF invasion of Gezira State in December 2023, contact has been unstable, especially in Gezira State.

Indicator 2. ARC and relevant institutions have the capacity to produce 300 kg of FS and/or RS per year.

Seed production at ARC Gezira and ARC White Nile Research Stations are shown in the table 91.

Table 91. Amount of FS and RS Produced at ARC RSs

Year	2018	2019	2020	2021	2022	2023	Total
FS	24.51kg	260kg	-	-	-	-	284.51kg
RS	-	65.5kg	406.00kg	226.81kg	157.00kg	340kg	1064.31kg

Indicator 3. At least four (4) farmers in Gezira State and at least (2) farmers in each of the three states (Sennar, White Nile, and River Nile States) can produce certified seeds.

Number of Famers who Produce CS in Gezira, Sennar and River Nile States are shown in the table 92. The tables indicate actual number of farmers who produced CS and who were selected respectively.

Table 92 (1). Number of Contracted Farmers for CS Production (Actual Number of Farmers who Produce CS)

Year	2020	2021	2022	2023	Total
Gezira State	5	7	3	5	20
Sennar State	2	4	3	3	12
White Nile State	2	6	3	2	13
River Nile State	2	4	5	2	13

Table 92 (2). Number of Contracted Farmers for CS Production (Selected Number)

Year	2020	2021	2022	2023	Total
Gezira State	6	8	4	6	24
Sennar State	2	7	3	4	16
White Nile State	2	8	3	2	15
River Nile State	2	6	5	4	17

[Perspective for Achievement of the Overall Goal]

The Project cannot state the expected level of achievement of the overall goal since the on-going deteriorated security conditions after the outbreak of armed conflict between SAF and RSF in April 2023, in particular, in the capital Khartoum and Gezira State. It should be noted that an ex-post evaluation will be conducted 3-5 years after the completion of a project to determine the status of achievement level of the overall goal, however, it would be conducted under the premise that the conflict has been come to an end and the security condition of the country has been restored.

Chapter 4 Issues, Ingenuity, and Lessons Learned in Project Implementation (Way of Work, Management Structure, etc.)

4.1 Challenges

4.1.1 Significant Constraints Due to External Factors Affecting Project Operations

It is essential to document the significant external factors that have caused major constrains on the promotion and operations of the Project from 2019 through the end of the Project in 2024, excluding 2018, in Sudan. Below is an outline of these factors.

(1) On April 11,2019, a coup occurred in Sudan, marking the end of the Bashir regime, which had been in power for nearly 30 years. This was followed by the establishment of an interim government jointly led by the military and civilians. Consequently, there were changes in government personnel and budget allocations, leading to frequent cases where budgets were not appropriately executed.
(2) Around March 2020, the global impact of COVID-19 also affected Sudan. Restrictions on travel to Sudan meant that JICA experts had to conduct project activities remotely, which made detailed guidance and advice more challenging to deliver.
(3) On October 25, 2021, the military faction within the interim government (Interim Council) took control though unrest, effectively seizing power in governance. This resulted in personnel and budget allocation issues being negatively influenced by the military's dictatorship, significantly impacting project budget allocation and expenditure.
(4) On April 15, 2023, internal power struggles within the military led to fighting between SAF and RSF, which has been still on going at the time of project completion. This internal conflict turned the capital into one of the primary battlefields, rendering MoAF and its related bodies (ICD, NRP, ARC and SA) completely unable to function normally. Many government officials fled the capital, with some escaping abroad, resulting in severe disruptions to normal operations. It was also reported that many government personnel were not receiving their salaries. In other states involved in the Project, the typical organizational functions of the state governments were not operational, with no budget and no employee salaries paid, a situation that persisted since April 2023.

4.1.2 Remote Implementation of Operations

Due to external factors mentioned in section 4.1.1, the Project was repeatedly forced to carry out operations remotely. Out of 77-month project period, the duration which JICA experts could not enter Sudan amounted to 36 months. As a result, communications with project-employed staff and C/P were conducted via email, phone, and social media to keep the Project progressing. Locally, project-employed consultant took on the responsibility of liaising with C/P and related institutions to advance project activities. Due to the disruption of entering Sudan many times in a way of unexpected manner, Japanese experts were not able to come to the project sites regularly as scheduled. Consequently, the Project was forced to handle by the ways of remote communication. However, Japanese experts were not able to come timely to the field sites at the time of most needed time of advices of Japanese experts, such times as sowing time, off-type removing time, harvest time.

4.1.3 Changes with the Project Framework

(1) Challenges on the Japanese Side

1) Handling of the R/D and Pre-Project Survey

The R/D, the fundamental document summarizing agreement with the project counterpart, was drafted within a short pre-project survey of about two weeks. This often led to inaccurate or inoculate information and the omission of important matters. Here are some examples:

① Activities related to SA, which plays a critical role in achieving Output 2, were only set as activities 2-5. This limitation in the planned made it difficult to improve the seed inspection system thorough these activities alone. The improvement of seed inspection system could continue an output in its own right

within its limited stipulation in R/D.

② The R/D stipulated the establishment of the Technical Sterring Committee (TSC), but the purpose, frequency, and other details were unclear, rendering it ineffective. This lack of clarity meant that even frequent meetings did not contribute meaningfully to the project activities. A similar issue was found with the scheduled Forum, which lacked clear objectives and had set an impractical annual frequency.

③ Gezira SMoPER, which is more advanced than in rice cultivation than the other 5 states, actively pushed forward with the concept of CoE Gezira. However, there was a vague understanding that CoE Gezira meant "Gezira State" without any actual structure or budget to support such a role. This ambiguity made it challenging for CoE Gezira (Gezira SMoPER, RPU) to guide other 5 states. Additionally, the concept CoE Gezira lacked clarity, leading to confusion, particularly among C/P, about its concrete representation.

④ All CS production relied solely on the flow from ARC through BS, FS, and RS, leading to a unidirectional structure for seed production. There is no stipulation on seed multiplication (CS multiplication) in Sudan. Therefore, even ARC as federal organization cannot multiply CS seeds.
This approach was impractical and confusing for states producing CS seed, as it required ARC to produce large amount of RS annually to the concerned 6 states, which was unrealistic and confusing.

(2) Challenges on the Sudanese Side

1) Timely and appropriate expenditure of the Sudanese C/P fund

A major goal of this Project was to establish a seed production system for rice cultivation. In Sudan, there is no defined organization responsible for seed multiplication (i.e. CS production). ARC is designed to produce BS, FS and RS. Given this situation, the Project assumed that CS production would be carried out and promoted in each state. The project plan also assumed that the government would buy CS from farmers to promote CS production, but in reality, the government was often unable to pay for the CS produced by farmers, posing significant challenges.

Additionally, while adequate budgets were allocated during the budget planning stages for promoting rice production, there were repeated instances during the expenditure phase where disbursement could not be made due to a lack of funds. This necessitates future improvement (as detailed in Chapter 5).

2) Basic challenges in promoting the rice project

① Improving rice milling rate and utilizing broken rice

In Sudan, the rice harvest period coincides with hot, dry weather, increasing the broken rice at the time of milling. Despite efforts to reduce the rate of broken rice, overcoming the high temperature and dry conditions significantly lower the broken rice rate has been proving challenging. Considering these climatic conditions, the Project incorporated activities not originally included in the PDM, such as utilizing broken rice by experimenting with rice bread and rice-based confectionary. These trial activities are received positive feedback not only from government officials but also from private sector stakeholders (as detailed in section 4.2 on innovation).

4.2 Examples of Innovations

4.2.1 Innovations in Technical Aspects

(1) Innovations in Cultivation Techniques for Improving Upland Rice Cultivation

1) Elimination of differences in land elevation and irrigation efficiency within cultivation fields through subdivision of cultivation plots

In Sudan, efforts have been made to promote upland rice cultivation. Timely and appropriate irrigation management is crucial even in upland rice cultivation. To ensure proper irrigation in upland rice cultivation, the field are leveled before sowing, usually checked visually for flatness. However, in Sudan, where field are divided into rectangular plots (approximately 40m x 100m), leveling by visual inspection often leads to unevenness within the same field due to differences in elevation.

To address the difficulty of evenly distributing irrigation water across the fields and to facilitate water management, the Project devised a method of subdividing each field (1 feddan), into 20 or more plots and irrigating them evenly within the same field. By subdividing the fields, water management in the fields was more effectively carried out. If irrigation was done with the field as one plot (1 feddan), visual leveling inevitably led to elevation. This resulted in areas where irrigation water was less likely to reach higher areas, hindering

upland rice growth and making those areas more susceptible to termite damage.

2) Early sowing to avoid heavy rain during the rainy season

Recommended sowing time for rice to avoid flooding of fields during the rainy season. Heavy rains often occur at the end of July or early August. If rice seed sown during this period, rice plants are still small (about 5cm) and they may sink into the flooded fields, thus causing improper growth or even death of the rice plants. To avoid food damage, the Project proposed growing rice plant size significantly big before the heavy rains start.

As a measure, sowing around June 15th allows the rice seedlings to reach a height of 25cm to 30cm by the end of Jully to early August. The early sowing approach provides a significant advantage, as even if heavy rains occur at the end of July or early August, at least one-third of the rice stems and leaves will not be submerged, allowing for continued growth.

3) Trial of ridge cultivation for upland rice

Similar to the cultivation of sorghum or wheat, low ridges were created, and cultivation was introduced using inter-ridge irrigation which yielded excellent results in the cultivation of general rice (rice for sell) in Gezira State. While ridge cultivation requires more labor, it is a familiar method for farmers as it has been used in the cultivation of sorghum and wheat. Although ridge cultivation had not been attempted in upland rice cultivation due to its higher irrigation requirement compared to sorghum, advanced rice farmer in Gezira State were encouraged to adopt this method. As a result, the advanced farmer tried this irrigation cultivation method and successfully cultivated general rice using this method for two years (twice). It is expected that upland rice cultivation using this method will increase in the future.

4.2.2 Creation of Training Opportunities for SA Inspectors and Innovative Training Content

SA inspectors have limited knowledge about upland rice cultivation compared to extensionists in concerned 6 states. However, their duties involve conducting CS seed inspection three times. The first inspection occurs before heading, during the heading and flowering stage at the CS production field. The second inspection occurs before harvest, examining the cultivation conditions of CS plants and field (checking if the distance between the plants is sufficient, ensuring there are no of-types or weeds, and assessing the crop's growth progress at CS fields. The third inspection occurs after harvest, examining CS quality, including checking for the presence of off-type seeds, diseased seeds, and ensuring germination rate of at least 80%, conducted in a laboratory.

Given these inspection duties, SA inspectors need to conduct these inspections accurately and the right time. However, their current knowledge about upland rice cultivation is lacking due to its novelty. Without good understanding of rice cultivation and inspection timing, inspectors may fail to conduct inspections at the right time, affecting harvest activities adversely.

Initially, the training content for seed inspectors only covered activities 2-5 as noted 4.1.3, however this content assumed that CS seed inspectors had sufficient experience and knowledge of upland rice cultivation, leading to a significant disparity between the inspectors' actual knowledge and expected knowledge level.

To address this gap, the Project proposed the need for specialized training to improve the knowledge of inspection staff regarding upland rice cultivation, which was not initially included in the PDM. After discussions between NRP, and SA, a special training program was planned and implemented. Specifically, a training opportunity was created by the Project for relevant inspection staff to improve their knowledge of upland rice cultivation. JICA expert (Mr. Goto) who is the specialist responsible for seed inspection-related activities, conducted this training. The training utilized the handbook on upland rice cultivation made by the same expert in the former Project to deepen the inspector's understanding of upland rice cultivation.

4.2.3 Promotion of Collaboration between ARC and Relevant States in Upland Rice Cultivation

In the 6 relevant sates, although extensionists and have basic knowledge and some experience in rice cultivation, their cultivation techniques have not reached a satisfactory level. Recognizing this situation, the Project has been encouraging constant collaboration between the ARC's researchers and the rice sections of relevant states. By fostering collaboration, the Project aims to ensure that research findings are communicated to extensionists. By doing so, extensionists can then disseminate the knowledge and techniques to farmers in a timely manner. Strengthening such collaboration is believed to facilitate the formation of a desirable cycle wherein farmers convey cultivation-related problems encountered in rice production to extensionists, who then

relay these challenges to researchers for their further study.
The Project has been urging such collaboration by organizing visits to each state at least once during the upland rice cultivation season, and significant progress has been made in enhancing collaboration in the relevant states. This effort has primarily been led by Mr. Nakagaki, Mr. Goto and the project consultant Dr. Hassan.

4.2.4 Institutional Innovations

(1) Monthly Meeting in Relevant States

Upon the project team's initiatives, monthly meetings were organized in the target states to facilitate the smooth implementation of project activities. The first monthly meeting was held in the capital, Khartoum, on November 29 ,2022, where the importance of regular meeting was acknowledged within the project team. Before organizing these meetings, Mr. Nakagaki, chief advisor of the Project explained the significance of the meeting to DG of ICD, ensuring sufficient understanding. Subsequently, the importance of these meetings and their regularity were communicated to stakeholders by the manager of the Project (National Rice Coordinator of NRP) under the auspices of DG of ICD. Following this, the Project proposed and implemented monthly meeting in each state similar to those at federal level. These meetings aimed at information sharing, monitoring progress, and addressing issues. As a result, monthly meetings were held in five out of 6 states from February to May 2023, yielding significant results. However, due to armed conflict within the army in April 2023, this initiative has been suspended. For example, in Gezira State, not only agriculture related personnel but also high raking officials from the State Ministry of Finance attended the meeting and expressed financial support to the Project. In Sennar State, acting State Minister of Agriculture, DG of Agriculture and other concerned personnel attended the meeting to promote CS production and future upland rice cultivation. In White Nile State, acting State Minister of Agriculture attended the meeting together with other concerned personnel to promote upland rice cultivation through organizing rice farmers of about 85 members. In River Nile State, they concluded to disburse money for CS production farmers beforehand of federal government to pay this.

4.2.5 Innovative Use of Broken Rice after Milling

(1) Trials and Testing of Rice Flour Bread and Rice Snacks

While improving the milling rate of harvested rice, it remains a challenge. The Project also considered the effective utilization of broken or crushed rice. Hence, trials were conducted to produce food items using these crushed rice, and tasting sessions were held to gauge the Sudanese people's preference.

Trials were conducted for rice flour bread (using a mixture of 60% rice flour and 40%wheat flour) which received positive feedback when provided to officials from MoAF, the Gezira State Government, and participants from other states attending the Field Dau. Additionally, trials and tasting sessions for rice snacks were also conducted, receiving favorable responses. It is anticipated that as rice production increases, private entities may purchase rice flour to manufacture and sell products like rice flour bread and snacks.

4.2.6 Public relations Initiatives to promote Rice Cultivation among Sudanese Farmers

In Gezira State, a harvest day was organized, bringing together government officials, farmers, and media representatives to inform a wide range of people, including farmers, about the possibility of upland rice cultivation in Sudan, despite its hot and dry climate.

The Field Day activities in Gezira State had two significant effects:

1) Through television and newspapers, the Field Day highlighted the feasibility of upland rice cultivation and its financial attractiveness, thus informing many farmers and government officials and creating a positive image.
2) Experiencing the success of upland rice cultivation at the Field Day encouraged other states to consider organizing similar events. Consequently, several other states begun holding field day events using their own budget, thereby spreading awareness and promoting rice cultivation within their jurisdictions.

The Field Day not only involved stakeholders from Gezira State but also attracted high ranking federal government officials and representatives from other states and media outlets. This event effectively served as a platform to promote upland rice cultivation to a wider audience, with an average attendance of approximately 250-300 people per event.

It should be stressed that farmers of other 5 states than Gezira do not have knowledges on upland rice

cultivation and its profitability compared to traditional crops. With this background, the harvesting events have provided significant opportunity for these farmers by attending the event and get to know real upland rice growth directory in the field. It was the significant opportunity for those farmers to understand that upland rice can grow in their fields and has good profit gaining opportunity. Consequently, the Field Day event provided significant positive impact to grow upland rice for ordinary farmers who have not experienced upland rice cultivation before.

4.3 Lessons and Learned

Lesson-1: Coordination of Expenditure Timing between Sudan and Japan

In many cases, Sudanese C/Ps faced challenges in timely and appropriate disbursement of the necessary C/P funds for project activities.

Recommendation:

Implement a more flexible approach to financial support disbursement, considering Sudan`s constraints, without compromising project timeline.

Lesson-2: Collaboration Approach between the Project and Sudanese Government

In developing countries in general, “delegation system” is not well developed. Consequently, it is important to know “top-down” decision making system in these country and act accordingly. This means that before making important decision at actual field level of lower organization it is important to contact beforehand to the persons in decision making posts at upper organization. In forwarding this process, it is also important and useful to handle with letters that can be used as evidence when necessary.

By proactively engaging with SMoPER at the local level, beyond the original project framework, the Project facilitated operational improvements. However, incorporating collaboration activities not initially outlined in the project framework was challenging. In hierarchal administrative system like Sudan’s lobbying at higher administrative levels was crucial for project advancement.

Recommendation:

Ensure comprehensive explanations to higher authorities to gain their understanding and support for collaboration activities beyond the project`s initial scope.

Lesson-3: Key Personnel for Remote Operations

In remote operations, local consultant played a crucial role in conveying the perspectives and opinions of JICA experts who could not travel to Sudan. Establishing trust with local counterparts and gaining the confidence of JICA experts were crucial for effective communication and decision-making.

In this Project, the Project employed competent consultant who had been employed in the former Project by JICA. The consultant has worked for MoAF, and has got Ph.D. in UK. He has wide human network within the ministry and Sudan in general.

Recommendation:

Ensure the availability of competent consultant who can effectively serve as intermediaries between Japanese experts and local counterparts.

Lesson-4: Through Pre-Survey and Flexibility in Project Implementation

The initial assessment revealed vulnerabilities in the seed production system at ARC HQ, although the White Nile State ARC station (WNRS) was well-equipped and had a clear mandate for rice seed production (BS, FS and RS). However, it was not initially included in the project scope. Flexibility allowed for its inclusion in the project in the second year, with other ARC stations following suit in the third year.

Chapter 5 Recommendations for achieving the Overall Goal

5.1 Improvement for external factors after completing the Project

There had been critical changes in the circumstances in Sudan, as such that 1) End of Bashir administration and establishment of “the new tentative government”, 2) Big influence by the COVID-19 in the world, 3) Collapse of the new tentative government and establishment of government by the army, 4) Collision among the factions in the Sudanese army, it is being hoped to end inner fighting by the two side (SAF and RSA) as early as possible.

However, it may take some time to come back to normal democratic political system. It is also considered to restore normal government functions as had been before the armed conflict (fighting by two side of army: SAF and RSF). There seems to be some time needed to get back to normal function of government by having proper function of the Government by personnel assignment and providing necessary budget in the Government.

5.2 How to cope with the critical issues for attaining the overall goal of the Project

5.2.1 Normalization of relevant organization and budget

It is very necessary to restore the normal assignment of the personnel and the allocation of budget of the MoAF after fighting in Sudan. This restoration includes normal function of ICD, NRP, SA, and ARC as well. Similar normalization of government functions in the concerned states is also necessary.

5.2.2 Maintaining government policy to promote rice production in Sudan

The Sudanese government must reaffirm its commitment to promoting rice cultivation as a strategic secondary crop. Ensuring the continued functioning of the NRP and its coordinating role in rice cultivation initiatives is imperative.

5.2.3 Ensuring organization, personnel, and budget for rice cultivation

Securing organizational structure personnel, and budgets within federal and state agricultural departments is vital. Efforts should be focused on ensuring timely budget allocation and expenditure to avoid disruption, particularly the payment of CS seed payment to farmers.

5.2.4 Maintaining the number of farmers capable of seed production

Once stability is restored, effort should be made to maintain the number of farmers capable of seed production, as outlined in the project`s activities. The government must instill confidence among farmers regarding the payment for CS production in rice production initiatives.

5.2.5 Rice production and the number of ordinary rice growing farmers

A comprehensive understanding of the number of ordinary rice growing farmers is crucial for planning CS production. This data will be utilized for decisions regarding CS production quantities and ensure alignment with the overall rice cultivation strategy.

5.2.6 Implementation of PDCA (Plan Do Check and Action) in rice production in Sudan

The former Project successfully conducted training sessions, particularly in project management by introducing PCM method for staff and extensionists in MoAF, and concerned 6 states as well. In this Project, the importance of PDCA has been emphasized in meetings and practical rice cultivation activities. Post- Project, it is crucial to continue implementing PDCA approach to ensure continuous improvement and adaptation. The Sudanese version of NRDS, it may not be able to achieve production targets precisely, however it serves as a valuable reference for improvement of future improvement of rice production in Sudan.

5.2.7 Enthusiasm of Extensionists and Farmers in Rice Cultivation

Extensionists and farmers in Sudan have demonstrated remarkable enthusiasm and commitment to rice cultivation initiatives though this Project. Despite challenges such as lack of salaries for extensionists and delayed CS payment for farmers, their dedication remained strong. Such enthusiasm reflects trust in the Project and potential for rice cultivation in Sudan. Sustaining and nurturing this enthusiasm among stakeholders is essential for the continued promotion of rice production in Sudan.

5.2.8 Sustainability and Future Collaboration Opportunities of JICA

The requirements for sustainable development of post-project, as in Chapter 4 and Chapter 5, are critical for advancing rice production in Sudan.

Based on the discussion in Chapter 5, Section 5.1, and 5.2.1-5.2.7, it is imperative for Sudan to continue efforts in seed production system maintenance, expand rice cultivation among farmers, and advance activities related rice production promotion in post-conflict restoration. Given the nascent stage of rice production in Sudan, further collaboration and knowledge-sharing in rice production promotion activities, if requested, could yield significant benefits, building upon JICA's expertise and achievement in the field of rice production in Sudan.

In considering the possibility of cooperation for upland rice promotion by JICA, it will be useful to consider the following elements as stated below. In Sudan, rice cultivation is not widely spread to ordinary farmers. On the other hand, however, the government of Sudan has put rice as second strategic crop next to wheat. Under this back ground, in the former project by JICA, upland rice cultivation has introduced successfully. With the success of the former Project, the Project continued the upland rice promotion for rice seed production system development. Under the several external circumstances of political conflicts and COVID-19, the Project has attained significant results. Considering the overall goal of rice production in Sudan, it is imperative to act upon and embark on the extension activities for upland rice cultivation. It is considered to bring about for Sudan, it will be the great positive meaning to both Sudan and Japan (JICA). For Sudan, it will be the useful for reconstruction activities and food security project after armed conflicts, and for Japan it can be expected to have effective cooperation results thorough utilizing gained cooperation confidence in the preceding projects from Sudan. It is considered that JICA may have been requested from Sudan for further cooperation on rice production development.

Appendix 1. PDM (ver.0-ver.2)

Annex 1

Version 0 (as of 09. 07, 2017)

Project Design Matrix

Project Title: The Capacity Building Project for Promotion of Rice Production

Implementing Agency: MoAF (GD of Production/NRP, GD of TTE/Seed Administration), ARC HQ, SMoA/Gezira as CoE

Direct Beneficiaries: MoAF (NRP staff, Seed administraion staff, ARC HQ researchers and technicians, SMoA Rice Unit staff in 6 States (Gezira, Sennar, Gedaref, White Nile, River Nile, Northern), Seed production farmers in 6 States, CS users' farmers in Gezira State

Indirect Beneficiaries: Ordinally farmers in 6 States

Period of Project: 5 years

Main Project Site: Khartoum, Gezira

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption
Overall Goal The rice production is promoted in 6 States (Gezira, Sennar, Gedaref, White Nile, River Nile and Northern).	1. Amount of rice production by ordinary farmers in each 6 State is increased to Xt/year. 2. Amount of CS distribution to ordinary farmers in each 6 States is increased to Xt/year. 3. Trial sale of milled local rice is conducted in each 5 States more than X times.	Baseline Survey SMoA Monthly Report submitted to NRP Annual Report	
Project Purpose The institutional and technical capacity of Federal Ministry of Agricultural and Forests (MoAF), Agricultural Research Corporation headquarters (ARC HQ), and Center of Excellence located in Gezira State (CoE)*[1] for the implementation of rice promotion is improved.	1. Draft Mid-Term Plan to utilize CoE for 6 States by MoAF is circulated to MoAF and 6 SMoA. 2. Seed Production Plan for 6 States is produced with the cooperation of MoAF, ARC HQ and CoE. 3. Purity of FS and RS at ARC HQ maintains more than X% and X% respectively.	Seed Production Plan Plan for CEO on rice promotion utilizing for 6 States Annual Report Project Report	-MoAF does not change rice promotion/extention strategy significantly. -GoS secures and disburses the necessary budget in a timely manner to implement rice promotion/extention strategy at MoAF, ARC HQ and SMoAs in 6 States. -The price of imported rice does not drop drastically.
Outputs 1.The coordination system of stakeholders in rice promotion at Federal level is established.	1-1. Annual M&E Report on rice promotion based on activities set in TOR is produced every year. 1-2. Good practices, lessons learned on rice promotion is compiled based on Rice Development Forum every year.	Annual Report Rice Development Form Report	No significant natural hazards occur that will impact rice cultivation in targeted areas (e.g. drought, floods, storm, disease, insect, bird damage)
2. Foundation Seed (FS) and Registered Seed (RS) are produced at ARC HQ.	2-1. Field inspection by ARC HQ and/or Seed Administration is conducted more than X times/year. 2-2: Amounts of FS and RS production are more than XX kg/year and XX kg/year respectively. 2-3: Purity of produced FS and RS is more than X% and X% respectively. 2-4. FS and RS production manual is approved by MoAF.	Baseline Survey SMoA Monthly Report submitted to NRP Project Report Annual Report	
3. Certified Seed (CS) supply system is established for ordinary farmers in CoE.	3-1. Purity of produced CS is more than X%. 3-2. No. of ordinary farmers who receive CS is more than X/year. 3-3. Amount of CS distributed to ordinary farmers is more than Xkg/year. 3-4. CS production manual in Gezira State is approved by MoAF.	Baseline Survey SMoA Monthly Report submitted to NRP Project Report Annual Report	
4. The issues of rice marketing are identified based on trial sales of milled local rice in Gezira State.	4-1. Reports on Profitability Analysis and Market Survey are circulated to MoAF and 5 States. 4-2. Broken rice ratio of milled local rice decreases from X% to Y%. 4-3. Report on good practices and lessons learned on trial sales of milled local rice is circulated to MoAF and 5 States.	Report on Profitability Analysis Report on Market Survey Baseline Survey SMoA Monthly Report submitted to NRP Project Report Annual Report Report on Trial Sales of milled local rice	
5. The production of CS is started in 5 States (Sennar, Gedaref, White Nile, River Nile and Northern).* (*) Output 5 is aimed to achieve the overall goal.	5-1. The capacity of Extension Workers in 5 States improve X% and X% respectively. 5-2. Amounts of RS distributed from ARC HQ to 5 SMoAs are Xkg/year/SMoA. 5-3. No. of contracted farmers for CS production in 5 States is more than X/year. 5-4. Area of CS Production in 5 States is more than X feddan/year.	Baseline Survey SMoA Monthly Report submitted to NRP Project Report Annual Report	

Annex 1

Version 0 (as of 09. 07, 2017)

Activities	Inputs		Important Assumption
	The Japanese Side	The Sudanese Side	
0. Baseline Survey and Endline Survey are conducted in 6 States. 1-1. MoAF prepares TOR to clarify the role and responsibility of MoAF*2 and SMoA. 1-2. MoAF and SMoA agree with TOR set in activity 1-1. 1-3. MoAF and NRP disburse the budget and inputs in a timely manner. 1-4. MoAF and NRP monitor and evaluate activities based on TOR every year. 1-5. NRP organizes Rice Development Forum*3 1-6. MoAF, ARC HQ and CoE jointly compile necessary data for Seed Production Plan for 6 States. 1-7. MoAF produce draft Mid-Term Plan to utilize CoE for 6 States. 2-1. ARC HQ verifies the purity of Breeder Seed and FS. 2-2. ARC HQ selects some upland rice varieties from the released varieties. 2-3. ARC HQ rehabilitates rice field for FS and RS production. 2-4. ARC HQ researchers and technicians cultivate BS and FS. 2-5. Seed administration and/or ARC HQ improve seed inspection procedure on field and in laboratory. 2-6. ARC HQ prepares production manual for FS and RS. 2-7. ARC HQ expedites the release of new varieties including NERICA. 3-1. ARC HQ distributes RS to CoE. 3-2. CoE selects contracted farmers for CS production based on criteria. 3-3. CoE provides training on CS production to contracted farmers. 3-4. CoE supervises CS production by contracted farmers. 3-5. CoE prepares production manual for CS. 3-6. CoE prepares a plan for CS supply system to ordinary farmers in a sustainable manner. 3-7. CoE distributes CS to ordinary farmers. 3-8. CoE submits next year proposal for CS production including budget to NRP in a timely manner. 3-9. CoE explores the possibility of CS production in private sector. 4-1. CoE conducts profitability analysis for rice production and other main crops. 4-2. CoE conducts market survey for milled local rice and imported rice. 4-3. CoE continues to manage paddy production by utilizing "Handbook on Upland Rice Cultivation"*4 4-4. CoE improves cultivation methods and pre-harvest techniques as necessary. 4-5. Rice milling techniques of extension workers are strengthened. 4-6. CoE establishes operation and management structure of rice milling machines 4-7. CoE prepares a plan for trial sales for milled local rice. 4-8. CoE conducts trial sales of milled local rice. 5-1. Each SMoA of 5 States selects CS production farmers based on 5-2. Extension workers and contracted farmers from 5 States receive trainings for CS production at CoE organized by MoAF. 5-3. ARC HQ distributes RS to 5 SMoA.	1. Experts - Chief Adviser/Rice Promotion Program - Seed Production and Propagation - Upland Rice Cultivation - Coordinator/M&E - Rice Field Design and Construction Management - Seed Inspection - Post-Harvest Processing and Management - Marketing and Profitability Analysis **Vehicle(s) to be procured for experts' use 2. Provision of equipment - Water pump - Generator - Seed inspection-related equipment 3. Construction -Rice Field Rehabilitation for FS and RS 4. Provision of Training - Training in Japan and/or in third countries	1. Counterpart personnel including salaries 2.Office space with necessary equipment 3. Running expenses necessary for the implementation of the Project 4. Local expenses for the Project	GoS disburses the necessary budget for rice promotion to MoAF, ARC HQ and SMoAs in a timely manner. Assigned CPs do not change frequently. Irrigation system in targeted areas are functioning. Contracted seed production farmers have access to necessary agricultural machines (e.g., combine harvester). Security condition in target States and Khartoum does not deteriorate drastically.
			Pre-Conditions MoAF maintains the importance of national rice

The Project targets Aerobic (upland) rice.
BS: Breeders Seed, FS: Foundation Seed, RS: Registered Seed, CS: Certified Seed
*1 CoE stands for SMoA/Gezira which serves for the purpose of rice promotion in 6 States.
*2 MoAF mainly related to the Project refers to NRP, Seed Administration, ARC HQ, ICD (and Agricultural Economics etc.).
*3 Rice Development Forum is the platform where public and private sectors can jointly discuss the issues in order to develop rice industries in Sudan.

Project Design Matrix (ver. 1)

Project Title: The Capacity Building Project for Promotion of Rice Production
Implementing Agency: MoAF (GD of Production/NRP, GD of TTE/Seed Administration), ARC HQ, SMoPER/Gezira as CoE
Direct Beneficiaries: MoAF (NRP staff, Seed administration staff, ARC HQ researchers and technicians, SMoPER Rice Unit staff in 6 States (Gezira, Sennar, Gedaref, White Nile, River Nile, Northern), Seed production farmers in 6 States, contracted farmers for CS production in Gezira State
Indirect Beneficiaries: Ordinary farmers in 6 States
Period of Project: 6 years and 5 months
Main Project Site: Khartoum (Capital), Gezira State

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption
Overall Goal			
The rice production is promoted in 6 States (Gezira, Sennar, Gedaref, White Nile, River Nile and Northern).	1. Cultivated area for rice seed reaches XX feddan/ year in 5 years after the termination of the Project. 2. Number of contracted farmers for CS production reaches XX/ year in 5 years after the termination of the Project. 3. Amount of rice seed production reaches XX kg/ year in 5 years after the termination of the Project.	SMoPER Monthly Report and NRP Annual Report SMoPER Monthly Report and NRP Annual Report SMoPER Monthly Report and NRP Annual Report	
Project Purpose			
The institutional and technical capacity*[1] of Federal Ministry of Agriculture and Forests (MoAF), Agricultural Research Corporation headquarters (ARC HQ)*[2], and Center of Excellence located in Gezira State (CoE)*[3] for the implementation of rice promotion is improved.	1. Draft Mid-Term Plan to utilize CoE for 6 States by MoAF is circulated to MoAF and 6 SMoPER. 2. Seed Production Plan for 6 States is produced with the cooperation of MoAF, ARC HQ and CoE. 3. Purity of FS and RS at ARC HQ maintains more than 99.0%.	Seed Production Plan Plan for CoE on rice promotion utilizing for 6 States NRP Annual Report Project Report	-MoAF does not change rice promotion/extension strategy significantly. -GoS secures and disburses the necessary budget in a timely manner to implement rice promotion/extension strategy at MoAF, ARC HQ and SMoPERs in 6 States. -The price of imported rice does not drop drastically.
Outputs			
1.The coordination system of stakeholders in rice promotion at the Federal and State levels is established.	1-1. Annual M&E Report on rice promotion based on activities set in TOR is produced every year. 1-2. Rice Development Forum is held once every couple of years for reporting and discussing the status of rice cultivation to a wide range of people in the public and private sectors involved in rice cultivation in Sudan. 1-3. Good practices, lessons learned on rice promotion is compiled based on Wrap-up Meeting held by organizations*[4] involved in rice crop promotion every year.	NRP Annual Report Wrap-up Meeting Report	-No significant natural hazards occur that will impact rice cultivation in targeted areas (e.g. drought, floods, storm, disease, insect, bird damage). -Security condition in target States and Khartoum does not deteriorate drastically.

2. Foundation Seed (FS) and Registered Seed (RS) are produced at ARC HQ.	2-1. Field inspection*[5] by Seed Administration is conducted more than 2 times/plot/variety on time at the flowering stage of rice plant and at harvesting stage, which is indispensable to maintaining seed quality. 2-2. ARC produces and retains FS for RS production. RS production reaches 230kg/year respectively. 2-3. Purity of produced FS and RS is more than 99.0% respectively. 2-4. FS and RS production manual is approved by MoAF.	SMoPER Monthly Report submitted to NRP Project Report NRP Annual Report
3. Certified Seed (CS) production system is established for ordinary farmers in CoE.	3-1. Purity of produced CS is more than 98.0%. 3-2. More than 6 farmers produce CS annually at more than 6 feddan paddy fields as a whole at the termination of the project. 3-3. Number of ordinary farmers who receive CS reaches more than 10/year and more than 10feddan/year at the termination of the Project. 3-4. Amount of CS distributed to ordinary farmers reaches more than 350kg/year at the termination of the Project. 3-5. CS production manual in Gezira State is approved by MoAF.	SMoPER Monthly Report submitted to NRP Project Report NRP Annual Report
4. The issues of rice marketing are identified based on trial rice sales* in Gezira State. (*) Rice sales indicates both of sale of broken rice and milled local rice	4-1. Reports on Profitability Analysis and Market Survey are circulated to MoAF and 5 States. 4-2. Broken rice ratio*[6] of milled local rice decreases from 72.9% to 45%. 4-3. Report on good practices and lessons learned on trial rice sales is circulated to MoAF and 5 States.	Report on Profitability Analysis Report on Market Survey Baseline Survey SMoPER Monthly Report submitted to NRP Project Report NRP Annual Report Record on trial rice sales
5. The production of CS is started in 5 States (Sennar, Gedaref, White Nile, River Nile and Northern).* (*) Output 5 is aimed to achieve the overall goal.	5-1. A total of 40 extensionists (at least 4 extensionists in each of 5 States) who received training in CS production and extension conducted by the project, have been deployed. 5-2. Amount of seeds distributed from ARC Research Stations to 5 SMoPERs reaches more than 140kg/year at the termination of the Project. 5-3. Number of contracted farmers for CS production in 5 States reaches more than 10/year at the termination of the Project. 5-4. Area of CS production in 5 States reaches more than 10feddan/year at the termination of the Project.	SMoPER Monthly Report submitted to NRP Project Report NRP Annual Report

Activities	Inputs		Important Assumption
	The Japanese Side	The Sudanese Side	
0.Baseline Survey and Endline Survey are conducted in 6 States. 1.1. MoAF prepares TOR to clarify the role and responsibility of MoAF*[7] and SMoPER. 1.2. MoAF and SMoPER agree with TOR set in activity 1.1. 1-3 The Project encourages MoAF and SMoPERs to fulfill their roles and responsibilities set in TOR. 1.4. MoAF and NRP disburse the budget and inputs in a timely manner. 1.5. MoAF and NRP monitor and evaluate activities based on TOR every year. 1.6. MoAF, ARC HQ and CoE organize Wrap-up meeting*[8] for sharing good practices and lessons learned. 1.7. MoAF, ARC HQ and CoE jointly compile necessary data for Seed Production Plan for 6 States. 1.8. MoAF produce draft Mid-Term Plan to utilize CoE for 6 States. 2.1. ARC HQ verifies the purity of BS and FS. 2.2. ARC HQ selects some upland rice varieties from the released varieties. 2.3. ARC HQ rehabilitates rice field for FS and RS production. 2.4. ARC HQ researchers and technicians cultivate BS and FS. 2.5. Seed administration improves seed inspection procedure on field and in laboratory by receiving training opportunities in inspection of rice seeds and preparing the relevant documents on seed inspection. 2.6. ARC HQ prepares production manual for FS and RS. 2.7. ARC HQ expedites the release of new varieties including NERICA. 3.1. ARC HQ distributes RS to CoE. 3.2. CoE selects contracted farmers for CS production based on criteria. 3.3. CoE provides training on CS production to contracted farmers.	1. Experts -Chief Advisor/Rice Promotion Program1 -Deputy Chief Advisor/Rice Promotion Program2/Coordinator -Seed Production/Propagation -Upland Rice Cultivation -Monitoring and Evaluation -Rice Field Design and Construction Management -Post-Harvest Processing and Management -Seed Inspection -Marketing and Profitability Analysis 2. Provision of equipment -Copy/Printer (Color) -Awn Remover -Stone Remover -Irrigation Pump -pH Meter -Grain (Seed) Counter -Binocular stereo microscope -Motorbike -Refrigerator -Generator 3. Construction -Rice Field Rehabilitation for FS and RS 4. Provision of Training - Training in Japan and/or in third countries	1. Counterpart personnel 2.Office space with necessary equipment 3. Running expenses necessary for the implementation of the Project 4. Local expenses for the Project	-GoS disburses the necessary budget for rice promotion to MoAF, ARC HQ and SMoPERs in a timely manner. -Assigned CPs do not change frequently. -Irrigation system in targeted areas are functioning. -Contracted seed production farmers have access to necessary agricultural machines (e.g. combine harvester). -Security condition in target States and Khartoum does not deteriorate drastically. - No significant natural hazards occur that will impact rice cultivation in targeted areas (e.g. drought, floods, storm, disease, insect, bird damage).

3.4. CoE supervises CS production by contracted farmers.
3.5. CoE prepares production manual for CS
3.6. CoE prepares a plan for CS supply system to ordinary farmers in a sustainable manner.
3.7. CoE distributes CS to ordinary farmers.
3.8. CoE submits next year plan/proposal for CS production including budget to NRP in a timely manner.

4.1. CoE conducts profitability analysis for rice production and other main crops.
4.2. CoE conducts market survey for milled local rice and imported rice.
4.3. CoE continues to manage and improve cultivation methods and pre-harvest techniques as necessary by utilizing "Handbook on Upland Rice Cultivation."*9
4.4. Rice milling techniques of extension workers are strengthened.
4.5. CoE establishes operation and management structure of rice milling machines.
4.6. CoE prepares a plan for trial rice sales.
4.7. CoE conducts trial rice sales.
4.8. CoE identifies and compiles issues of rice marketing through trial rice sales.

5.1. Each SMoPER of 5 States selects CS production farmers based on criteria.
5.2. Extension workers and contracted farmers from 5 States receive trainings for CS production at CoE organized by MoAF.
5.3. ARC Research Stations distribute RS to 5 SMoPERs.

Pre-Conditions

MoAF maintains the importance of national rice development strategy.

The Project targets Aerobic (upland) rice.
BS: Breeder Seed, defined as seed produced and controlled directly by a designated plant breeder; FS: Foundation Seed, designated by an agriculture experiment station accordingly; RS: Registered Seed, defined as the progeny of FS or RS; and CS: Certified Seed, defined as the progeny of FS, RS or CS.
*1 The institutional capacity indicates skills and experience in management, planning, assessment and coordination with other institutions, while the technical capacity indicates skills and techniques in rice & rice seed cultivation, seed supply & distribution, marketing, post-harvest, etc.

*[2] ARC HQ indicates ARC Headquarters in Gezira State and ARC White Nile Research Station in White Nile State headed by the National Rice Research Coordinator in charge of management, BS production, release of new varieties, etc.
*[3] CoE stands for SMoPER/Gezira which serves for the purpose of rice promotion in 6 States.
*[4] ICD, NRP, ARC, Seed Administration, and Gezira State
*[5] Seed Inspection is required to conduct at least twice at the flowering stage of rice plant and at harvesting stage for each seed plot for each variety.
*[6] The measurement of broken rice ratio is based on ISO.(The crushed rice ratio is defined as the percentage of the weight of rice with a grain length of less than 3/4 of the crushed rice to the total grain length of 100 g sample.)
*[7] MoAF, main implementor of the Project, refers to NRP, Seed Administration, ARC HQ, ICD (and Agricultural Economics, etc.).
*[8] Wrap-up meeting is intended to be periodical meeting after harvest where a variety of stakeholders in the rice sector such as NRP, ARC, Seed Administration, SMoPERs, farmers, Arab Seed Company can jointly discuss current progress and the issues for sharing good practices and lessons learned.
*[9] "Handbook on Upland Rice Cultivation" is the one published by the former JICA Project.

Project Design Matrix (ver. 2)

Project Title: The Capacity Building Project for Promotion of Rice Production
Implementing Agency: MoAF (GD of Production/NRP, GD of TTE/Seed Administration), ARC HQ, SMoPER/Gezira as CoE
Direct Beneficiaries: MoAF (NRP staff, Seed administration staff, ARC HQ researchers and technicians, SMoPER Rice Unit staff in 6 States (Gezira, Sennar, Gedaref, White Nile, River Nile, Northern), Seed production farmers in 6 States, contracted farmers for CS production in Gezira State
Indirect Beneficiaries: Ordinary farmers in 6 States
Period of Project: 6 years and 5 months
Main Project Site: Khartoum (Capital), Gezira State

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption
Overall Goal The rice production is promoted in 6 States (Gezira, Sennar, Gedaref, White Nile, River Nile and Northern).	1. MoAF of the Sudanese Government maintains its structure of the NRP as a permanent department for the promotion of rice production under DIC to coordinate activities of ARC, SA, and the relevant states. 2. ARC and relevant institutions have the capacity to produce 300 kg of FS and/or RS per year. 3. At least four (4) farmers in Gezira State and at least (2) farmers in each of the three states (Sennar, White Nile, and River Nile States) can produce certified seeds.	Structure of MoAF and the relevant states NRP Annual Report FS and/or RS produced NRP Annual Report SMoPER Monthly Report and NRP Annual Report	
Project Purpose The institutional and technical capacity*1 of Federal Ministry of Agriculture and Forests (MoAF), Agricultural Research Corporation headquarters (ARC HQ)*2, and Center of Excellence located in Gezira State (CoE)*3 for the implementation of rice promotion is improved.	1. Draft Mid-Term Plan to utilize CoE for 6 States by MoAF is circulated to MoAF and 6 SMoPER. 2. Seed Production Plan for 6 States is produced with the cooperation of MoAF, ARC HQ and CoE. 3. Purity of FS and RS at ARC HQ maintains more than 99.0%.	Seed Production Plan Plan for CoE on rice promotion utilizing for 6 States NRP Annual Report Project Report	- A series of conflicts originated from the military confrontation that broke out on April 15, 2023 are suspended or terminated. -MoAF does not change rice promotion/extension strategy significantly. -GoS secures and disburses the necessary budget in a timely manner to implement rice promotion/extension strategy at MoAF, ARC HQ and SMoPERs in 6 States. -The price of imported rice does not drop drastically.
Outputs 1.The coordination system of stakeholders in rice promotion at the Federal and State levels is established.	1-1. Annual M&E Report on rice promotion based on activities set in TOR is produced every year. 1-2. Rice Development Forum is held once every couple of years for reporting and discussing the	NRP Annual Report Wrap-up Meeting Report	-No significant natural hazards occur that will impact rice cultivation in targeted areas (e.g.

	status of rice cultivation to a wide range of people in the public and private sectors involved in rice cultivation in Sudan. 1-3. Good practices, lessons learned on rice promotion is compiled based on Wrap-up Meeting held by organizations*[4] involved in rice crop promotion every year.		drought, floods, storm, disease, insect, bird damage). -Security condition in target States and Khartoum does not deteriorate drastically.
2. Foundation Seed (FS) and Registered Seed (RS) are produced at ARC HQ.	2-1. Field inspection*[5] by Seed Administration is conducted more than 2 times/plot/variety on time at the flowering stage of rice plant and at harvesting stage, which is indispensable to maintaining seed quality. 2-2. ARC produces and retains FS for RS production. RS production reaches 230kg/year respectively. 2-3. Purity of produced FS and RS is more than 99.0% respectively. 2-4. FS and RS production manual is approved by MoAF.	SMoPER Monthly Report submitted to NRP Project Report NRP Annual Report	
3. Certified Seed (CS) production system is established for ordinary farmers in CoE.	3-1. Purity of produced CS is more than 98.0%. 3-2. More than 6 farmers produce CS annually at more than 6 feddan paddy fields as a whole at the termination of the project. 3-3. Number of ordinary farmers who receive CS reaches more than 10/year and more than 10feddan/year at the termination of the Project. 3-4. Amount of CS distributed to ordinary farmers reaches more than 350kg/year at the termination of the Project. 3-5. CS production manual in Gezira State is approved by MoAF.	SMoPER Monthly Report submitted to NRP Project Report NRP Annual Report	
4. The issues of rice marketing are identified based on trial rice sales* in Gezira State. (*) Rice sales indicates both of sale of broken rice and milled local rice	4-1. Reports on Profitability Analysis and Market Survey are circulated to MoAF and 5 States. 4-2. Broken rice ratio*[6] of milled local rice decreases from 72.9% to 45%. 4-3. Report on good practices and lessons learned on trial rice sales is circulated to MoAF and 5 States.	Report on Profitability Analysis Report on Market Survey Baseline Survey SMoPER Monthly Report submitted to NRP Project Report NRP Annual Report Record on trial rice sales	
5. The production of CS is started in 5 States (Sennar, Gedaref, White Nile, River Nile and Northern).*	5-1. A total of 40 extensionists (at least 4 extensionists in each of 5 States) who received training in CS production and extension conducted by the project, have been deployed.	SMoPER Monthly Report submitted to NRP Project Report NRP Annual Report	

(*) Output 5 is aimed to achieve the overall goal.	5-2. Amount of seeds distributed from ARC Research Stations to 5 SMoPERs reaches more than 140kg/year at the termination of the Project. 5-3. Number of contracted farmers for CS production in 5 States reaches more than 10/year at the termination of the Project. 5-4. Area of CS production in 5 States reaches more than 10feddan/year at the termination of the Project.		
Activities	**Inputs**		
0.Baseline Survey and Endline Survey are conducted in 6 States. 1.1. MoAF prepares TOR to clarify the role and responsibility of MoAF*[7] and SMoPER. 1.2. MoAF and SMoPER agree with TOR set in activity 1.1. 1-3 The Project encourages MoAF and SMoPERs to fulfill their roles and responsibilities set in TOR. 1.4. MoAF and NRP disburse the budget and inputs in a timely manner. 1.5. MoAF and NRP monitor and evaluate activities based on TOR every year. 1.6. MoAF, ARC HQ and CoE organize Wrap-up meeting*[8] for sharing good practices and lessons learned. 1.7. MoAF, ARC HQ and CoE jointly compile necessary data for Seed Production Plan for 6 States. 1.8. MoAF produce draft Mid-Term Plan to utilize CoE for 6 States. 2.1. ARC HQ verifies the purity of BS and FS. 2.2. ARC HQ selects some upland rice varieties from the released varieties. 2.3. ARC HQ rehabilitates rice field for FS and RS production. 2.4. ARC HQ researchers and technicians cultivate BS and FS. 2.5. Seed administration improves seed inspection procedure on field and in laboratory by receiving	**The Japanese Side** 1. Experts -Chief Advisor/Rice Promotion Program1 -Deputy Chief Advisor/Rice Promotion Program2/Coordinator -Seed Production/Propagation -Upland Rice Cultivation -Monitoring and Evaluation -Rice Field Design and Construction Management -Post-Harvest Processing and Management -Seed Inspection -Marketing and Profitability Analysis 2. Provision of equipment -Copy/Printer (Color) -Awn Remover -Stone Remover -Irrigation Pump -pH Meter -Grain (Seed) Counter -Binocular stereo microscope -Motorbike	**The Sudanese Side** 1. Counterpart personnel 2.Office space with necessary equipment 3. Running expenses necessary for the implementation of the Project 4. Local expenses for the Project	**Important Assumption** -GoS disburses the necessary budget for rice promotion to MoAF, ARC HQ and SMoPERs in a timely manner. -Assigned CPs do not change frequently. -Irrigation system in targeted areas are functioning. -Contracted seed production farmers have access to necessary agricultural machines (e.g. combine harvester). -Security condition in target States and Khartoum does not deteriorate drastically.

training opportunities in inspection of rice seeds and preparing the relevant documents on seed inspection. 2.6. ARC HQ prepares production manual for FS and RS. 2.7. ARC HQ expedites the release of new varieties including NERICA. 3.1. ARC HQ distributes RS to CoE. 3.2. CoE selects contracted farmers for CS production based on criteria. 3.3. CoE provides training on CS production to contracted farmers. 3.4. CoE supervises CS production by contracted farmers. 3.5. CoE prepares production manual for CS 3.6. CoE prepares a plan for CS supply system to ordinary farmers in a sustainable manner. 3.7. CoE distributes CS to ordinary farmers. 3.8. CoE submits next year plan/proposal for CS production including budget to NRP in a timely manner. 4.1. CoE conducts profitability analysis for rice production and other main crops. 4.2. CoE conducts market survey for milled local rice and imported rice. 4.3. CoE continues to manage and improve cultivation methods and pre-harvest techniques as necessary by utilizing “Handbook on Upland Rice Cultivation.”*[9] 4.4. Rice milling techniques of extension workers are strengthened. 4.5. CoE establishes operation and management structure of rice milling machines. 4.6. CoE prepares a plan for trial rice sales. 4.7. CoE conducts trial rice sales. 4.8. CoE identifies and compiles issues of rice marketing through trial rice sales. 5.1. Each SMoPER of 5 States selects CS production farmers based on criteria. 5.2. Extension workers and contracted farmers from 5 States receive trainings for CS production at CoE organized by MoAF. 5.3. ARC Research Stations distribute RS to 5 SMoPERs.	-Refrigerator -Generator 3. Construction -Rice Field Rehabilitation for FS and RS 4. Provision of Training - Training in Japan and/or in third countries	-No significant natural hazards occur that will impact rice cultivation in targeted areas (e.g. drought, floods, storm, disease, insect, bird damage).

	Pre-Conditions MoAF maintains the importance of national rice development strategy.

The Project targets Aerobic (upland) rice.
BS: Breeder Seed, defined as seed produced and controlled directly by a designated plant breeder; FS: Foundation Seed, designated by an agriculture experiment station accordingly; RS: Registered Seed, defined as the progeny of FS or RS; and CS: Certified Seed, defined as the progeny of FS, RS or CS.
*[1] The institutional capacity indicates skills and experience in management, planning, assessment and coordination with other institutions, while the technical capacity indicates skills and techniques in rice & rice seed cultivation, seed supply & distribution, marketing, post-harvest, etc.
*[2] ARC HQ indicates ARC Headquarters in Gezira State and ARC White Nile Research Station in White Nile State headed by the National Rice Research Coordinator in charge of management, BS production, release of new varieties, etc.
*[3] CoE stands for SMoPER/Gezira which serves for the purpose of rice promotion in 6 States.
*[4] ICD, NRP, ARC, Seed Administration, and Gezira State
*[5] Seed Inspection is required to conduct at least twice at the flowering stage of rice plant and at harvesting stage for each seed plot for each variety.
*[6] The measurement of broken rice ratio is based on ISO. (The crushed rice ratio is defined as the percentage of the weight of rice with a grain length of less than 3/4 of the crushed rice to the total grain length of 100 g sample.)
*[7] MoAF, main implementor of the Project, refers to NRP, Seed Administration, ARC HQ, ICD (and Agricultural Economics, etc.).
*[8] Wrap-up meeting is intended to be periodical meeting after harvest where a variety of stakeholders in the rice sector such as NRP, ARC, Seed Administration, SMoPERs, farmers, Arab Seed Company can jointly discuss current progress and the issues for sharing good practices and lessons learned.
*[9] “Handbook on Upland Rice Cultivation” is the one published by the former JICA Project.

Appendix 2. PO (latest version)

Project Monitoring Sheet II (Plan of Operation)

Version 13

Dated: May 23, 2024

Project Title: Capacity Building Project for Promotion of Rice Production

Inputs	Year	1st Year (2018)				2nd Year (2019)				3rd Year (2020)				4th Year (2021)				5th Year (2022)				6th Year (2023)				7th Year (2024)		Remarks	Monitoring: Issue	Monitoring: Solution
		I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II			
Expert																												Delegation of experts was temporarily suspended due to the pandemic of COVID-19 in Sudan in 2020. Due to the political turmoil within the country occurred in October 25, 2021, delegation of Japanese experts was temporarily suspended again. Delegation of experts resumed in April 2022. Due to the military conflict in April 2023, delegation of Japanese experts was temporarily suspended again.		
Chief Advisor/ Rice Promotion Program1	Plan																													
	Actual																													
Deputy Chief Advisor/ Rice Promotion Program2/ Coordinator	Plan																													
	Actual																													
Seed Production/ Propagation	Plan																													
	Actual																													
Monitoring and Evaluation	Plan																													
	Actual																													
Upland Rice Cultivation	Plan																													
	Actual																													
Rice Field Design and Construction Management	Plan																													
	Actual																													
Post-Harvest Processing and Management	Plan																													
	Actual																													
Seed Inspection	Plan																													
	Actual																													
Marketing and Profitability Analysis	Plan																													
	Actual																													
Seed Inspection/ Marketing and Profitability Analysis	Plan																													
	Actual																													
Equipment																														
Copy/Printer (Color)	Plan																													
	Actual																													
Awn Remover	Plan																													
	Actual																													
Stone Remover	Plan																													
	Actual																													
Irrigation Pump	Plan																													
	Actual																													
Drone	Plan																													
	Actual																													
pH Meter	Plan																													
	Actual																													
Grain (Seed) Counter	Plan																													
	Actual																													
Binocular stereo microscope	Plan																													
	Actual																													
Motorbike	Plan																													
	Actual																													
Refrigerator (large)	Plan																													
	Actual																													
Refrigerator (small)	Plan																													
	Actual																													
Generator	Plan																													
	Actual																													
Training in Japan																														
	Plan																													
	Actual																													
In-country/Third country Training																												Training sessions in Egypt was postponed due to the pandemic of COVID-19 in Sudan to hold it in 2021.		
	Plan																													
	Actual																													

(Note) Dotted lines in red indicate project activities implemented on a remote basis with C/Ps and the Project Office.

Activities	Year	1st Year (2018)				2nd Year (2019)				3rd Year (2020)				4th Year (2021)				5th Year (2022)				6th Year (2023)				7th Year (2024)		Responsible Organization		Achievements	Issue & Countermeasures
		I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	Japan	GOS		
Cropping Season (*upland rice*)																															
0.Baseline Survey and Endline Survey are conducted in 6 States.	Plan																													·The baseline survey report was approved in December 2018 by the Project, which will be valuable data in considering the project implementation and in evaluating the project performance from now on. ·The Endline Survey will be implemented from January 2023 to March 2024. The successful bidder was TADBEER Consultancy Enterprise. The Project received the mid-term progress report from the consultant on March 27, 2023.	
	Actual																														
Output 1: The coordination system of stakeholders in rice promotion at Federal level is established.																															
1.1. MoAF prepares TOR to clarify the role and responsibility of MoAF and SMoA.	Plan																													·C/P institutions (NRP, ARC and Gezira SMoPER) understood their roles and responsibilities for the Project.	
	Actual																														
1.2. MoAF and SMoA agree with TOR set in activity 1.1.	Plan																													·C/P institutions (NRP, ARC and Gezira SMoPER) understood their roles and responsibilities for the Project through interview sessions held in January 2018 and attendance to the first JCC held on June 12, 2018.	
	Actual																														
1.3. The Project encourages MoAF and SMoPERs to fulfill their roles and responsibilities set in TOR.	Plan																													·Mainly through Project consultant, Dr. Hassan, with key C/Ps of the Sudanese side confirmed the seed inspection schedule and necessary arrangement and necessary operations for harvesting ·As a result, second field inspections by the Seed Administration Department was coordinated and conducted. In addition, they confirmed the schedule of harvesting operations in Gezira, Sennar, White Nile, and River Nile states, where CS production is being conducted. Furthermore, they confirmed the budget shortfalls for harvesting CS at the state level. The total amount of harvesting-related local operation expenses was 5,032,600 SDG (approximately 1.02 million yen), which was remitted on November 24, 2023 and received in Sudan on November 29, 2023.	
	Actual																														
1.4. MoAF and NRP disburse the budget and inputs in a timely manner.	Plan																													·NRP inquired its budget by submitting budget proposal on October 11, 2022 to Planning Department of MoAF after the Ministry received the budget preparation guideline from MoFEP on October 5, 2022. Through the discussion with NRP and Planning Department within the Ministry, MoAF approved a total budget for NRP of 434 million SDG for 2023 on November 7, 2022. After discussion between MoFEP and MoAF on November 8, 2022, finally, MoFEP approved a total budget for NRP of 350 million SDG for 2023. The budget of 350 million SDG for 2023 breaks down into the following items: Non-financial assets (development) (197,459,715SDG), the annual local component for the JICA rice Project(58,000,000SDG), Goods and services (80,000,000SDG), and workers compensations (14,540,285SDG).	
	Actual																														

1.5. MoAF and NRP monitor and evaluate activities based on TOR every year.				Plan				･The consultant hired by the Project and NRP frequently pays visit to the fields at ARC research stations and target farmers' rice fields on a monthly basis in Gezira State since April 2020. ･NRP actively visited six (6) states with Japanese experts and the project consultant to coordinate with six (6) SMoPERs, to exchange ideas with them and to implement project activities smoothly. ･In addition, the consultant of Capacity Building & Monitoring and Evaluation employed by the Project conducts internal monitoring and share the results monthly, conducting field visit and survey to 26 institutions in 2019, 57 institutions in 2020, 34 institutions in 2021, 16 institutions in 2022 and one institution in 2023. ･The Project established TSC meeting and JCC meeting frameworks as well as monthly meeting framework. Moreover, NRP issued a letter for RPUs to ask to establish coordinating units for the sustainability of the Project for rice production promotion at the state level on December 7, 2022. In the letter, NRP expects the target RPUs to facilitate and strengthen their roles in holding monthly meeting and preparing meeting records, budget planning, coordination between relevant stakeholders, solving challenges, etc. at the state level.	
				Actual					
1.6. MoAF, ARC HQ and CoE organize Wrap-up meeting for sharing good practices and lessons learned.				Plan				･The Project has organized Wrap-up meeting for sharing good practices and lessons learned in January 2020 (as review meeting), February 2021, March 2022 and March 2023. Wrap-up meeting was held on March 14 to 15, 2023, where they presented the progress of project activities and proposed plan for 2023: results and analysis of CS production results in the target six states and ARC stations, characteristics of new released varieties, rice profitability analysis of Gezira State case, upland rice cultivation and seed production techniques, lab test results in 2022, ordinary rice production (trial of local ordinary rice cultivated by Mr. Daffallah), etc.	
				Actual					

1.7. MoAF, ARC HQ and CoE jointly compile necessary data for Seed Production Plan for 6 States.					Plan							·The Project organizes every year the wrap-up workshop. MoAF (NRP, SA), ARC and 6 SMoPERs joins the workshop. In this meeting, the participants look back on the season, identify areas for reflection, and formulate a cultivation plan for the next season. Besides the meeting, the Project has a meeting with NRP and ARC every year in order to decide the amount of seed to be distributed to 6 SMoAs and ARC research stations for the next season. Necessary date for the meeting is compiled every year. ·Wrap-up meeting was held on March 14 to 15, 2023, where they presented the progress of project activities and proposed plan for 2023: results and analysis of CS production results in the target six states and ARC stations, characteristics of new released varieties, rice profitability analysis of Gezira State case, upland rice cultivation and seed production techniques, lab test results in 2022, ordinary rice production (trial of local ordinary rice cultivated by Mr. Daffallah), etc.	
					Actual								
1.8. MoAF produce draft Mid-Term Plan to utilize CoE for 6 States.					Plan							·The expert in monitoring and evaluation held an internal meeting with RPU Gezira staff to collect appropriate information from RPU to draft the plan. On May 24, 2022. CoE (Gezira State) indicated that it aims to become Gezira Center for rice training and technology transfer for dissemination and expansion of rice production and sustaining rice production in Sudan. After the framework is confirmed in May 2022, draft Mid-Term Plan to utilize CoE for 6 States is being formulated by RPU Gezira and expert in upland rice cultivation. It consists of training plan for six states, seed production plan, and preparation of rice fields focusing on good practices. Once the draft is formulated, NRP and Project Advisor will need to discuss a more practical and feasible plan to utilize CoE for 6 States based on the proposed draft. ·Gezira RPU completed the review of the draft of seed production manual within the Project and submitted it in January 2023 together with the draft Mid-Term Plan to utilize CoE for 6 States to NRP and General Directorate of International Cooperation. They will approve the manual and the mid-term plan after reviewing them. Concurrently, Gezira RPU has already started to translate the manual into Arabic. It will print and bind the manual after obtaining the approval from the MoAF to distribute it to relevant stakeholders in Sudan.	
					Actual								
Output 2: FS and RS are produced at ARC HQ.													
2.1. ARC HQ verifies the purity of BS and FS.					Plan							·Seed Administration passed seed inspection for seeds (FS and RS) produced at ARC RSs, which indicates their purity exceeds at least 98%. The Project is collecting more detailed data in purity of FS and RS produced in all of the target ARC RSs. What the Project already obtained up to now is that purity of seeds produced at ARC HQ (GRS) in 2018 is 99.9% (Kosti 1) and 99.9% (Umgar) while purity of seeds produced at ARC HQ (GRS) in 2019 is 99.9% (Kosti 1) and 99.9% (Umgar). Other than the data obtained in GRS, purity of seeds produced at Kosti RS in 2020 is 99.8% (Kosti 1) and 99.5% (Umgar).	
					Actual								
2.2. ARC HQ selects some upland rice varieties from the released varieties.					Plan							·ARC in cooperation with the expert in charge selected Kosti 1, Umgar, IR11N202, INPAGO 9, and NERICA 4 as the target lines and/or varieties for seed propagation in the 2018/19 season. In the 2019/2020 season, they selected Kosti 1, Umgar, IR11N202, INPAGO 9, NERICA4, and NERICA 3 as the target lines and/or varieties for seed propagation.	
					Actual								
2.3. ARC HQ rehabilitates rice field for FS and RS production.					Plan							·Conducted site visit of pipeline construction work and obtaining design drawings of the construction work. ·Surveyed the pump station located at the starting point of pipeline.	
					Actual								

Activity		Schedule		Remarks
2.4. ARC HQ researchers and technicians cultivate BS and FS.	Plan	FS, FS·RS, FS·RS, FS·RS, FS·RS, FS·RS		·FS amounts harvested (1st. sowing) in the 2018/19 season at Gezira RS were 8,330g (Kosti 1), 11,060g (Umgar), 2,790g (NERICA 4), 14,945g (IR11N202) and 6,995g (INPAGO 9). FS amounts harvested (2nd. sowing) in the 2018/19 season at Gezira RS were 4,000g (Kosti 1), 1,120g (Umgar), 3,175g (NERICA 4), 1,790g (IR11N202) and 4,715g (INPAGO 9). RS amounts harvested in the 2019/20 season at Gezira RS were46.25kg (Kosti 1), 19.25kg (Umgar), 4kg (NERICA 4), 5.5kg (NERICA 3), 231kg (IR11N202) and52kg (INPAGO 9). FS amounts harvested in the 2019 season at Kosti RS were 120kg (Kosti 1), 140kg (Umgar), 120kg (NERICA 4), 130kg (NERICA 3), 200kg (IR11N202) and 140kg (INPAGO 9). ·In the 2019/20 season, ARC HQ (GRS), Maatug RS (Gezira State), White Nile RS, Rahad RS (Gedaref State), Sennar RS cultivated rice seeds (registered seeds or foundation seeds. Harvest amounts of seeds have not been obtained yet. In the 2021 crop season, a total of seven (7) ARC research stations is scheduled cultivate rice seeds with a total of 5,760 m2. ·In the 2021 crop season, ARC started seed multiplication activities in June to August and harvested in November to December. ARC cultivated area of 4080 m2 in total at the target research stations and harvested 892.3 kg of rice seed. The average yield at four (4) target ARC research stations is 2.76ton/ha. Yield data of Rahad RS in Gedaref State and Sennar RS in Sennar State has not been obtained yet due to absence of researchers in charge for private reasons. ·Their actual yield in 2022 ranged between 91.9kg/feddan for NERICA 4 at GRS and 3,136kg/feddan for IR11N202 at WNRS. ·As the result of conducting seed multiplication activity at ARC research stations in 2022, the following amounts of seeds were obtained: Kosti 1, 102.2kg; Umgar, 128.5kg; IMPAGO 9, 124.0kg; IR11N202, 136.0kg; NERICA 4, 60.5kg; and NERICA 3, 47.0kg. ·As the result of conducting seed production at WNRS, the following amounts of seeds were obtained: Abasya, 120.0kg; Kenana, 82.0kg; Gezira, 75.0kg; and Umgar, 63.0kg.
	Actual			
2.5. Seed administration improves seed inspection procedure on field and in laboratory by receiving training opportunities in inspection of rice seeds and preparing the relevant documents on seed inspection.	Plan			·Field inspection by Seed Administration were already conducted twice on October 1 and November 14, 2018 for released varieties: Kosti 1 and Umgar for the 2018 season. Field inspection by Seed Administration were already conducted twice on October 10 and November 13, 2019 for released varieties: Kosti 1 and Umgar for the 2019 season. ·SA delegated inspection mission at least six times to the six (6) target states in the 2020 season. ·Seed Administration already finished field inspection conducted field inspection 62 times for seed production farmers' fields from September to November 2021 and ARC research stations 13 times from October to December 2021. ·In 2022, SA conducted seed inspections 43 times for 24 sites (18 times for 10 ARC seed production sites and 25 times for 14 CS production sites). ·The Project found out that test for all of produced seeds produced for 2022 passed the laboratory tests in May 2023. ·SA conducted seed inspections 40 times in total for 16 target sites at 46.5feddan in 2023. Due to the military conflicts between SAF and RSF in the capital, in April 2023, the Project did not conduct training sessions for SA in 2023 since then.
	Actual			

Activity		Schedule	Remarks
2.6. ARC HQ prepares production manual for FS and RS.	Plan	1st Draft; 2nd Draft	･The expert in charge (Seed Production/ Propagation) started preparing for FS and RS production manual by collecting and analyzing relevant documents (Handbook on Upland Rice Cultivation, manuals on seed production, seed catalogue, etc.) and the relevant data. In May 2022, the expert discussed the structure of the manual, drafting table of contents for the manual. The expert and C/Ps will formulate it based on the proposed table of contents. ･Due to the miliary conflict occurred in April 2023, the process of formulating the manual has been temporarily suspended. ･The manual is still in the process of developing along with proposed Table of Contents. Due to the conflicts between Sudanese Armed Forces and Rapid Support Forces in the capital, it is difficult to request editing work and comments, etc. from C/Ps on a frequent basis. Based on the information available and past exchanges of opinions with C/Ps and other researchers, the expert in charge (Seed Production/ Propagation) will continue to work on the preparation of the manual under the initiative of expert.
	Actual		
2.7. ARC HQ expedites the release of new varieties including NERICA.	Plan		･The Project will expedite the release of new varieties including NERICA 4 according to the necessity. ･In 2021, ARC submitted seven (7) applications including NERICAs to National Released Variety Committee for released rice varieties. National Variety Release Committee (NVRC) was held on March 18, 2022, where they did not examine them since more varieties and promising lines of other crops than expected for examination at the committee. They are scheduled to be examined at the next NVRC. ･On September 18, 2022, Dr. Khaild, the National Rice Research Coordinator and Co-Project Manager of the Project, made a presentation on proposed three pedigrees of upland rice: IR11N202, INPAGO9 and WAB0018096 (3) for new released varieties. In response to his proposal, National Released Variety Committee (NRVC) were determined to approve the three pedigrees as new released varieties. IR11N202, INPAGO9 and WAB0018096 (3) were denominated as “Abasya”, “Kenana”, and “Gezira” respectively.
	Actual		
Output 3: CS supply system is established for ordinary farmers in Gezira State.			
3.1. ARC HQ distributes RS to CoE.	Plan	BS → FS → RS	･Kosti Research Station will distribute 100kg of Umgar and 75kg of Kosti 1 to the Project. The Project will produce CS with the distributed seeds from Kosti Research Station and RS produced at Gezira Research Station in the 2019/20 season. ･In the 2020 season, amount of RS distributed to ordinary farmers was 104kg (Kosti 1, 40kg and; Umgar, 64kg) to Gezira State in June 2020. ･In the 2021 crop season, a total of 1,015kg (Scheduled tentative amount by CS Production Plan) of seeds was distributed to ordinary farmers in May and July 2021. ･In June 2023, Gezira RPU received new variety seeds (Abasya and Kenana) from ARC White Nile station at Kosti. ･Gezira RPU received 490kg of RS (Abasya, 260kg; Kenana, 200kg; and Gezira, 30kg) while White Nile and Sennar States received 215kg of RS (Abasya, 80kg; Kenana, 80kg; and Gezira, 55kg).
	Actual		
3.2. CoE selects contracted farmers for CS production based on criteria.	Plan		･As of the beginning of April 2020, the number of CS production farmers is two (2) farmers in each of 5 states. A total number of contracted farmers for CS production in 5 States is 10. In addition to them, other four (4) farmers in Gezira State were also selected as CS production farmers. ･In 2021, a total of eight (8) farmers was scheduled to cultivate CS at 17.8 feddans in total while a total of 43 farmers in the five states is scheduled to cultivate ordinary rice at 32 feddans in total. ･At the beginning of the 2022 season, a total of four CS farmers were selected with a set criterion in Gezira Scheme in 2022. ･Gezira RPU has already made seed production plan for 2023. Six feddan at Wadsawi with Abasya and two feddan at Talha with Kenana will be cultivated. In 2023, two (2) farmers in Gezira State were selected as contracted farmers who produce CS.
	Actual		

Activity		Remarks
3.3. CoE provides training on CS production to contracted farmers.	Plan	･The Project held workshop on seed production in January 2020 and training sessions on seed production with lectures and practices in March 2020. ･The Project held "Training Course on Rice Harvest and Post-harvest" for two days from 13 to 14 October, 2020 on CS production techniques such as differentiation of released rice varieties and removing off-type, etc. ･Project decided to hold a training course on seed production with emphasis on off-type identification and rogueing for target farmers and extensionists from September 20 and 21. ･In response to the training plan formulated by the expert in charge, the Project held "Training Course on Rice Seed Production" on 25 to 26 October, 2022, where Gezira RPU, ARC and SA staff gave lectures on post-harvest and harvest management on 25 October, 2022 and the Project provided practical training at ARC GRS Field to Wadsawi CS fields on October 26, 2022. ･In 2023, due to the military conflicts between SAF and RSF in the capital in April 2023, the Project did not conduct training sessions for extensionists and farmers since then.
	Actual	
3.4. CoE supervises CS production by contracted farmers.	Plan	･Their yield and amount harvested in 2018 ranged between 4.07 ton/ha and 0.43 ton/ha and between 6,090 kg and 630 kg. In the 2019/20 season, it is unfortunate that all of four (4) key farmers' rice fields were already cancelled directly due to damaged seedlings from flooding by heavy rain during July and August. ･Gezira SMoPER provides technical assistance target farmers in the state in cooperation with NRP and the consultant hired by the Project. Target farmers in Gezira State produced 0.96 ton of Kosti1 and 1.86 ton of Umgar as certified seeds. In addition, Target farmers in the other five (5) states produced 0.67 ton of Kosti1 and 1.05 ton of Umgar as certified seeds. ･In the 2021/2022 crop season, CoE makes use of provided vehicle by JICA for extension activities for target farmers and supervision of CS production by them. ･At the beginning of the 2022 season, a total of four CS farmers were selected with a set criterion in Gezira Scheme. A CS field were affected by flooding due to heavy rains and broken in irrigation canals (10-25/8/2022), which end up with cancelling its cultivation. Actual yield and actual amount harvested of the remaining three CS farmers were 667kg/feddan and 4000kg for Kosti 2. ･A total of five farmers produce CS in six sites with 12 feddan in the 2023 cropping season under the supervision of Gezira RPU.
	Actual	
3.5. CoE prepares production manual for CS.	Plan	･In November 2022 during his delegation, the expert discussed more detailed contents for the manual with C/Ps. The manual is characterized by containing as many as photos, pictures and diagrams. The expert in charge (Upland Rice Cultivation) finished and submitted the final draft of CS production manual by the November 2022 for approval of MoAF/NRP. ･Gezira RPU completed the review of the draft of seed production manual and submitted it in January 2023 to NRP and General Directorate of International Cooperation. They will approve the manual after reviewing it.
	Actual	
3.6. CoE prepares a plan for CS supply system to ordinary farmers in a sustainable manner.	Plan	･Gezira SMoPER starts a plan for CS supply system to ordinary farmers by organizing one chapter on CS supply system in the manual. ･Gezira SMoPER has established a seed supply system, where ARC through NRP provides Foundation seed (FS1, or Foundation seed) and Foundation seed (FS2, or Registered seed) for CS production. CS supply system is understood as a flow of seed from ARC/NRP to ordinary rice farmers. Furthermore, Gezira SMoPER has established a CS production plan for five years including the target yield for each year. Amounts of CS distributed to ordinary farmers in 2023 are 70kg (Estimated).
	Actual	

Activity	Plan/Actual	Remarks
3.7. CoE distributes CS to ordinary farmers.	Plan	·Gezira SMoPER distributed CS to ordinary famers in the middle of June (June 15) 2021 before sowing while Gezira SMoPER is expected to distributed CS to ordinary famers in June 2022. ·In 2021, Gezira SMoPER distributed a total of 300kg of Umgar variety CS from 2020 products to 4 farmers for their ordinary rice production. In the following season of 2022, Gezira SMoPER distributed around 400kg of Kosti1 CS to 4 farmers to produce ordinary rice in 9.75 feddans.
	Actual	
3.8. CoE submits next year plan/proposal for CS production including budget to NRP in a timely manner.	Plan	·Gezira SMoPER submitted proposal in the form of cultivation plan for CS production to NRP in March 2021 and May 2022 respectively. -RPU Gezira already submitted proposed budget for 2023 to NRP in September 2022. The proposed cultivated area in the budget is 50 feddans, which is more than what the State is scheduled to cultivate to acquire more budget. Actually, RPU is scheduled to select four rice seed farmers in total to cultivate 8 feddan of rice seed field while it is scheduled to select 6 ordinary farmers in total to cultivate 16 feddan of ordinary rice fields.
	Actual	
Output 4: The issues of rice marketing are identified based on trial sales of milled local rice in Gezira State.		
4.1. CoE conducts profitability analysis for rice production and other main crops.	Plan (Work with local consultant)	·Currently, the expert in charge (Marketing and Profitability Analysis) is collecting and organizing data in Japan. Profitability analysis will be completed by March 2019. ·In starting to write the report, the expert in charge and C/Ps reviewed profitability analysis cases that has been executed in the past (profitability analysis report organized in April 2019 by Mr. Ando and presentation in Wrap-up meeting held in February 2021). The expert in charge and C/Ps already finished the final draft of the report that includes the relevant project activities in the past. They will submit a finalized report to MoAF/NRP by December 2022.
	Actual	
4.2. CoE conducts market survey for milled local rice and imported rice.	Plan	·The expert in charge collected information on marketing channel with SMoPER, sales channel of agricultural crops, local markets in Wad Medani, promising wholesalers in Wad Medani, etc. On June 5 and 8, 2018, the Project conducted a preliminary survey (questionnaire survey) on preference of rice flour bread for Wad Medani citizens. ·The Project have promoted rice flour sales to snack product companies (Baraka Biscuit Company and Borai Confectionery Company). ·In September 2022, a questionnaire survey of tasting was conducted on 130 people of different age groups in different places. The result of survey was quite commendable as shown below, 89% of surveyed people chose rice mixed bread against ordinary bread. ·The expert in charge and C/Ps already formulated the first draft on October 9, 2022 and the final draft as of December 23, 2022. RPU Gezira will submit a finalized report to MoAF/NRP shortly by December 2022.
	Actual	

4.3. CoE continues to manage and improve cultivation methods and pre-harvest techniques as necessary by utilizing “Handbook on Upland Rice Cultivation.”					Plan				[Management of paddy production by utilizing “Handbook on Upland Rice Cultivation“] ·RPU Gezira utilized “Handbook on Upland Rice Cultivation” sufficiently. RPU gives technical assistance through the handbook. Once a new farmer is selected, RPU provides a copy of the handbook to him. -Copies of the manual were distributed to new rice farmers in 2022 as well. In the Wrap-up Meeting in 2022, RPU also distributed them to farmers who attended the meeting. The manual is well utilized for extension of rice cultivation techniques and practices. [Improvement of cultivation methods and pre-harvest techniques] ・During the 2019, the expert has been instructing key farmers to control weeding on the rice fields thoroughly and divide the fields into smaller plots for efficient water management on the rice fields. ・The Project held workshop on seed production in January 2020 and training sessions on seed production with lectures and practices in March 2020. ・The Project held ”Training Course on Rice Harvest and Post-harvest” for two days from 13 to 14 October, 2020 on rice harvest and post-harvest (including seed storing), etc. · In September 2022, they conducted another marketing survey for ministry, school, and bakery shop in Wad Medani so as to update data and information obtained by the last marketing survey in July 2018.	
					Actual					
4.4. Rice milling techniques of extension workers are strengthened.					Plan				･Arab Organization for Agricultural Development (AOAD) held training sessions for the six target states on post-harvesting in December 2018.The training sessions were arranged by NRP and Gezira SMoPER and financed by Federal Ministry of Finance. ･The Project held ”Training Course on Rice Harvest and Post-harvest” for two days from 13 to 14 October, 2020 on differentiation of released rice varieties and removing off-type, etc. ·As it is necessary for Gezira CoE to maintain the rice milling machines on a regular basis, in particular, mechanical and electrical system in the equipment. A series of on-site training on the operation and maintenance of the installed rice milling machines in September 2021 were conducted to develop capacity for newly appointed C/Ps. ·The Project implemented OJT training in rice milling and sorting for milling machine operators (13 operators (extensionists), four private operators, and six locality officers), especially by 25 RPU staffs, in five localities (Hosh, Haji Abudalh, Hasahisa and Rahad) in November 2022. ·In 2022, the Project started to evaluate capacity of milling machine operators in five localities (Hosh, Haji Abudalh, Hasahisa and Rahad) of Gezira State. Specifically, it is recommended that from the following years on, RPUs should conduct OJTs that include maintenance and spare parts replacement. ·Results of rice milling in 2022 show that rice broken ration that is defined as the ratio consisting of sum of large, medium, and small broken rice ranges between 54 to 93 % with average of 73 %.	
					Actual					
4.5. CoE establishes operation and management structure of rice milling machines.					Plan				･The Project grasped the current situation of the operation structure of rice milling machines. For each of the target RPUs in Gezira State, at least two (2) extension workers are assigned for post-harvest handling and operation of rice milling machine(s) executed by the RPUs. They are regularly engaged in the operational work of the machines under the coordination by the Rice Promotion Unit. The extension workers at Umbarona, Hasahisa and Rahad 44 are well trained to undertake rice milling activities at their stations on their own even though they still need to accumulate further exercises in rice milling and to acquire successively how to realize troubleshooting in detail when milling machines are in trouble. ·As of 2022, a structure for operation and maintenance of rice milling machines had been established to some extent and keep updated throughout the project period. In general, operators (extensionists) and private operators are assigned in each locality to operate and maintain rice milling machine. Post-harvest experts in Rice Promotion Unit of Gezira State SMoPER provides OJT, supervision, and assistance to them.	
					Actual					

Activity	Plan/Actual	Remarks
4.6. CoE prepares a plan for trial sales for milled local rice.	Plan	･The expert in charge and C/Ps formed the rice and broken rice sales promotion concept. They will put stress on rice flour sales channel development, targeting for bakery shops and promoting trial sales at exhibition.
	Actual	
4.7. CoE conducts trial rice sales.	Plan	･Gezira SMoPER sold 300kg of rice to a wholesaler in Wad Medani with 10 SDG/kg on July 8, 2018. SMoPER successfully sold 10kg of rice flour in Wad Medani in December 2018. RPU sold 25 sacks of broken rice to the local market at the price of 20SDG/kg in June 2019. ･Gezira SMoPER started to sell rice/ rice products using rice flour on a commercial basis in November and December 2019. In total, the Project sold 2530.5kg of rice/ rice flour for 67,360 SDG to Baraka Company, Rural Women School, trader and individual consumers, etc. ·RPU Gezira sold 0.5ton of broken rice to Nigerian residents in Sudan in March 2022.
	Actual	
4.8. CoE identifies and compiles issues of rice marketing through trial rice sales.	Plan	Based on the results of the past surveys: marketing surveys in September 2022 and July 2018 and review of relevant project activities, expert in charge and C/Ps confirmed that the Project accumulated some good practices of food/snack samples utilizing rice flour and rice sales to others and identified some challenges regarding trial rice sales and supplying rice flour for food/snack samples through a series of rice trial sales activities. The expert in charge and C/Ps already formulated the first draft on October 9, 2022 and the final draft as of December 23, 2022. RPU Gezira submitted a finalized report to MoAF/NRP in January 2023.
	Actual	
Output 5: The production of CS is started in 5 states (Sennar, Gedaref, White Nile, River Nile, Northern)		
5.1. Each SMoPER of 5 States selects CS production farmers based on criteria.	Plan	･As of the beginning of April 2020, two (2) farmers were selected as CS producers in each of the target five (5). A total number of contracted farmers for CS production in the target five (5) States adds up to 10. In addition to them, the other four (4) farmers in Gezira State were also selected as CS producers. ·In the 2021 Season, a total of 43 farmers in the five states is scheduled to cultivate CS at 32 feddans in total. ·They are still in the process of finalizing selection of farmers. ·In 2022, three CS farmers in Sennar State, three CS farmers in White Nile and five CS farmers in River Nile State were selected and they cultivated CS. sed by SA in 2021. ·In 2023, four (4) farmers in Sennar State, two (2) farmers in White Nile State, and four (4) farmers in River Nile State were selected as contracted farmers who produce CS.
	Actual	
5.2. Extension workers and contracted farmers from 5 States receive trainings for CS production at CoE organized by MoAF.	Plan	･The Project held workshop on seed production in January 2020 and training sessions on seed production with lectures and practices in March 2020. ･The Project held "Training Course on Rice Harvest and Post-harvest" for two days from 13 to 14 October, 2020 on CS production. The selected farmers in the five state also participated in the training. ·They participated in Warp-up training in February 2021 and Workshop on CS Production in April 2021. ·In response to the training plan formulated by the expert in charge, the Project held "Training Course on Rice Seed Production" on 25 to 26 October, 2022, where Gezira RPU, ARC and SA staff gave lectures on post-harvest and harvest management on 25 October, 2022 and the Project provided practical training at ARC GRS Field to Wadsawi CS fields on October 26, 2022. According to participants, it was highly evaluated that it was very useful for them since they were well aware of new released varieties, off-type identification and practical methods of rogueing through the training opportunities. Eight extensionists and 17 farmers in the other five states participated in the training other than those in Gezira State. ･In 2023, due to the military conflicts between SAF and RSF in the capital in April 2023, the Project did not conduct training sessions for extensionists and farmers since then.
	Actual	

5.3. ARC Research Stations distribute RS to 5 SMoPERs.					Plan									Amounts of RS (seeds) distributed from ARC HQ in the target five states are 2020: 80kg, 2021: 262kg, 2022: 90kg (Abasya, 30kg; Kenana, 30kg and; Gezira, 30kg), and 2023: 215kg (Abasya, 80kg; Kenana, 80kg; and Gezira, 55kg)
					Actual									

Monitoring Plan	Year	1st Year (2018)	2nd Year (2019)	3rd Year (2020)	4th Year (2021)	5th Year (2022)	6th Year (2023)	7th Year (2024)	Remarks	Issue	Solution
		Ⅰ Ⅱ Ⅲ Ⅳ	Ⅰ Ⅱ Ⅲ Ⅳ	Ⅰ Ⅱ Ⅲ Ⅳ	Ⅰ Ⅱ Ⅲ Ⅳ	Ⅰ Ⅱ Ⅲ Ⅳ	Ⅰ Ⅱ Ⅲ Ⅳ	Ⅰ Ⅱ			
Monitoring											
Joint Coordinating Committee	Plan										
	Actual										
Technical Steering Committee	Plan										
	Actual										
Set-up the Detailed Plan of Operation	Plan										
	Actual										
Submission of Monitoring Sheet	Plan										
	Actual										
Monitoring Mission from Japan	Plan										
	Actual										
Reports/Documents											
Project Progress Report	Plan										
	Actual										
Project Completion Report	Plan										
	Actual										
Public Relations											
Public Relations	Plan								Newsletter (Issue 04) was issued in October 2020. Copies of NL were distributed at the Field Day in Nov.2020.		
	Actual										
	Plan										
	Actual										

Appendix 3. JICA experts assignment result

Delegation of Japanese Experts

(i) Assignment in Sudan

No.	Assigned Field of Work	Name of Expert	Assignment (M/M)	Assignment (M/M)
			Phase I*	Phase II*
1.	Chief Advisor/Rice Promotion Program1	Mr. Osamu NAKAGAKI	5.90	6.77
2.	Deputy Chief Advisor/Rice Promotion Program2/Coordinator	Mr. Takeshi MATSUDA	8.57	4.30
3.	Seed Production/Propagation	Mr. Akio GOTO	8.43	7.17
4.	Upland Rice Cultivation	Mr. Kazuhiko YAGI	6.30	4.57
5.	Monitoring and Evaluation	Mr. Akira OGASAWARA	2.50	3.13
6.	Rice Field Design and Construction Management	Mr. Yuichi MATSUMOTO	1.00	
7.	Post-Harvest Processing and Management	Mr. Hirokazu NAGAOKA	1.00	
	Post-Harvest Processing and Management	Dr. Taisuke ONISHI	4.60	
	Post-Harvest Processing and Management	Mr. Kenji NAKAMURA		3.97
8.	Seed Inspection/ Marketing and Profitability Analysis	Mr. Takamasa ANDO	6.37	
9.	Seed Inspection	Mr. Tomoyuki FUJII		0.40
10.	Marketing and Profitability Analysis	Mr. Tsuneo TSURUSAKI		3.40
	Total		44.67	33.70

(ii) Assignment in Japan

No.	Assigned Field of Work in Japan	Name of Expert	Assignment (M/M)	Assignment (M/M)
			Phase I*	Phase II*
1.	Chief Advisor/Rice Promotion Program1	Mr. Osamu NAKAGAKI	1.5	9.80
2.	Deputy Chief Advisor/Rice Promotion Program2/Coordinator	Mr. Takeshi MATSUDA	2.45	10.45
3.	Seed Production/Propagation	Mr. Akio GOTO	1.55	5.55
4.	Upland Rice Cultivation	Mr. Kazuhiko YAGI	0.7	4.20
5.	Monitoring and Evaluation	Mr. Akira OGASAWARA	0.7	3.00
6.	Rice Field Design and Construction Management	Mr. Yuichi MATSUMOTO	0	

7.	Post-Harvest Processing and Management	Mr. Hirokazu NAGAOKA	0.1	
	Post-Harvest Processing and Management	Dr. Taisuke ONISHI	0.5	
	Post-Harvest Processing and Management	Mr. Kenji NAKAMURA		2.74
8.	Seed Inspection/ Marketing and Profitability Analysis	Mr. Takamasa ANDO	3.3	3.15
9.	Seed Inspection	Mr. Tomoyuki FUJII		0.30
10.	Marketing and Profitability Analysis	Mr. Tsuneo TSURUSAKI		1.05
	Total		10.8	40.24
	Grand Total		55.47	73.94

*Phase I: Jan. 2018 – Mar. 2020, Phase II: Jun. 2020 – May 2024

Appendix 4. Result of equipment procurement

Result of equipment procurement

State	Place	Equipment	Unit Price	Qty	Date of procurement	Status (Date checked)	Date of hand over
Gezira	SMoPER	Laptop (HP 250 G7 Notebook)	450 USD	1	Oct. 26, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Speakerphone (Yealink CP900)	310 USD	1	Nov. 27, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Wi-Fi Router (DWR-M921)	25,500 SDG	1	Nov. 27, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Motorbike (Boxer X 125cc)	1,145 USD	5	Nov. 28, 2021	OK (13 Dec 2023)	Apr. 15, 2024**
		Refrigerator (HFR600 (600L))	7,600 USD	1	Dec. 23, 2021	OK (13 Dec 2023)	Apr. 15, 2024**
		Generator (EG6050A (6.0KVA))	3,100 USD	1	Dec. 23, 2021	OK (13 Dec 2023)	Apr. 15, 2024**
		Car (Hilux, 114/25)	3,502,194 JPY	1	Mar. 17, 2020	OK (13 Dec 2023)	TBD
	ARC (Gezira)	Irrigation pump (NDL100P)	16,500 SDG	1	Jun. 25, 2018	Unknown*	Apr. 15, 2024**
		Awner (TDS100)	151,600 JPY	1	Dec. 5, 2018	Unknown*	Apr. 15, 2024**
		Stone remover machine (HS102E)	87,900 JPY	1	Dec. 5, 2018	Unknown*	Apr. 15, 2024**
		Laptop (HP 250 G7 Notebook)	450 USD	1	Oct. 26, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Speakerphone (Yealink CP900)	310 USD	1	Nov. 27, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Wi-Fi Router (DWR-M921)	25,500 SDG	1	Nov. 27, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Motorbike (Boxer X 125cc)	1,145 USD	1	Nov. 28, 2021	Unknown*	Apr. 15, 2024**
		Refrigerator (HFR600 (600L))	7,600 USD	1	Dec. 23, 2021	Unknown*	Apr. 15, 2024**
		Generator (EG6050A (6.0KVA))	3,100 USD	1	Dec. 23, 2021	Unknown*	Apr. 15, 2024**
	ARC (Gezira, Project office)	Copy machine (MP C4500)	1,785 USD	1	Apr. 10, 2018	Unknown*	Apr. 15, 2024**
		Seed Counter (SLY-C)	55,700 JPY	1	Dec. 5, 2018	Unknown*	Apr. 15, 2024**
White Nile	SMoPER	Laptop (HP 250 G7 Notebook)	450 USD	1	Oct. 26, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Speakerphone (Yealink CP900)	310 USD	1	Nov. 27, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Wi-Fi Router (DWR-M921)	25,500 SDG	1	Nov. 27, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Motorbike (Boxer X 125cc)	1,145 USD	2	Nov. 28, 2021	OK (14 Dec 2023)	Apr. 15, 2024**
		Refrigerator (HFR300 (300L))	3,200 SDG	1	Dec. 23, 2021	OK (14 Dec 2023)	Apr. 15, 2024**
	ARC (White Nile)	Awner (TDS100)	151,600 JPY	1	Dec. 5, 2018	OK (12 Mar 2024)	Apr. 15, 2024**
		Stone remover machine (HS102E)	87,900 JPY	1	Dec. 5, 2018	OK (12 Mar 2024)	Apr. 15, 2024**
		Laptop (HP 250 G7 Notebook)	450 USD	1	Oct. 26, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Speakerphone (Yealink CP900)	310 USD	1	Nov. 27, 2020	OK (13 Apr 2021)	Apr. 13, 2021

		Wi-Fi Router (DWR-M921)	25,500 SDG	1	Nov. 27, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Motorbike (Boxer X 125cc)	1,145 USD	1	Nov. 28, 2021	OK (17 Dec 2023)	Apr. 15, 2024**
		Refrigerator (HFR600 (600L))	7,600 USD	1	Dec. 23, 2021	OK (17 Dec 2023)	Apr. 15, 2024**
		Generator (EG6050A (6.0KVA))	3,100 USD	1	Dec. 23, 2021	OK (17 Dec 2023)	Apr. 15, 2024**
Sennar	SMoPER	Laptop (HP 250 G7 Notebook)	450 USD	1	Oct. 26, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Speakerphone (Yealink CP900)	310 USD	1	Nov. 27, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Wi-Fi Router (DWR-M921)	25,500 SDG	1	Nov. 27, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Motorbike (Boxer X 125cc)	1,145 USD	3	Nov. 28, 2021	OK (15 Dec 2023)	Apr. 15, 2024**
		Refrigerator (HFR300 (300L))	3,200 SDG	1	Dec. 23, 2021	OK (15 Dec 2023)	Apr. 15, 2024**
	ARC (Sennar)	Motorbike (Boxer X 125cc)	1,145 USD	1	Nov. 28, 2021	Unknown*	Apr. 15, 2024**
Gedaref	SMoPER	Laptop (HP 250 G7 Notebook)	450 USD	1	Oct. 26, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Speakerphone (Yealink CP900)	310 USD	1	Nov. 27, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Wi-Fi Router (DWR-M921)	25,500 SDG	1	Nov. 27, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Motorbike (Boxer X 125cc)	1,145 USD	2	Nov. 28, 2021	OK (15 Dec 2023)	Apr. 15, 2024**
		Refrigerator (HFR300 (300L))	3,200 SDG	1	Dec. 23, 2021	OK (15 Dec 2023)	Apr. 15, 2024**
	ARC (Rahad)	Motorbike (Boxer X 125cc)	1,145 USD	1	Nov. 28, 2021	OK (13 Dec 2023)	Apr. 15, 2024**
River Nile	SMoPER	Laptop (HP 250 G7 Notebook)	450 USD	1	Oct. 26, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Speakerphone (Yealink CP900)	310 USD	1	Nov. 27, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Wi-Fi Router (DWR-M921)	25,500 SDG	1	Nov. 27, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Motorbike (Boxer X 125cc)	1,145 USD	3	Nov. 28, 2021	OK (20 Dec 2023)	Apr. 15, 2024**
		Refrigerator (HFR300 (300L))	3,200 SDG	1	Dec. 23, 2021	OK (20 Dec 2023)	Apr. 15, 2024**
Northern	SMoPER	Laptop (HP 250 G7 Notebook)	450 USD	1	Oct. 26, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Speakerphone (Yealink CP900)	310 USD	1	Nov. 27, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Wi-Fi Router (DWR-M921)	25,500 SDG	1	Nov. 27, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Motorbike (Boxer X 125cc)	1,145 USD	1	Nov. 28, 2021	OK (31 Jan 2024)	Apr. 15, 2024**
		Refrigerator (HFR300 (300L))	3,200 SDG	1	Dec. 23, 2021	OK (31 Jan 2024)	Apr. 15, 2024**
	Al-Daba village (House of Mr. Wail)	Car (Hilux, 114/21)	3,620,227 JPY	1	Jan. 23, 2018	OK (10 May 2024)	TBD
Khartoum	NRP	Laptop (HP 250 G7 Notebook)	450 USD	1	Oct. 26, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Speakerphone (Yealink CP900)	310 USD	1	Nov. 27, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Wi-Fi Router (DWR-M921)	25,500 SDG	1	Nov. 27, 2020	OK (13 Apr 2021)	Apr. 13, 2021

		Awner (TDS100)	91,430 JPY	1	Aug. 31, 2021	Unknown*	Apr. 15, 2024**
		Stone remover machine (HS103E)	102,250 JPY	1	Aug. 31, 2021	Unknown*	Apr. 15, 2024**
	NRP (Project office)	Laptop (HP 250 G7 Notebook)	450 USD	1	Oct. 26, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Speakerphone (Yealink CP900)	310 USD	1	Nov. 27, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Wi-Fi Router (DWR-M921)	25,500 SDG	1	Nov. 27, 2020	OK (13 Apr 2021)	Apr. 13, 2021
		Mobile satellite (THURAYA XT-LITE)	18,700 SDG	1	Jan. 25, 2018	Unknown*	Apr. 15, 2024**
		Safe box	17,000 SDG	1	Jan. 30, 2018	Unknown*	Apr. 15, 2024**
		Desktop PC (Pilot PC All IN ONE)	15,600 SDG	2	Jan. 30, 2018	Unknown*	Apr. 15, 2024**
		Laptop (HP 15-BS020NX)	16,400 SDG	1	Jan. 30, 2018	Unknown*	Apr. 15, 2024**
		Copy machine (MP C2011SP)	3,260 USD	1	Feb. 7, 2018	Unknown*	Apr. 15, 2024**
		Car (Land Cruiser, 114/19)	6,027,285 JPY	1	Jan. 23, 2018	Damaged (Jan. 24, 2024)	TBD
Egypt, Cairo	Cairo (House of Dr. Hassan)	Laptop (DYNABOOK SATELIGHT PRO C-50-H)	16,530 EGP	1	Oct. 2, 2023	OK (Apr. 30, 2024)	Apr, 30, 2024 (returned to JICA)

* It was impossible to confirm the current status due to the armed conflict.

** As of May 10, 2024, awaiting signature of counterpart agency.

Appendix 5. Result of training/workshop

Result of Training/Workshop

Year	Month	Days	Trainings	Implementer	Venue	Number Participated (target: Extensionists, farmers, etc.)	Remarks	NRP			Seed Adminstration			Others, MoAF			ARC			Gezira State			Extensionist in Gezira State			Farmer in Gezira State			Other five State			Extensionist in Other five State			Farmer in Other five State			Private Entities			Media			JICA (including Project)			M Total	F Total	G Total
								M	F	Total	M	F	Total	M	F	Total	M	F	Total	M	F	Total	M	F	Total	M	F	Total	M	F	Total	M	F	Total	M	F	Total	M	F	Total	M	F	Total	M	F	Total			
2020	Jan	14	Workshop for CS production	RPU Gezira/NRP/JICA	Gezira	36	Extensionists: 29, Farmers: 7	1		1	1		1			0			0	3	2	5	19	10	29	7		7			0			0			0			0	1	1	2	2		2	34	13	47
	Mar	2-3	Rice Seed Production	RPU Gezira/NRP/JICA	Gezira	42	Extensionists: 24, Farmers: 18	1		1			0			0	1		1	4	2	6	17	2	19	9		9			0	4	1	5	21		21			0	1	1	2	5		5	63	6	69
	Oct	13-14	Rice Seed Harvest & Post-harvest	RPU Gezira/NRP/JICA	Gezira	42	Extensionists: 25, Farmers: 17	2	1	3		1	1			0	3		3	3		3	17	2	19	10		10			0	4	1	5	10		10	1		1	1	1	2	1	3	4	52	9	61
2021	Feb	15-16	Wrap-up meeting (training) on CS production in 2020 Season	RPU Gezira/NRP/JICA	Gezira	36	Extensionists: 20, Farmers: 16	2		2	1		1	2	2	4	2		2	3		3	11	2	13	11		11	2	2	4	6	2	8	10		10			0			0	7	1	8	57	9	66
	Apr	5-6	CS Production for 2021 Season	RPU Gezira/NRP/JICA	Gezira	55	Extensionists: 15, Farmers: 40	2	0	2			0			0	2		2	1		1	10		10	13		13			0	5		5	27		27			0			0	2	1	3	62	1	63
	Sep	14	Profitability Analysis Workshop	RPU Gezira	Gezira	20				0			0			0			0	2	9	11	7	2	9			0			0			0			0			0			0			0	9	11	20
	Sep	21-22	Rice Seed Production	RPU Gezira/NRP/JICA	Gezira	17	Extensionists: 5, Farmers: 12			0			0			0			0	1		1	5		5	12		12			0			0			0			0			0	2	1	3	20	1	21
2022	Mar	27-28	Wrap-up meeting (training) on CS production in 2021 Season	RPU Gezira/NRP/JICA	Gezira	49	Extensionists: 24, Farmers: 25	1		1			0			0	1	0	1	4	0	4	10	7	17	9	0	9	3	0	3	6	1	7	16	0	16	1	0	1	1	0	1	2	3	5	54	11	65
	Oct	25-26	Rice Seed Harvest	RPU Gezira/NRP/JICA	Gezira	50	Extensionists: 24, Farmers: 26	1		1	2		2			0	1		1	1		1	9	7	16	9		9			0	6	2	8	17		17			0			0	2	1	3	48	10	58
2023	Mar	14-15	Wrap-up meeting (training) on CS production in 2022 Season	RPU Gezira/NRP/JICA	Gezira	55	Extensionists: 31, Farmers: 24	2		2	5	1	6			0	1		1	1	4	5	15	10	25	9		9			0	4	2	6	15	0	15	0	0	0	0		0	4	1	5	56	18	74
Total								12	1	13	9	2	11	2	2	4	11	0	11	23	17	40	120	42	162	89	0	89	5	2	7	35	9	44	116	0	116	2	0	2	4	3	7	27	11	38	455	89	544

Appendix 6. Good practice and lessons learned from Wrap-up meeting

Good practice and lessons learned from Wrap-up meeting

February 2021

The General Recommendations:

The general recommendations are divided into two as follows:

1. **Technical recommendations:**

   It concerns the technical aspects of producing certified seeds, for example:

   - Select good farmers and good location.
   - Good land preparation (leveling).
   - Pre-watering.
   - Sowing date, June 15th to avoid big rain of late July and early August.
   - Water management. Enough water to irrigate at the time of earing period of rice.
   - Remove weeds. Proper operation for weed control.
   - Harvest timely and conduct proper post-harvest process.
   - Storage, by proper place and methods, etc.

2. **Management Recommendations:**

   It relates to the administrative aspects of producing certified seeds, for example:

   - Clarify the different roles of all concerned parties.
   - Provide adequate budgets for the production of rice seeds.
   - Providing fuel and agricultural machinery for agricultural operations.
   - Providing mobility facilities for the guides.
   - Coordinate with the seed administration for timely field inspection.
   - Coordination with the irrigation authorities to supply the water at the required time, etc.

Lessons learned

1) Good selection of farmers and locations.

2) More attention for the land preparations especially land leveling.

<u>March 2022</u>

The results of the discussions and the recommendations:

- Using pure seeds in CS production fields.
- Regeneration of the seed from the base level to continue the seed production system and strengthen the chain.
- Using effective herbicide application and dose (1.5 L/Fed) Pendimethalin.
- Coordinating with the ministry of irrigation during the plan stage to insure the availability of water and provide water in canals earlier for the selected fields.
- Appling pre watering to CS fields if possible to control weeds and provide weeding loans to the farmers to solve weed problems.
- Coordinating with seed administration to prepare early time schedule for the fields inspection.
- Provide adequate budget for project activities.
- Due to the financial conditions that the country is going through, and because of the scarcity of resources, it is suggested to reduce the cultivated areas in the next season and work to improve performance in the cultivated areas in order to increase productivity (vertical increase).
- Due to the current conditions of the farmers resulting from not receiving their money for produced CS seeds and the high living conditions, the meeting is request JICA to help in paying afore-mentioned money for CS seeds for the 2020 - 2021 season.
- Work between all concerned authorities to find a mechanism to pay for produced CS seeds by farmers in a timely manner.
- The meeting calls for the need for administrative stability, especially for general managers of the SMoPER.
- All participants stressed the need to adhere to the implementation of the outcomes of the meeting.
- The meeting calls for the need for administrative stability, especially for general managers.

- The meeting requests JICA to expedite the attendance of the Japanese experts and increase their stay in Sudan to present their experiences and knowledge to the Sudanese counterparts.

Summary of meeting results:

- Learn about the performance of the previous season and evaluate the results
- Identify the main problems, which are:
  1) Poor productivity,
  2) Deduction of cultivated areas,
  3) High cost of weeding,
  4) Problems of irrigation water,
  5) Problem of non-payment for produced CS seeds by farmers.
- Determining technical treatments to improve productivity, coordinating with the irrigation authorities to ensure the availability of irrigation water.
- Working between all the concerned parties to find a mechanism to pay for CS seeds produced by famers in the time manure.
- Confirmation of farmers to continue cultivation CS production despite not receiving their benefits.
- Exchange the information and the experiences.
- Request JICA to help in paying for CS seeds produced by farmers for this season.

March 2023

- The main lessons learned and the recommendations:
  1) Focus on small area to concentrate and get good result of yield.
  2) Selection of good location and farmers based on criteria established by project experts.
  3) Establish farmers associations to produce rice and benefit from the facilities provided by the Agricultural Bank to finance the production of rice seeds.

Appendix 7. Mid-term plan to utilize CoE 2024-2027

State of Gezira

Ministry of Production and Economic Resources

General Administration of Agriculture

Promising Crops Department

Rice Promotion Unit

Mid-Term Plan

2024-2027

March 2024

CONTENT

1. Introduction

Rice is one of the promising crops in Sudan as the demand and consumption is seen to surge rapidly, and this is understood by all rice stakeholders. Gezira state as a Center of Excellence (hereafter as "CoE") has played significant roles in the promotion of rice production of certified seeds and ordinary rice in Sudan since the beginning of 21st century, and is expected to expand its activity.

The roles of CoE are:

(1) to be a model in rice production of both certified seed and ordinary rice,
(2) to be a provider of trainings related to rice production and culture, and
(3) to be a model in various promotion activities associated to rice.

These roles must be accomplished in line with national rice development strategy in collaboration with federal government and other local governments. The objective of this document is therefore,

(1) To formulate rice production plan including rice seed supply system to produce high quality seed and ordinary rice to meet the expansion in rice demand in Sudan.
(2) To enhance coordination and collaboration among stakeholders in order to sustain rice production and food security in Sudan.

This document consists of rice production plan including seed supply system, training plan and promotional activity plan, and is to exhibit mid-term plan of CoE so that Federal government and all rice stakeholders comprehend and proceed to further development of rice in Sudan.

2. Rice Production

Rice production, both certified seed (CS) and ordinary rice (OR), must be implemented with a feasible and practical plan under appropriate collaboration of federal government (FMoA), local government (SMoA), Agricultural Research Center (ARC) and Seed Administration (SA). Table (1) shows 5-year production plan of certified seed and ordinary rice in Gezira state from 2023 to 2027. The Table also shows expected yield of each year for both seed and ordinary rice.

Table (1) Rice Production Plan in Gezira (from 2023 to 2027)

Item	2023			2024			2025			2026			2027			Grand
	CS	OR	Total	CS	Or	Total	CS	Or	Total	CS	Or	Total	CS	Or	Total	Total
No. Farmers	4	8	12	5	10	15	5	10	15	5	15	20	5	20	25	87
Area (fed.)	8.0	16.0	24.0	10.0	20.0	30.0	10.0	20.0	30.0	10.0	30.0	40.0	10.0	40.0	50.0	174.0
Yield (t/fed.)	1.0	1.2		1.0	1.2		1.0	1.3		1.0	1.4		1.0	1.4		
Paddy (t)	8.0	19.2	27.2	10.0	24.0	34.0	10.0	26.0	36.0	10.0	42.0	52.0	10.0	56.0	66.0	215.2

Notes: “CS” means certified seed and “OR” means ordinary rice

2-1. Seed Production

2-1-1. Structure of Rice Seed

Seed is a vital input for rice production. Use of quality seeds of improved varieties is necessary to increase crop productivity and income of farmers. Researchers at the Rice Research Program from Agricultural Research Corporation (ARC) has engaged in rice seed system by producing early generation seed classes: Breeder Seed (BS), Foundation Seed 1 (FS1) and Foundation Seed 2 (FS2). The FS1 and FS2 can be introduced to rice farmers to produce Certified Seed (CS) under supervision of Rice Promotion Units. CS is then distributed to ordinary rice farmers.

Rice seed structure in Sudan is shown in Figure (1), where BS originates to produce FS1 and FS2. CS is produced from either FS1 and/or FS2. Sudanese system allows to produce CS1, CS2 and CS3. CS1 can produce CS2 in the next season and CS2 produces CS3 in the following season. Any generations of CS can be used to produce ordinary rice.

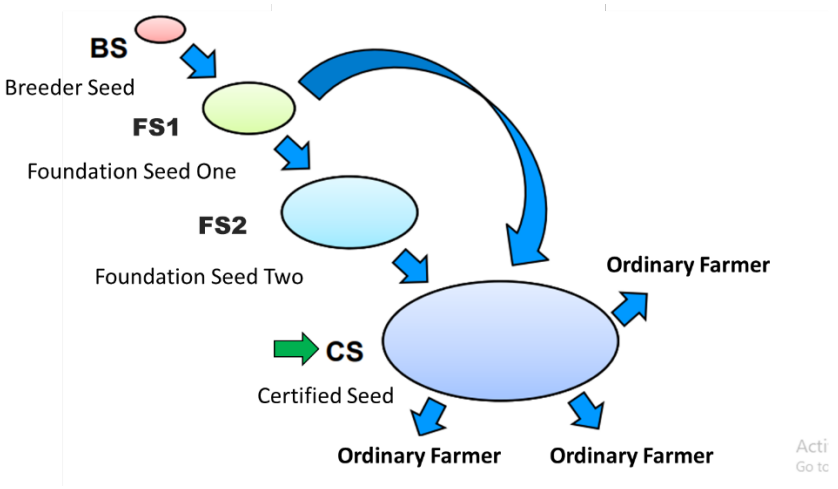


Figure (1) Rice Seed Structure

2-1-2. Seed Supply System

FS1 and FS2 produced and supplied by ARC and Arab Seed Company (ASC) through National Rice Project (NRP) are source of CS.

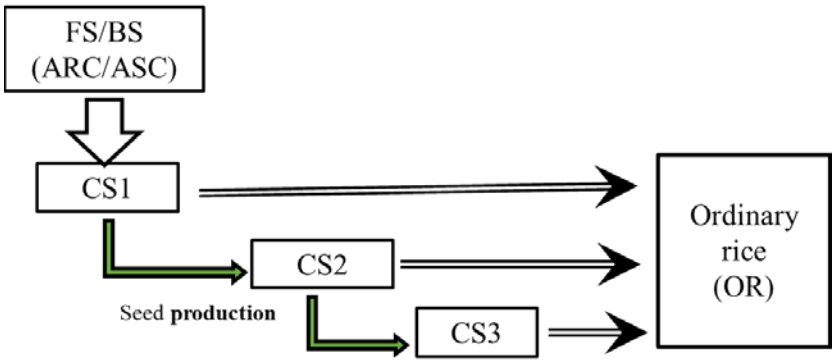


Figure (2) Flow chart of classes of seed

ARC/ASC provides FS1/FS2 to Gezira through NRP. CoE produces certified seed of 1st, 2nd and 3rd generations (CS1, CS2 and CS3). CS1 can be used to produce CS of 2nd and 3rd generations (CS2, CS3) in the following seasons. CS of any generation can be used to produce ordinary rice (OR).

Considering the classes and previous experience on seed production, seed production plan of CoE is shown in Table (2). CoE plans to continue seed production in 8 ~ 10 feddans throughout the target period. Gezira expects to receive FS1/FS2 for 4 feddans every year from ARC/ASC through NRP to produce CS1. CoE also expects to receive 1 or 2 varieties of FS1 and/or FS2 every year. In season 2022 CoE received Kosti2 seed of C2 class from ASC, and produced CS3. However, CS3 seed is only for ordinary

rice production and not suitable for seed production in 2023 season. It is therefore CoE asks NRP to provide CS1 seed enough for 4 feddans so that CoE can continue seed production of CS2 class in the following seasons.

As for the rice variety, it depends on the delivery from ARC or Federal government. This should be discussed and determined with rice stakeholders including farmers well ahead of the land preparation and sowing season. The most convenient occasion would be Wrap-up meeting[1] or similar events. CoE Gezira expects to receive FS1/FS2 of the maximum two varieties for 4 feddans every year from ARC/ASC through NRP in consideration of available harvesting machines, which prevent the mixing of the produced seeds of CS1, CS2 and CS3.

Table (2) Seed Production Plan

Type of Farm	Class of Seed	Source of Seed	Finance	Area/ Fed.					
				2022	2023	2024	2025	2026	2027
Certified Seed (CS)	Fs1 or Fs2	ARC	NRP		4	4	4	4	4
	CS1	RPU	NRP		4	6	4	4	4
	CS2	RPU	NRP	8			2	2	2
	CS3	RPU	NRP						
Total CS Area (Fed.)				**8**	**8**	**10**	**10**	**10**	**10**
Expected Yield (t/fed.)					**1**	**1**	**1**	**1**	**1**
Total CS Expected Yield (ton)				**8**	**8**	**10**	**10**	**10**	**10**

2-1-3. Seed Production Stage

CoE envisages that the rice production be conducted as shown in the Figure (3) below where CS production and OR production coexists. 1 or 2 OR producing farmers surround a CS producing farmer (or a core farmer), and the number of OR farmers would rise as experience among the farmers and extension officers amasses. The number of CS farmer would also expands depending on the progress of the production. In order to reach to the establishing system level, there is a need to start from smaller numbers. Success would bring more farmers and expand the rice crop.

In average and under normal condition, one CS farmer can provide necessary amount of seed to 10 to 15 OR farmers. When there are 2 CS farmers in one area or village, there will be 20 to 30 OR farmers benefitted. This stage with a provision of storage and milling machine can be regarded as the establishing stage.

[1] Wrap-up meetings have been held during the “Capacity Building Project of Rice Promotion” and used to be conducted in February or March.

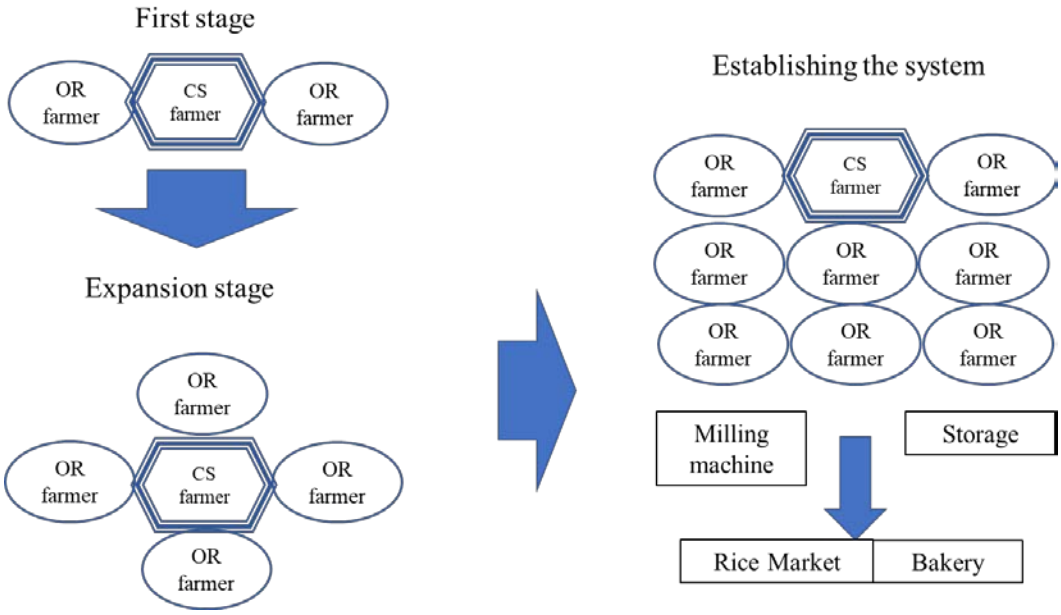


Figure (3) Stages of rice production

Table (3) Number of farmers and average yield during stages of seed system

Target	First stage	Expansion stage	Establishing stage
Number of CS farmer	**4 ~ 5**	**4 ~ 5**	**10 ~**
Yield (ton/fed.)	**0.7**	**1.2 ~ 1.4**	**1.4 ~**

Table (3) shows that the number of CS farmers increasing gradually at the first, expansion and establishing stages in addition to the expected yield (0.7 ton/fed. at first stage) and increases to more than 1.4 (ton/fed.) at the establishing stage. Each 70 kg of FS seed[2] provided by ARC can be introduced to 1 CS farmer to cultivate 2 feddans and that can generate 1,000 kg CS seeds (after cleaning) which can deliver in next season to around 10 OR farmers to cultivate more than 25 feddans. In following seasons, CS producing size can increase as well as OR producing farmers. CoE hopes the CS yield per feddan will be increased by improving both seed quality and farmer's skills on CS production.

[2] Current recommended seed rate is 35kg/feddan. 70kg seed covers 2 feddans. Some farmers and field may be applied 40kg/feddan.

2-1-4. Seed for Stock and Sale

The produced seed is expected to be around 10 tons every year and this will be more than the seed used for next season. So, the remaining amount of produced seed will be stocked and/or sold to other states and private sector or milled. Table (4) shows the amount of seed available to market. Availing the seed to private sectors would encourage them to involve in rice production and marketing.

Table (4) Amount of seed to sell (ton)

Class of Seed	**Source of Seed**	**Ton**					
CS1 CS2 CS3	RPU	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
		0	2.2	6.0	6.0	5.6	5.2

2-2. Ordinary Rice Production

2-2-1. Production Plan

The OR producing area will be increased from 16 feddans in 2023 to 40 feddans in 2027. The production is financed by NRP, SMoA and self-finance (see Table 5). CoE is willing to expand a case demonstrated in 2022 season where an ordinary rice producing farmer produced and sold the rice. This type of demonstration would encourage capable farmers and should be expanded whenever possible while rice milling machines and other technical support and advice should be accompanied. This would positively reduce the financial load of the SMoA.

Table (5) Ordinary rice production plan

Type of Farm	**Class of Seed**	**Source of Seed**	**Finance**	**Area/ Fed.**					
				2022	**2023**	**2024**	**2025**	**2026**	**2027**
Ordinary (OR)	CS1 CS2 CS3	RPU	NRP	8	10	10	10	20	20
			SMoA	0	4	6	6	4	8
			Self	2	2	4	4	6	12
Total OR Area (Fed.)				**10**	**16**	**20**	**20**	**30**	**40**
Expected Yield (t/fed.)					**1.2**	**1.2**	**1.3**	**1.4**	**1.4**
Total OR Expected Yield (ton)					**19.2**	**24**	**26**	**42**	**56**

2-2-2. Rice Production System

Structure of Rice Production system is same as seed production system shown in Figure (3) where each CS Farmer is surrounded by some OR farmers. The current situation is that one CS farmer surrounded by two ordinary rice farmers which was implemented in season 2022 at Wadsawi area in Gezira scheme. During the early stages of the plan this model will be implemented for several years and eventually reach to a model in that one CS farmer is surrounded by four ordinary rice farmers. CoE aims to reach a stage where one CS farmer is surrounded by ten ordinary rice farmers at the establishing stage in the future. This system will facilitate smooth and effective transfer of experience on rice cultivation technique such as land preparation, land leveling, weeding, water management, etc. and produce quality CS seeds under concentrated supervision of Rice Promotion Unit (RPU). Also, this structure will assist the efficient work of RPU members and make the service provision such as machine of land preparation and combine harvester to the farmers group easier and more effective. RPU also provides necessary techniques and support to farmers in order to create Farmers to Farmers extension environment by making farmers group in each production area.

2-2-3. A trial for Utilization of Rice Milling Machine in Rahad 44 Season 2022-2023

The purpose of this trial was to cultivate 2 feddans of ordinary rice in Rahad 44 area with Mr. Daffalla Bashir within the plan of season 2022-2023, and to mill the grain after harvest by the milling machine which was provided to the farmer. RPU and Mr. Daffala discussed and agreed in that RPU provides technical support and the farmer conducts rice production and marketing the product. RPU extends necessary support in the post-harvest processing and marketing, and monitor the activity. This is called self-financed ordinary rice production. CoE plans to increase this type of rice production and marketing as shown in ordinary rice production plan.

2-3. Budget for Rice Production

Detailed cost for rice production in season 2023 is summarized and shown in Annex I. The average cost is **1,003,500** SDG for one feddan. Necessary budget to carry out the planned rice production in Gezira is estimated to be **24,084,000** SDG for 24 feddans in 2023 as of November 2022. In case of the budgetary shortage, the scale of the production and the plan must be adjusted accordingly.

Proper financial arrangement is inevitable for the planned rice production. Failure of this arrangement causes unfavorable effect to the rice producing farmers as in the cases before. One of the preferable

measures is to establish a fund which enables swift payment to the farmers after the rice harvest. CoE seeks every opportunity to materialize this idea in collaboration with FMoA, SMoA, relevant financial departments and donor organizations.

Following table is a result of a simulation rice production and value for seed and ordinary rice using values as of November 2022. Care for market value changes must be taken. Taking an example of case 4 for CS and 4 for OR of the Table (6), the values become 4.5 million and 5.4 million SDG, respectively. The value of ordinary rice (after milling) can be put aside into a fund as a development fund to be used for financing the activities of the next season. The production size, yield and harvest would increase year by year, and the budget must be secured accordingly.

Table (6) Simulation of rice production and values

(values are as of November 2022. Exchange rate is 566.9SDG/US$)

Certified Seed production					
Case No.	**Yield (t/feddan)**	**Field (feddan)**	**Harvest (kg)**	**Value (SDG)**	**Value (US$)**
1	1.0	8	8,000	3,600,000	6,350.33
2	1.2	8	9,600	4,320,000	7.620.39
3	1.5	8	12,000	5,400,000	9,525.49
4	**1.0**	**10**	**10,000**	**4,500,000**	**7,937.91**
5	1.2	10	12,000	5,400,000	9,525.49
6	1.5	10	15,000	6,750,000	11,906.86
7	1.0	15	15,000	6,750,000	11,906.86
8	1.2	15	18,000	8,100,000	14,288.23
9	1.5	15	22,500	10,125,000	17,860.29

(Assuming 1Kg of certified seed is valued at 450 SDG)

Ordinary Rice production					
Case No.	**Yield (t/fed.)**	**Field (feddan)**	**Harvest (kg)**	**Value (SDG)**	**Value (US$)**
1	1.2	10	12,000	3,600,000	6,350.33
2	1.5	10	15,000	4,500,000	7,937.91
3	2.0	10	20,000	6,000,000	10,583.88
4	**1.2**	**15**	**18,000**	**5,400,000**	**9,525.49**
5	1.5	15	22,500	6,750,000	11,906.86
6	2.0	15	30,000	9,000,000	15,875.82
7	1.2	20	24,000	7,200,000	12,700.65
8	1.5	20	30,000	9,000,000	15,875.82
9	2.0	20	40,000	12,000,000	21,167.75

(Assuming 1Kg of ordinary rice is valued at 300 SDG)

To secure budget for rice production, preparing a fund from government or donors is the necessary steps for the proper implementation of the first stages of the mid-term plan. Swift payment to farmers, sound budget allocation and better utilization of money coming from the products are suggested to achieve the objectives of the plan.

2-4. Contract Agreement between Farmers and Government

It is necessary to prepare an agreement on the rice production among the stakeholders such as farmers and the governments. Actual agreement is attached in Annex II. Unit value of the rice grain and seed is stipulated in the agreement; however, the increase of the commodity price is so rapid and aggressive and the delay in the payment to farmers make situation worse. Under such circumstances, there seems a need to improve the content of the agreement. The followings are points of future improvement in the agreement.

(1) State the date of payment to farmers to avoid any delay in the payment
(2) Rooms for negotiation of the unit prices of the grain and seeds in case of commodity price increase beyond control

3. Training

Trainings are important in Sudan as the number of rice producing farmers are still limited and the quality of produced rice needs improvement. Training plan in 2022 is shown in Figure (4). The 5-year training plan is based on this single year plan.

3-1. Annual Training Plan:

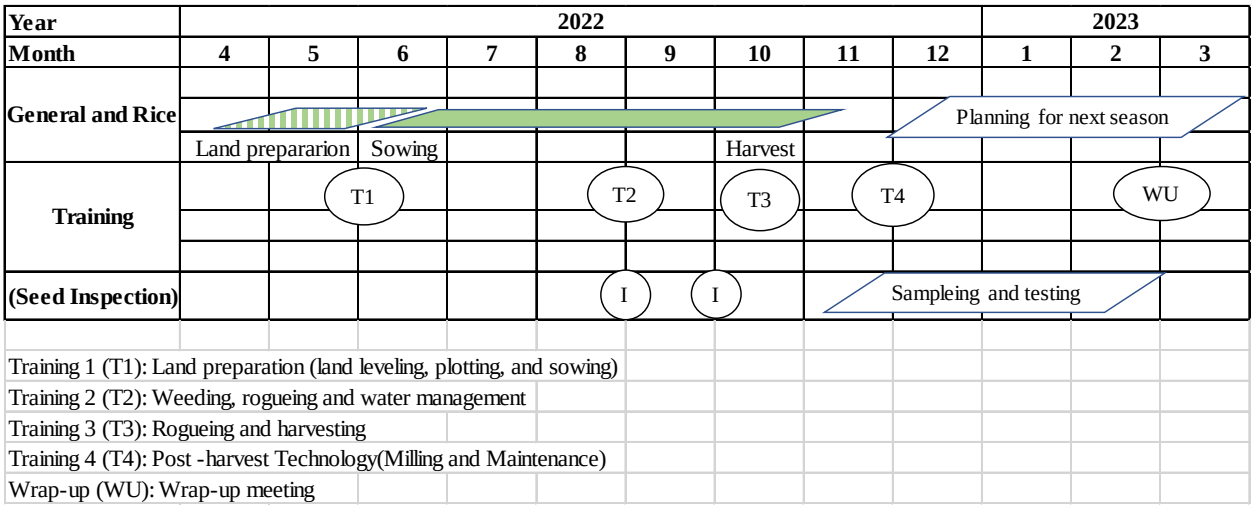


Fig. (4) Annual Training plan 2022

Five years training plan is based on the 2022 training plan and is to repeat the similar training for 5 years. The expected number of participants (farmers, extension workers and other stakeholders) will increase as shown below in Table (7). This plan must be discussed and understood among rice stake holders. Training details are attached in Annex III. Abroad training out of Sudan and exchange of visit open eyes for extension workers and farmers and CoE believes these should be provided as much as possible.

Table (7) Training participants per year

No.	Type of Training	Number of Participants				
		2023	2024	2025	2026	2027
1	**T1**	50	50-70	60-80	70-90	80-100
2	**T2**	50	50-70	60-80	70-90	80-100
3	**T3**	50	50-70	60-80	70-90	80-100
4	**T4**	20	20	20-30	20-30	30-40
5	**WU**	50	50-70	60-80	70-90	80-100

3-2. Training Budget:

Estimated necessary budget for the annual training (T1, T2, T3, T4 & WU) implementation for 220 participants becomes **18,963,000** SDG as of November 2022. The detailed information of the training budget analysis is in Annex IV. In case of the financial limitation, the number of participants must be adjusted accordingly.

4. Promotional Activity

Promotional Activities will be conducted every season to enhance rice production promotion and sustainability in Sudan. These activities include:

(1) Effectively utilize "Certified Seed Production Manual for Farmers" by printing and delivering to farmers in need. The manual has been prepared by CoE (yet to be approved by NRP) in 2022.
(2) Update the "Certified Seed Production Manual for Farmers".
(3) Continued implementation of field day event plays considerable role in the promotion of rice production and important to showcase rice production to neighboring communities and farmers.
(4) Encourage farmers to establish cooperative and/or farmers group to promote rice production. This kind of work, mechanism and contribution to communities must be shared among rice stake holders.
(5) Conduct marketing survey, trial sale on white rice and improve cost analysis for rice production.
(6) Produce rice by-products (rice bread, cookies …etc.).
(7) Making and distributing brochures and leaflet related to rice production, rice bi-products and rice culture.

4-1. Budget of Promotional Activities:

The required budget for the rice promotion activities is around **4,000,000** SDG for one year as in the Table (8) below.

Table (8) Budget of promotional activities (as of November 2022)

No.	Activity	Cost (SDG)
1	Field Day	3,000,000
2	Market survey, sale trials, rice products	1,000,000
Total		**4,000,000**

5. Implementation System

Following table shows annual schedule of rice production and related activities in CoE. The production plan is confirmed before the rice production season. Rice production fields and farmers are to be selected according to the plan and a criterion. After harvesting the rice, data are collected and analyzed. This analysis provides fundamental but key information for improving next season's production plan. The improved next season's plan is consulted with NRP and is shared with other stakeholders during Wrap-up training.

CoE has already started conducting monthly meeting, and this is a venue for compiling, analyzing the production results and reviewing the season's plan.

Table (9) Annual schedule

Month	1	2	3	4	5	6	7	8	9	10	11	12
Rice production												
Wrap Up training												
Confirm season's plan												
Select fields and farmers												
Compile production result												
Analyze production result												
Review next season's plan												
Consultation with NRP												
Sharing the plan with stakeholders												

6. Required Inputs and Conditions

There are other necessary inputs and conditions to achieve this Mid-term plan. The followings are such requirement and conditions.

(1) Direct inputs

1. High quality seeds of high yielding varieties (F1, F2)
2. Production inputs such as fertilizers, insecticides, etc.
3. Storage and cleaning facilities
4. Machineries and equipment (field and Post-harvest)

(2) Indirect inputs

1. Developed institutional structure of federal and state organizations (NRP & CoE)
2. Good coordination with all stakeholders through annual meetings.

Annex I

Cultivation Cost of 1 feddan of Rice season 2023-2024 (as of November 2022)

No.	Work/Activity	Machine/Manual	No. of Times	Cost (SDG)	Cost (US$)
1	Ploughing	Machine	1	20,000	35.28
2	Harrowing and DAP application	Machine	1	80,000	141.12
3	Leveling	Machine	1	15,000	26.46
4	Sowing	Machine	1	10,000	17.64
5	Seed		1	24,500	43.22
6	Ridging and Plotting	Machine/Manual	1	18,000	31.75
7	Pre-emergence herbicide	Manual	1	20,000	35.28
8	Weeding	Manual	4	120,000	211.68
9	Post-emergence herbicide	Manual	1	5,000	8.82
10	Application of termite control	Manual	1	15,000	26.46
11	Herbicides Application (Pre & Post)	Manual	2	15,000	26.46
12	Nitrogen (Urea)	Manual	2	100,000	176.40
13	Rogueing	Manual	4	30,000	52.92
14	Urea Application	Manual	2	5,000	8.82
15	Irrigation cost			120,000	211.68
16	Irrigation fee		1	16,000	28.22
17	Harvesting	Machine	1	30,000	52.92
18	Input & Product Transportation	Machine	1	60,000	105.84
19	Carrier for Crawler –type combine harvester	Machine	1	300,000	529.19
Total				**1,003,500**	**1,770.15**

Annex II
Contract between farmers and government (sample)

بسم الله الرحمن الرحيم
ولاية الجزيرة
وزارة الإنتاج والموارد الاقتصادية
وحدة تطوير وانتاج الأرز

عقد إتفاق

تم الإتفاق بين وزارة الإنتاج والموارد الإقتصادية – وحدة تطوير الأرز بولاية الجزيرة (**طرف أول**) ويمثلها السيد/ مهندس زراعي: ..... و المزارع ..... صاحب الحواشة الواقعة بمشروع ..... (**طرف ثاني**).

على الآتي:

1. من المعلوم أن الطرف الأول يقوم بزراعة تقاوي محصول الأرز غير المغمور بولاية الجزيرة.
2. أتفق الطرفان علي زراعة تقاوي محصول الأرز غير المغمور في المساحة المملوكة للطرف الثاني والبالغ مساحتها ..... فدان.
3. يقوم الطرف الأول بتمويل زراعة هذه المساحة وتوفير كل المدخلات الزراعية المختلفة والمتمثلة في تحضير الأرض وتوفير التقاوي والأسمدة والمبيدات وتنفيذ الحصاد وتوفير الجوالات.
4. يقوم الطرف الثاني بالعمليات الفلاحية المختلفة والمتمثلة في نظافة المحصول من الحشائش ورفع التقانت والجداول وتطبيق الأسمدة حسب رؤية الطرف الأول ورش المحصول بالمبيدات إذا لزم الأمر وكسر التقانت والجداول عند عملية الحصاد والقيام بعمليات الري طيلة فترة الزراعة حتى الحصاد والقيام بعملية إزالة الأصناف الغريبة (التنقية) والقيام باي عمليات فلاحية أخرى يطلبها الطرف الاول.
5. يقوم المشروع القومي للأرز بشراء منتج المحصول خالي من الشوائب بعد خصم تكلفة الإنتاج التي قام بها الطرف الأول بواقع الكيلوجرام ..... جنيه (فقط أربعمائة جنيه).
6. مخلفات المحصول من نصيب الطرف الثاني.

اتفق الطرفان على ما جاء أعلاه ووقعا عليه بحضور الشهود بتأريخ ..... من شهر ..... عام 2021م.

الطرف الأول	**الطرف الثاني**
.....	.....

الشهود:

1. .....
2. .....

إعتماد مدير عام الوزارة:.....

Annex III
Proposal of CS Training Programs Season 2023-2027

(1)Title: Rice Certified Seed Field Management

Overall Goal: Disseminate rice production in Gezira State

Objective (s):

1. Provide farmers with practical knowledge on rice CS establishment.
2. Exchange/transfer experiences among farmer, extensionists and researchers.
3. To establish farmer- to -farmer extension system

Time/ duration: May-June (2 day)

Place: Gezira State

No. of Participants: 50 persons (15 farmers and 5 extension workers from Gezira State, 20 farmers and 5 extension workers from other states, 3 from SA and 2 from ARC)

Cost: Attached

Output and Contents:

Expected Module Output	Subjects/Agendas	Methodology
To make farmers implement proper rice field preparation	1) Agricultural machinery for land preparation 2) Importance of land leveling	Lectures Demonstration
To understand water management	1) Proper plotting 2) Irrigation and drainage	Lectures Demonstration
To conduct effective use of inputs (herbicides & fertilizers)	1) Application of herbicides 2) Timing of adding urea	Lectures Demonstration
To implement effective field practices	Pre-watering, plotting and land leveling	Field Practice Demonstration
To share knowledge and challenges of rice establishment	Open discussion	Field Trip

(2) Title: Rice Certified Seed Production

Overall Goal: Disseminate rice production system in 6 States

Objective (s):

1. Provide farmers and extension workers with practical knowledge on rice CS Production.
2. To know how to produce pure seeds with high quality.
3. To know the procedure/importance of rice seed certification.

Time/ duration: August - September (2 days)

Place: Gezira State

No. of Participants: 50 persons (15 farmers and 5 extension workers from Gezira State, 20 farmers and 5 extension workers from other states, 3 from SA and 2 from ARC)

Cost: Attached.

Output and Contents:

Expected Module Output	Subjects/Agendas	Methodology
To make farmers and extension workers understand and explain the technical package of rice seed production	1) The main topics of rice seed production 2) Characteristics of ARC released varieties	Lectures Demonstration
To understand Seed Administration (SA) procedures	1) Seed field inspection 2) Seed certification	Lecture Demonstration
To conduct effective rogueing (removing off-types)	1) Importance of removing off-types 2) Time of rogueing 3) How to identify off-type plants	Lecture Practice Demonstration
To implement effective field practices	Rogueing and identification of off-types	Field Practice Demonstration
To share knowledge and challenges of rice production	Open discussion	Field Trip

(3) Title: Harvest and Post-Harvest Technology for Certified Rice Seed Production

Overall Goal: Disseminate rice production system in 6 States

Objective (s):

1. Provide farmers and extension workers with practical knowledge on rice CS harvest and post-harvest.
2. To know the appropriate methods to store rice seed.

Time/ duration: October (2 days)

Place: Gezira State

No. of Participants: 50 persons (15 farmers and 5 extension workers from Gezira State, 20 farmers and 5 extension workers from other states, 3 from SA and 2 from ARC)

Cost: Attached.

Output and Contents:

Expected Module Output	Subjects/Agendas	Methodology
To make farmers and extension workers understand and explain the technology of rice seed harvest	1) Timing of rice harvest 2) Harvesting methods 3) Machineries and tools of harvest	Lectures Practice Demonstration
To understand and explain the technology of rice seed post-harvest	1) Seed field drying 2) Cleaning 3) Packing 4) Storing	Lectures Practice Demonstration
To understand the importance of rice harvest and post-harvest	1) Seed quality deterioration 2) Seed quantity losses	Lectures Demonstration
To implement effective seed harvest and post-harvest practices	Timing of rice harvest, Seed field drying, cleaning and storing	Field Practice Demonstration
To share knowledge and challenges of rice harvest and post-harvest	Open discussion	Field Trip

(4) Title: Rice Post-Harvest Technology (milling operation and maintenance)

Overall Goal: Disseminate rice production system in 6 States

Objective (s):

1. Provide farmers and extension workers with practical knowledge on rice milling operation and maintenance
2. To know the appropriate methods on rice milling operation and maintenance.

Time/ duration: November-December (2 days)

Place: Gezira State

No. of Participants: 25 persons (15 farmers and extension workers from Gezira State, 10 farmers and extension workers from other states)

Cost: Attached.

Output and Contents:

Expected Module Output	Subjects/Agendas	Methodology
To make farmers and extension workers understand and explain the technology of post-harvest Technology	3) Rice Post-harvest technology 4) Methods of rice milling 4) Machineries and tools of milling	Lectures Practice Demonstration
To understand and explain the technology of rice milling machines	5) Milling operation 6) Maintenance	Lectures Practice Demonstration
To understand the importance of rice post-harvest	3) Rice quality control 4) Rice quantity losses	Lectures Demonstration
To implement effective rice post-harvest practices	Cleaning, grading, packing and storing	Practice Demonstration
To share knowledge and challenges of rice post-harvest	Open discussion	Field Trip

(5) Title: Wrap-up Meeting

Overall Goal: Disseminate rice production system in 6 States

Objective (s):

1. To Evaluate rice production implementation of rice production plan in 6 States and ARC
2. To explain challenges of the previous season and find out practical solutions
3. To present learnt lessons to develop rice production in 6 states

Time/ duration: March (2 days)

Place: Gezira State

No. of Participants: 50 persons (15 farmers and 5 extension workers from Gezira State, 20 farmers and 5 extension workers from other states, 3 from SA and 2 from ARC)

Cost: Attached.

Output and Contents:

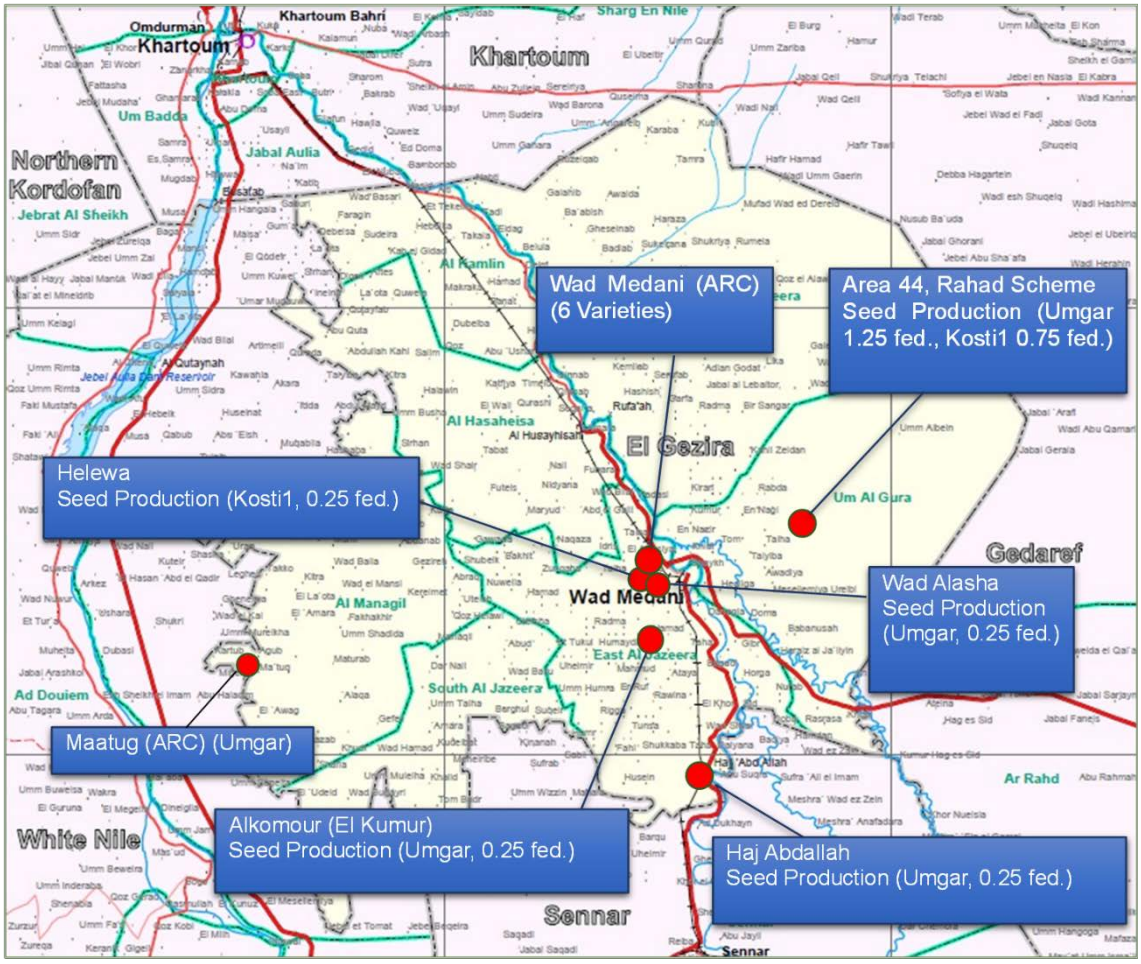
Expected Module Output	Subjects/Agendas	Methodology
To make farmers and extension workers understand and explain the implementation of rice production plan	5) Results and analysis of CS/OR production results in 6 states 6) Results and analysis on seed production at ARC	Presentations Discussion
To understand and explain seed regulations	7) Discussion on seed registration and inspection	Presentations Discussion
To understand the feasibility and economics of rice production	8) Cost analysis on CS production - Gezira State	Presentations Discussion
To prepare proper and realistic plan for next season	9) Measures for next season (Basic plan for next season)	Presentations Discussion
To share Discussion on improvement and countermeasures	Open Discussion	Discussion

Annex IV
Budget of one training program

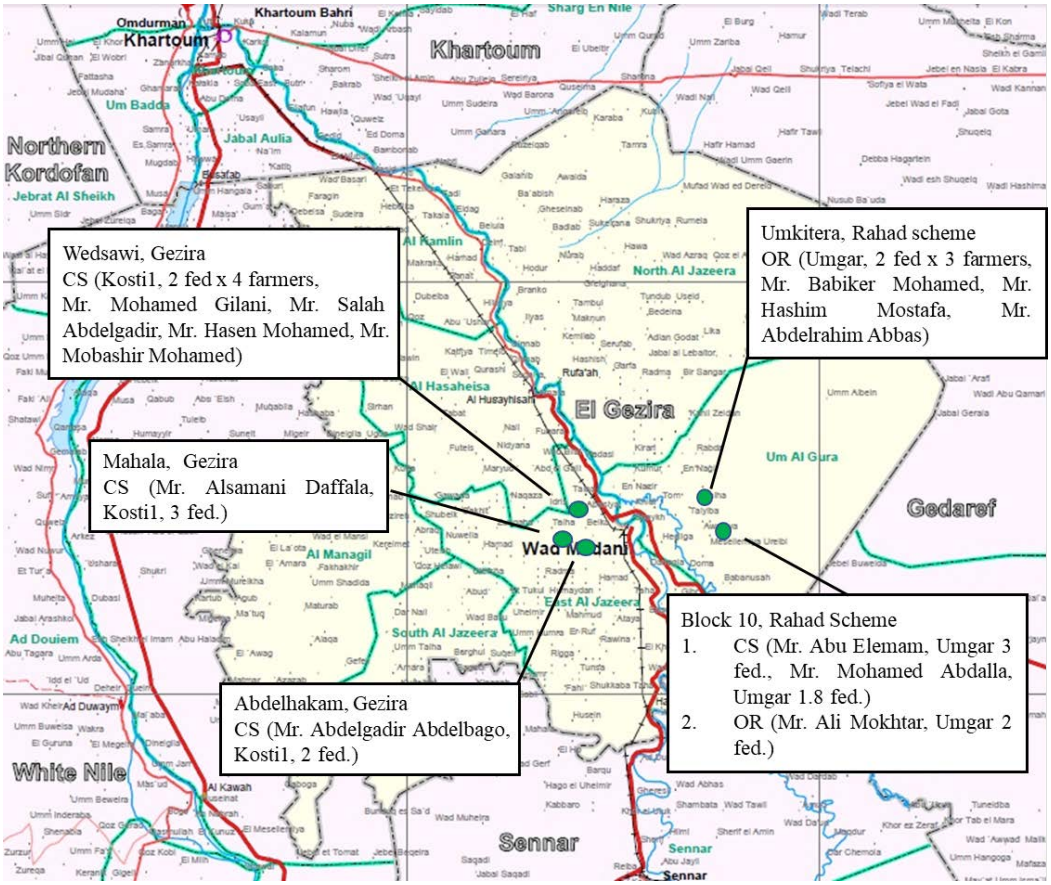
Training on Removing off-types & Weeding				
Tentative Cost of Training for CS Production Farmers 2022				
(25~26/10/2022)				
		Farmers from States 20, Farmers from Gezira 12, Exts States 5, Exts Gezira 5 ARC 1, SA 2, Guests 5 = 50)		
No.		**Item**	**Cost (SDG)**	**Remarks**
1	**Cost for Farmers**			
		Transportation for farmers from Gezira	158000	1580 Km (total distance) × 100 SDG (for 12 farmers)
		Transportation for farmers from 5 States	376000	by Bus round trip from 5 States
		Daily allowance for farmers from Gezira	60000	5000 SDG × 1 days × 12 persons
		Daily allowance for farmers from5 States	200000	5000 SDG × 2 days × 20 persons
		Accommodation for farmers from Gezira	480000	20000 SDG × 2 days × 12 persons
		Accommodation for farmers from 5 States	800000	20000 SDG × 2 days × 20 persons
2	**Cost for extensionists**			
		Accommodation for Exts from Gezira	200000	20000 SDG × 2 days × 5 persons
		Accommodation for Exts from 5 States	200000	20000 SDG × 2 days × 5 persons
		Daily allowance for extensionists from Gezira	50000	5000 SDG × 5 persons × 2 days
		Daily allowance for extensionists from 5 States	50000	5000 SDG × 5 persons × 2 days
3	**Cost for Trainers**			
		Accommodation for Trainers from ARC & SA	120000	20000 SDG × 2 days × 3 persons
		Daily allowance for Trainers from ARC (1), SA (2), RPU(2)	100000	10000 SDG × 2 days × 5 persons
4	**Domestic transportation**			
		Two Minibus for domastic transportation	200000	from Hotel to Hall + Field Visit (2 days)
5	**Training materials**			
		Printing hand-out materials (40 pieces)	50000	for handout matreial
		Training Materials & Tools (Pens,note and plastic cover, …ect.)	40000	
6	**Breakfast and Refreshment**			
		Breakfast cost for 2-days for 60 Persons	660000	5500 SDG 60 persons × 2 days
		Refreshment for 2-days for 60 Persons	240000	2000 SDG ×60 persons × 2 days (Snacks)
		Training hall (2-days, chairs, prepration, daily cleaning)	200000	2 days
		Crona Virus	30000	for 60 persons × 2 days
		Total	**4214000**	
Remark:	This Price as of Today price (11/8/2022) 1 USD = 570 SDG			

Appendix 8. Location map of production sites in Gezira

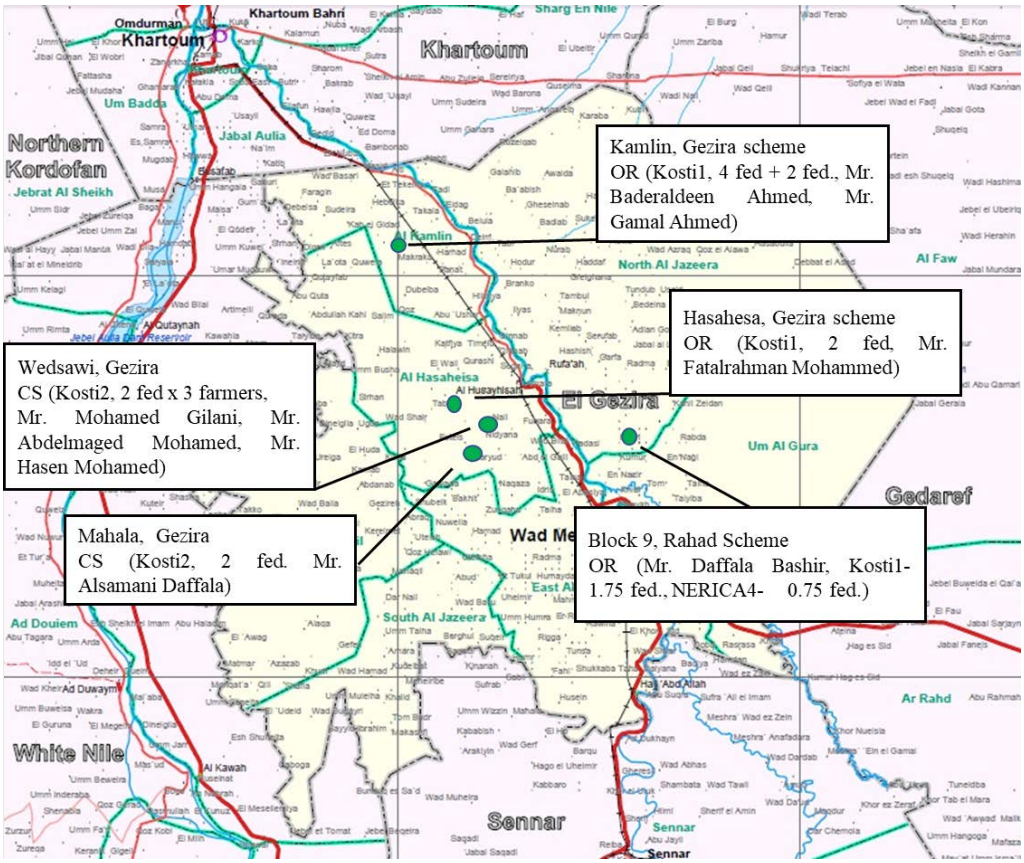
The Location Map of Production Sites in Gezira State



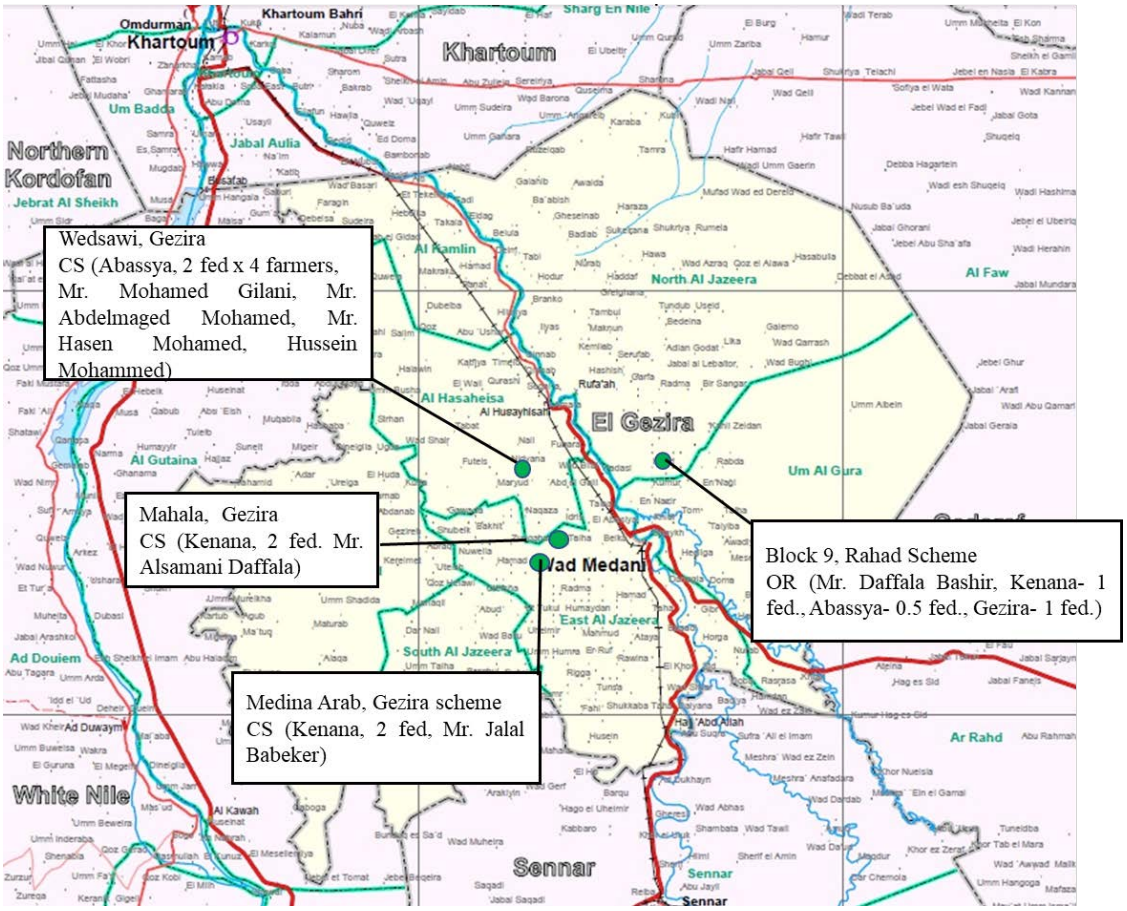
Seed Production Sites, 2020 in Gezira State (including ARC)



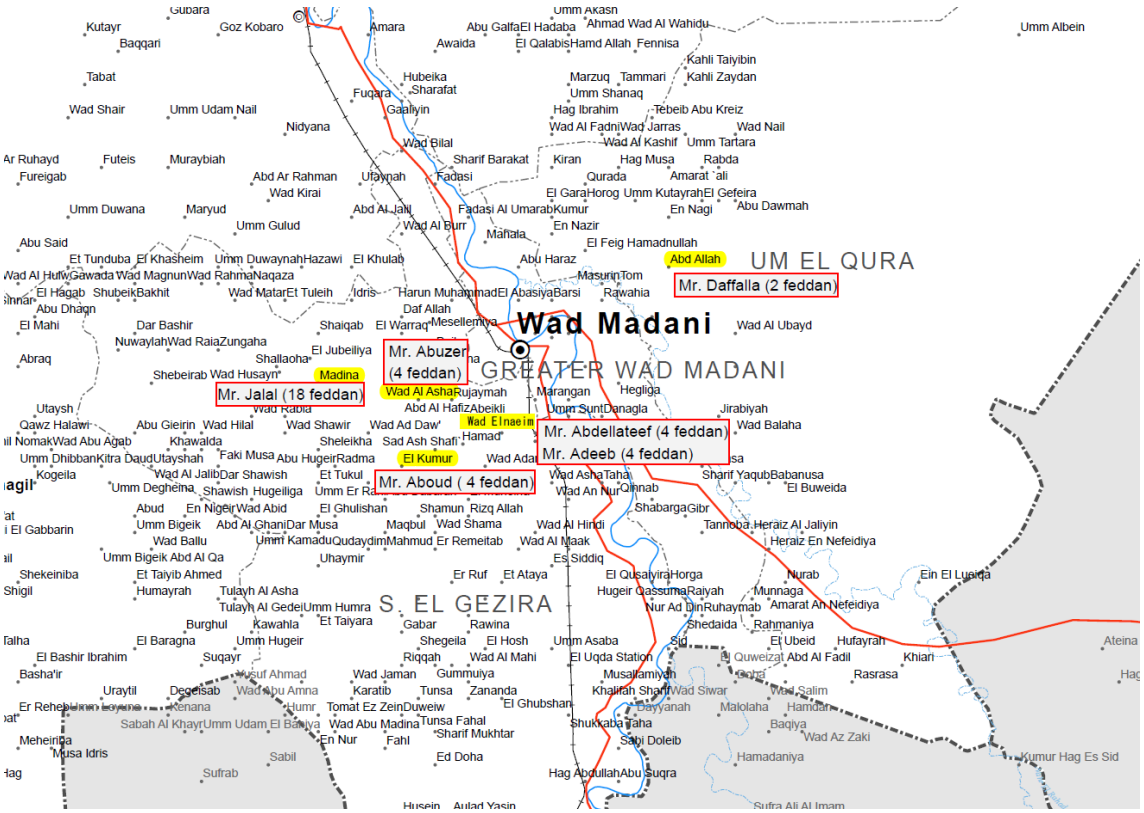
Seed and Ordinary Rice Production Sites, 2021 in Gezira State



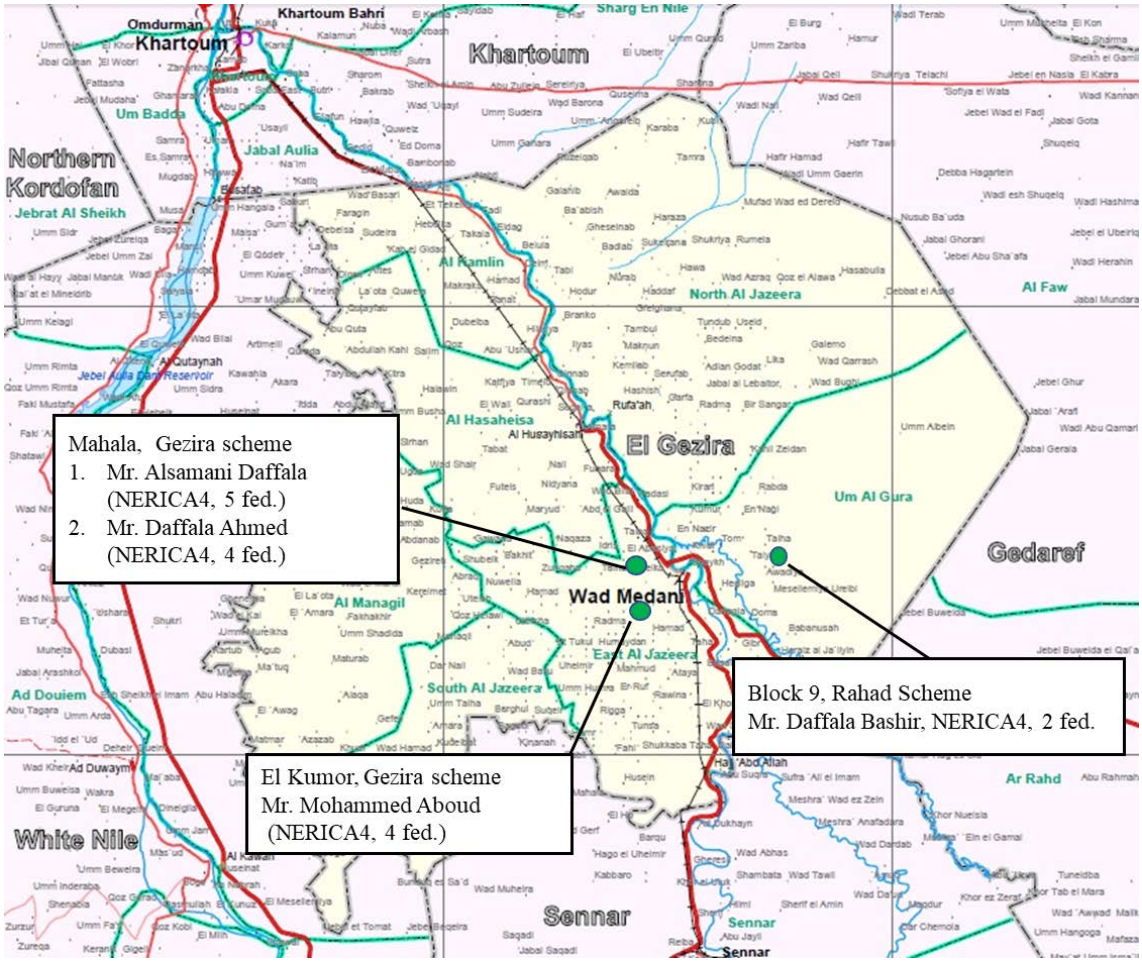
Seed and Ordinary Rice Production Sites, 2022 in Gezira State



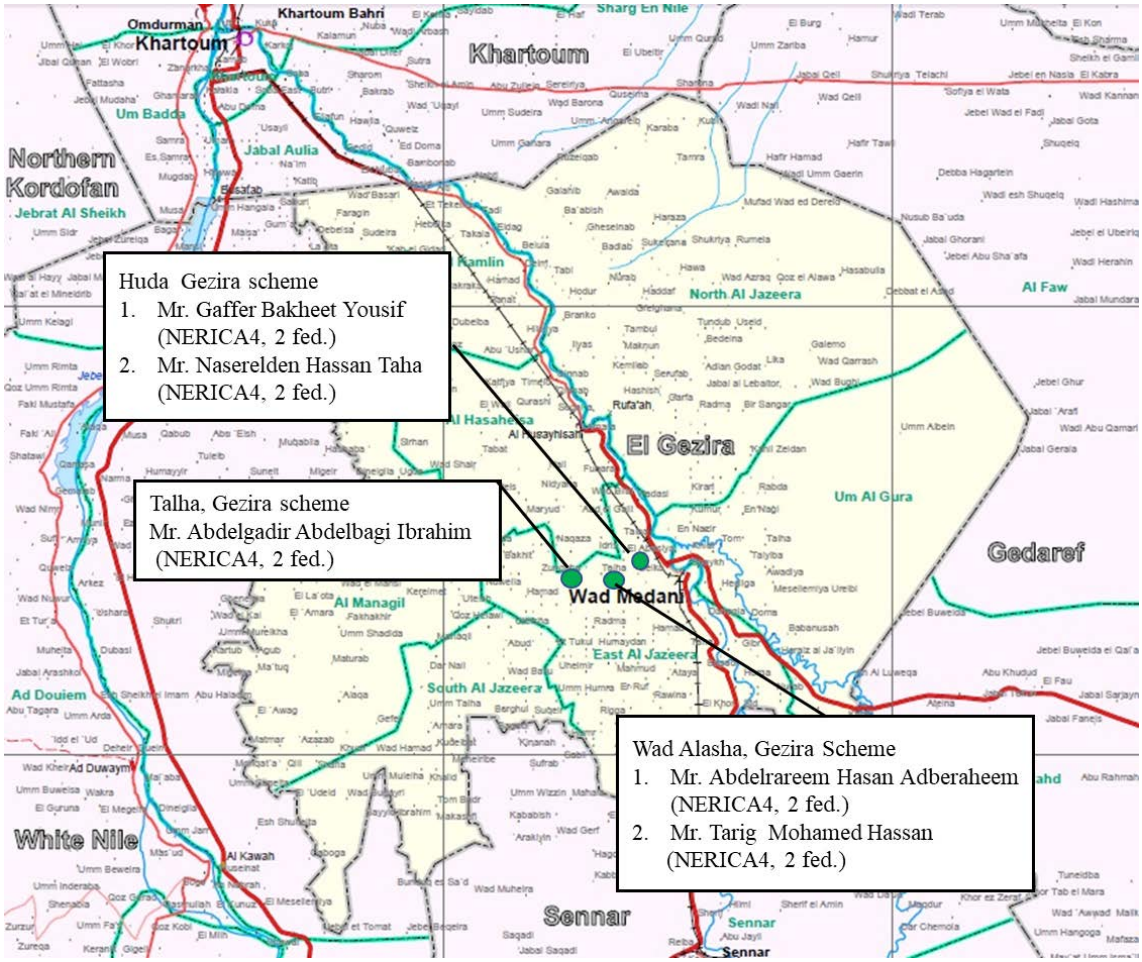
Seed and Ordinary Rice Production Sites, 2023 in Gezira State



Ordinary Rice Production Sites, 2018 in Gezira State



Ordinary Rice Production Sites, 2019 in Gezira State



Ordinary Rice Production Sites, 2020 in Gezira State

Appendix 9. Photos of activities

Photos of Activities

1. JCC meeting

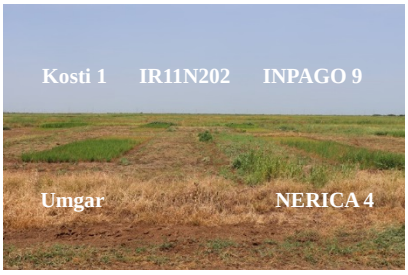
		
The first JCC	The second JCC (the center is Undersecretary at that time)	The third JCC
		
The fourth JCC	The second TSC	The fifth JCC

2. Seed production activities in ARC

＜Irrigation facilities in ARC＞

		
Canal of Gezira Scheme from which ARC HQ (GRS) field obtain irrigation water (29/01/2018)	Underground pipeline facility for providing irrigation water to GRS was under construction. (29/01/2018)	Electrical pump installed in GRS which utilize groundwater for irrigation (06/02/2018)
		
The end part of the completed pipeline facility. Through conducting subsequent test run, this facility cannot provide any irrigation water to GRS (14/06/2018)	Additional electrical groundwater pump was installed (29/06/2022)	Seed production field was located near the canal from Gezira Scheme (right) and the electrical pump (center) due to easy access to irrigation water (27/09/2022)

＜Season 2018＞

		
Sowing operation（GRS, 04/07/2018）	Sowing operation by dibbling（GRS, 04/07/2018）	FS production field （ GRS, 13/09/2018）
		
Field inspection by seed inspector (center)（01/10/2018）	Growth situation of plants of 1st sowing (Kosti 1, GRS, 13/11/2018)	Growth situation of plants of 2nd sowing (Kosti 1, GRS, 13/11/2018)

＜Season 2019＞

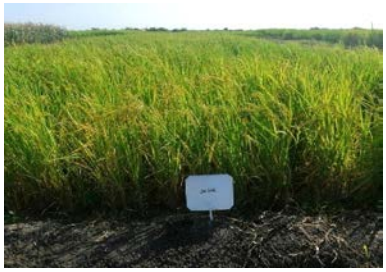
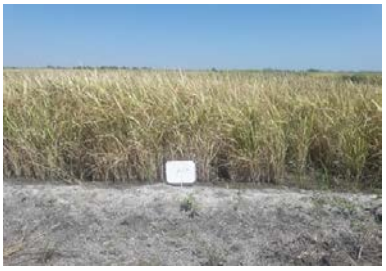
		
Sowing operation was started in the field of GRS under supervision of Dr. Yassir. (01/07/2019)	Missing hills and yellowing plants due to heavy rain were observed. (15/08/2019)	Dr. Khalid and rice plants in multiplication field at White Nile Research Station (31/08/2019)
		
Good growth of rice plants in Seed multiplication field (31/08/2019)	Missing hills are observed in the field of GRS because of inadequate drainage facility (28/10/2019)	Harvesting operation (GRS, INPAGO 9, 19/11/2019)

ARC White Nile Research Station (Kosti) Field Inspection Program (Nov. 4, 2019)

		
Installed tent in front of fields	Well grown rice in fields	Explanation by Dr. Khalid (center)
		
Rice bread and rice cookie	General view inside the tent	Dr. Khalid（National Rice Research Coordinator, ARC）
		
Mr. Hag Attwa（National Rice Coordinator, NRP）	Mr. Nakagaki, Chief Advisor	Mr. Takahashi, Chief Representative, JICA Sudan office
		
Prof. Dafalla（Representative, ARC）	Mr. Elhadi（DG, White Nile State MoPER）	Mr. Yamaguchi, 1st secretary, Embassy of Japan in Sudan

		
Undersecretary, Federal MoAF	Governor, White Nile State	

＜Season 2020＞

		
Sowing operation was started in the field of GRS by seed driller. (12/07/2020)	Missing hills due to heavy rain were observed in GRS. (15/08/2020)	Good growth condition at heading stage of seed multiplication field in GRS. (15/09/2020)
		
Most rice plants of the field in GRS became maturity stage. (15/11/2020)	Harvesting operation was started (variety: Kosti 1) in the field of GRS. (01/12/2020).	Explanation by Dr. Khalid to visitors in seed multiplication field of WNRS. (16/07/2019)
		
Mr. Hag Attwa (NRP) visited the field of WNRS (variety: Kosti 1). (13/08/2020)	Good growth of variety Umgar (98days after sowing) in WNRS (07/10/2020)	Variety NERICA 3 was in maturity stage in WNRS. (18/10/2019)

		
Harvesting operation was ongoing in WNRS (promising line: INPAGO 9). (10/11/2020)	Seed multiplication field in MRS at 97days after sowing (variety: Umgar) (18/10/2020)	Harvesting operation was started in MRS (variety: Umgar) (02/12/2020)
		
Seed multiplication field in RRS at 33days after sowing (variety: Umgar) (10/08/2020)	Extensionist of SMoA checked rice plant (variety: Kosti 1) in the field of RRS. (16/09/2020)	Dr. Jamal is Rice breeding researcher and is in charge of seed multiplication activity in RRS. (16/10/2020)
		
Good germination in seed multiplication field of SRS (variety: Umgar) (16/07/2020)	Missing hills caused by heavy rain and lots of weeds were observed in SRS (variety: Kosti 1) (12/08/2020)	Dr. Mahmoud is Rice researcher and is in charge of seed multiplication activity in SRS. (17/10/2020)

＜Season 2021＞

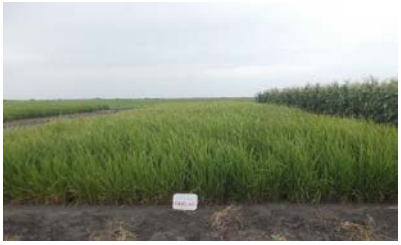
【ARC HQ (Gezira Research Station, GRS) 】

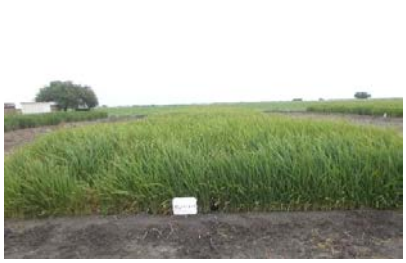
		
There was no irrigation water in Main canal. (09/07/2021).	Making sowing line by ‘Karack’ (a forked-rake for rice drill-planting) (12/07/2021)	Manual Sowing operation (12/07/2021)

		
Sowing by Seeding Machine for Kosti 1 and Umgar (15/07/2021)	Seed Multiplication Field (16/07/2021)	Irrigation water came to Main canal eventually (17/07/2021)
		
Kosti 1 (47-Day, Good growth) (31/08/2021)	Umgar (47-Day, Good growth, but weeding should be conducted) (31/08/2021)	IMPAGO 9 (50-Day, Missing hills were observed) (31/08/2021)
		
IR11N202 (50-Day, There are lot of missing hills) (31/08/2021)	NERICA 4 (50-Day, Weeding should be conducted as soon as possible) (31/08/2021)	NERICA 3 (50-Day, Weeding should be conducted soon) (31/08/2021)
		
Kosti 1 (101-Day, 24/10/2021)	Rice plants became yellow because of insufficient fertilizer (24/10/2021)	Umgar (101-Day, 24/10/2021)
		
Umgar (Left) and off-type grains (Right). (24/10/2021)	INPAGO 9 (104-Day, 24/10/2021)	Heading stage. It is required to remove off-type plants in IMPAGO 9 (24/10/2021)

		
IR11N202. (104-Day, 24/10/2021)	Heading did not start yet. Missing plants was observed although sowing density was very high in IR11N202. (24/10/2021)	NERICA 4. (104-Day, 24/10/2021)
		
Missing plants and weeds (Right), partial sterility because of insufficient irrigation water in NERICA 4 (Left) (24/10/2021)	NERICA 3 (104-Day, 24/10/2021)	White heads and partial sterility were observed in NERICA 3 as well as other varieties. (24/10/2021)

【ARC White Nile Research Station (WNRS) 】

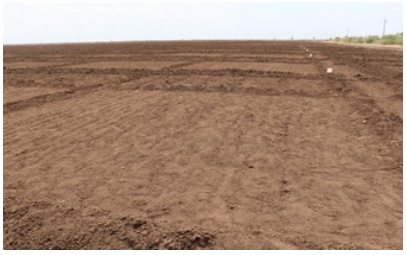
		
Explanation by Dr. Khalid about activity at WNRS including Seed Multiplication Activity (13/07/2021).	Field for Seed Multiplication Activity (right) and Seed Maintenance Activity (left) (13/07/2021)	Kosti 1 (70-Day, 13/09/2021)
		
Kosti 2 (70-Day, 13/09/2021)	Umgar (70-Day, 13/09/2021)	INPAGO 9 (70-Day, 13/09/2021)

		
IR11N202 (70-Day, 13/09/2021)	NERICA 4 (70-Day, 13/09/2021)	NERICA 3 (70-Day, 13/09/2021)

【ARC Rahad Research Station (RRS) 】

		
Explanation by Dr. Jamal about activity at RRS including Seed Multiplication Activity (07/07/2021)	Seed Multiplication field (right: Kosti 1, left: Umgar) (7/07/2021)	Kosti 1 (49-Day, Good growth despite shortage of irrigation water) (09/08/2021)
		
Umgar (49-Day, Good growth, Head of RPU visited) (09/08/2021)	Kosti 1 (85-Day, 14/09/2021)	Umgar (85-Day, 14/09/2021)
		
Dr. Jamal explained growth and characteristics of 2 varieties through this activity (17/10/2021)	Kosti 1 (Good maturity condition under insufficient irrigation water situation during growth period) (17/10/2021)	Umgar (Non-uniform growth and empty grains were observed) (17/10/2021)

【ARC Sennar Research Station (SRS) 】

		
Explanation by Dr. Mahmoud (left) about Seed Multiplication Activity at SRS (05/07/2021).	Seed Multiplication field before 1st irrigation (05/07/2021)	'Karack' which space between row and row is adjustable as needed (05/07/2021)
		
Kosti 1 (72-Day, 12/09/2021)	Umgar (72-Day, 12/09/2021)	INPAGO 9 (72-Day, 12/09/2021)
		
IR11N202 (72-Day, 12/09/2021)	NERICA 4 (72-Day, 12/09/2021)	NERICA 3 (72-Day, 12/09/2021)

＜Season 2022＞

【ARC HQ (Gezira Research Station, GRS) 】

		
Electric pump in filed No.1 which irrigate water by utilizing underground water (13/05/2022)	There was no irrigation water in Main canal (right, 13/05/2022).	1st plowing operation was conducted (13/05/2022).

		
Leveling operation was completed (29/06/2022)	There was still no irrigation water in Main canal (left. 29/06/202)	One additional electric pump which utilized underground water was installed (29/06/2022).
		
Old pump (back) and new pump (29/06/202)	Seed Multiplication Field in ARC GRS (28/09/2022)	Kosti 1 (85-Day, Full heading stage, Non-uniform growth was observed) (28/09/2022)
		
Umgar (85-Day, Initial heading stage, Conducting prompt irrigation was recommended) (29/08/2022)	INPAGO 9 (85-Day, Initial heading stage, a lot of missing hills were observed) (29/08/2022)	IR11N202 (85-Day, Heading did not start, Conducting prompt weeding operation was recommended) (29/08/2022)
		
NERICA 4 (85-Day, Heading ~ Full heading stage, Non-uniform growth, missing hills and weeds were observed) (29/08/2022)	NERICA 3 (85-Day, Full heading stage, Non-uniform growth was observed) (29/08/2022)	Seed Multiplication Field in ARC GRS (18/11/2022)

		
Kosti 1 (136-Day, Maturity stage, Good growth, Missing hills and weeds were observed.) (18/11/2022)	Umgar (136-Day, Maturity stage, Good growth, Missing hills and lodging were observed.) (18/11/2022)	INPAGO 9 (136-Day, Maturity stage, Non-uniform growth, missing hills and weeds were observed.) (18/11/2022)
		
IR11N202 (136-Day, Just before Maturity stage, Missing hills and weeds were observed.) (18/11/2022)	NERICA 4 (136-Day, Maturity stage, Non-uniform growth, a lot of missing hills and weeds were observed. Plant height was very low.) (18/11/2022)	NERICA 3 (136-Day, Maturity stage, Non-uniform growth, a lot of missing hills and weeds were observed. Plant height was very low.) (18/11/2022)

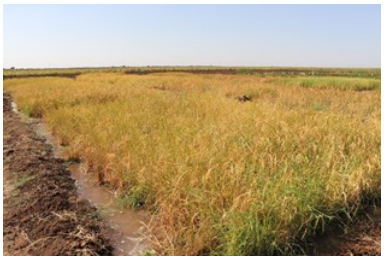
【ARC White Nile Research Station (WNRS) 】

		
Seed Multiplication Field in ARC WNRS (04/08/2022).	Dr. Khalid and Seed Multiplication Field in WNRS (04/08/2022)	Rice plants of most variety were harvested and cleaning operation was ongoing (24/11/2022)

【ARC Maatug Research Station (MRS) 】

		
Seed Multiplication Field in MRS with Mr. Ahmed Elhaj (04/08/2022).	Kosti 1 (25/09/2022)	Umgar (25/09/2022)

【ARC Sennar Research Station (SRS) 】

		
Seed Multiplication Field in SRS (23/11/2022).	Kosti 1 (23/11/2022)	Umgar (23/11/2022)
		
Kosti 2 (23/11/2022)	Wakara (23/11/2022)	INPAGO 9 (23/11/2022)
		
IR11N202 (23/11/2022)	NERICA 4 (23/11/2022)	NERICA 3 (23/11/2022)

＜Season 2023＞

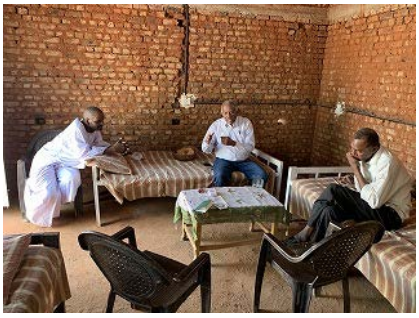

Field Day Event at MRS (01/11/2023)

3. Activity of CS production

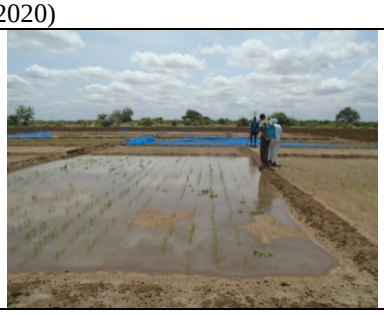
＜Season 2020＞

【Gezira State】

Selection of farmers

		
Interview to Mr. Daffala (white cloth) (March 4, 2020)	Discussion with Mr. Hassan (white cap), drainage and field (currently under cultivation of wheat) (March 4, 2020)	Field of Mr. Bakri (March 5, 2020)
		
Irrigation canal for Mr. Aboud's field (March 5, 2020)	Chick beans field of Mr. Aboud (March 5, 2020)	Mr. Mahmoud and his field (wheat is under cultivation, March 5, 2020)
		
Discussion with Mr. Abuzer (right) (March 5, 2020)	Field of Mr. Abuzer (already harvested carrot, March 5, 2020)	Mr. Alsamani (white cloth) and his field (March 5, 2020)

Production

		
Sowing operation at Mr. Daffala's field in Rahad Irrigation Scheme (June 22, 2020)	Sowing at Helewa area (July 2020)	Spraying herbicides at Hajabdallah area (July 12, 2020)
		
First irrigation at Hajabdallah area (July 12, 2020)	Mr. Daffala's field of Umgar variety (July 13, 2020)	Field of Mr. Abuzer (July 14, 2020)
		
Field of Mr. Mamoun (July 14, 2020)	Field of Mr. Abdelgadir (July 4, 2020, cancelled on July 26)	Field of Mr. Mamoun (July 25, 2020)
		
Field of Mr. Mubark (July 26, 2020)	CS field of Mr. Aboud (attacked by birds and rats, missing seedling, August 11, 2020)	CS field of Mr. Abuzer (some missing seedlings, but relatively well grown, August 11, 2020)

		
Visit to Mr. Daffala's CS field by Dr. Khalid of ARC and Gezira RPU staff. Well grown since early August, August 28, 2020)	CS field of Mr. Mamoun (August 11, 2020)	Mr. Aboud's CS field (Umgar variety, Sep. 19, 2020)
		
Mr. Mamoun's CS field (Umgar variety, Sep. 17, 2020), removing different varieties by RPU staff.	Mr. Daffala's CS field of Kosti1 variety (Sep. 17, 2020)	Mr. Daffala's CS field of Kosti1 variety (Oct. 13, 2020)
		
Mr. Aboud's CS field of Umgar variety (Oct. 15, 2020)	Mr. Abuzer's CS field of Kosti1 variety (Oct. 15, 2020)	Mr. Mamoun's CS field of Umgar variety (Oct. 14, 2020)

Field Day (Nov. 3, 2020)

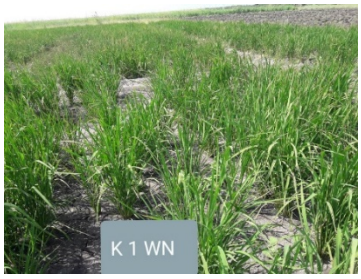
		
Speech by Governor of Gezira State	Speech by Undersecretary of MoAF	Speech by Mr. Takahashi, Chief representative of JICA Sudan office

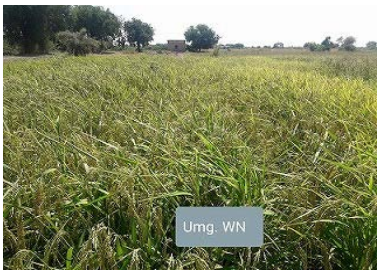
		
Mr. Mamoun (center), Mr. Takahashi and Ms. Nagano of JICA	Undersecretary and Governor experiencing manual harvest	VIPs attending the festival
		
Undersecretary demonstrates foot-pedal thresher	Mr. Takahashi and Gezira RPU staff	DG of Gezira SMoPER showing bi-products using rice flour

【Gedaref State】【Sennar State】【White Nile State】【River Nile State】【Northern State】

		
Mr. Alarabi and his CS production field in Gedaref state just after sowing (13/7/2020)	Mr. Ibrahim and his CS production field in Gedaref state just after sowing (13/7/2020)	Mr. Mahmoud's CS production field in Northern state just after sowing (21/7/2020)
		
Mr. Mustafa's CS production field in Northern state just after sowing (21/7/2020)	Mr. Alhassan's CS production field in Sennar state after sowing (16/7/2020)	Mr. Elnour's CS production field in Sennar state (16/7/2020)

		
Mr. Abdelbagi's CS production field in White Nile state (16/7/2020)	Mr. Osman's CS production field in White Nile state (16/7/2020)	Mr. Hag Attwa of NRP and RPU staff observe Mr. Ibrahim's field in Gedaref state (10/8/2020)
		
Mr. Alnour's field in Sennar state (12/8/2020)	Mr. Abdelbagi's field in White Nile state (13/8/2020)	Mr. Osman's field in White Nile state (13/8/2020)
		
Mr. Abdallah's field in Northern state (20/8/2020)	Mr. Mustafa and extensionists checking the growth at his CS field (20/8/2020)	Mr. Alnajir's CS production field in River Nile state (13/8/2020)
		
Mr. Altaib's CS production field in River Nile state (13/8/2020)	Mr. Alarabi's CS production field in Gedaref state (16/9/2020)	Field inspection by SA staff at Mr. Alarabi's field in Gedaref state (16/9/2020)

		
Mr. Ibrahim's CS production field in Gedaref state (16/9/2020)	Mr. Abdelbagi's CS production field in White Nile state. The first field inspection was conducted on this day (19/9/2020)	Mr. Osman's CS production field in White Nile state. The first field inspection was conducted on this day (19/9/2020)
		
Mr. Alnajir's CS production field in River Nile state (27/9/2020)	Mr. Altaib's CS production field in River Nile state (27/9/2020)	Mr. Abdallah's CS production field in Northern state. SA team accopanied by Mr. Hag Attwa and Dr. Hassan inspected the field (30/9/2020)
		
Mr. Mustafa's CS production field in Northern state. SA team accopanied by Mr. Hag Attwa and Dr. Hassan inspected the field (30/9/2020)	Staff of SA inspects the CS production field in White Nile state (18/9/2020)	Mr. Abdallah Mahmoud's CS production field in Northern state. (7/10/2020)
		
Mr. Alarabi's CS production field in Gedaref state. (16/10/2020)	Mr. Ibrahim and his CS production field in Gedaref state. (16/10/2020)	Mr. Alhassan's CS production field in Sennar state. (18/10/2020)

		
Mr. Alhassan's CS production field in White Nile state. (18/10/2020)	Mr. Osman and his CS production field in White Nile state. (18/10/2020)	Mr. Altaib and his CS production field in River Nile state. (9/10/2020)
		
SA staff inspecting Mr. Alnour's CS field in Sennar state. (28/10/2020)	SA staff inspecting Mr. Alarabi's CS field in Gedaref state. (4/11/2020)	Cleaning of harvested seed at Mr. Ibrahim's field in Gedaref state (4/11/2020)
		
Cleaned seed at Mr. Ibrahim's field in Gedaref state (4/11/2020)	Manually harvested rice at Mr. Alnour's field in Sennar state (30/11/2020)	Using pedal-type thresher for the harvested rice at Mr. Alnour's field in Sennar state (30/11/2020)

＜Season 2021＞

【Gezira State】

		
Mr. Abu Elemam's CS field in Block 10, Rahad Irrigation Scheme (Umgar variety, July 21, 2021)	Mr. Mohamed Abdalla's CS field in Block 10, Rahad Irrigation Scheme (Umgar variety, July 21, 2021)	Mr. Abdelgadir Abdelbagi's CS field in Abdelhakam, Gezira Irrigation Scheme (Kosti1 variety, July 11, 2021)

		
Mr. Alsamani Mohamed's CS field in Mahala, Gezira Irrigation Scheme (Kosti1 variety, July 21, 2021)	Mr. Mobashir Mohamed's CS field in Wadsawi, Gezira Irrigation Scheme (Kosti1 variety, July 21, 2021)	Mr. Mohamed Gilani's well grown CS field in Wadsawi area (Kosti1 variety, September 1, 2021)
		
Mr. Mohamed Abdalla's CS field in Block10, Rahad (Umgar variety, September 2, 2021)	Mr. Goto and RPU staff checking CS field and farmer engage in removal of different varieties at Mr. Gilani's field (Oct. 20, 2021)	Rice already dry at Mr. Gilani's CS field (Oct. 20, 2021)

【Gedaref State】

		
Discussion between farmers and RPU with the Project on CS production in the field of Gedaref State (07/07/2021)	One (1) CS field (Variety: Umgar, 2feddan) (07/07/2021)	Weed already appeared just after sowing despite applying pre-emergence type of herbicide. (07/07/2021)
		
CS field of Mr. Alttayif Altayeb. There was no weed due to conducting pre-watering operation (07/07/2021)	Clean and no weed (same as on the left field, 07/07/2021) Field Day Event was conducted in this field on 23/10/2021 for this season.	Field of Mr. Ibrahim Abdelraman (Variety: Kosti 1, 2feddan) (14/09/2021)

		
Field of Mr. Ahmed Alarabi (Variety: Umgar, 2feddan,) (14/09/2021)	Field of Mr. Altayeb Mohammed (Variety: Kosti 1, 2feddan) (14/09/2021)	Field of Mr. Alttayif Altayeb (Variety: Kosti 1, 2feddan) (14/09/2021)
		
Field of Mr. Ibrahim Abdelraman (Variety: Kosti 1) (17/10/2021)	Rice growth was good, but there are a lot of weeds (17/10/2021).	Field of Mr. Ahmed Alarabi (Variety: Umgar) (17/10/2021)
		
Rice growth was good. Conducting irrigation was required (17/10/2021).	Field of Mr. Alttayif Altayeb (Variety: Kosti 1) (17/10/2021)	There are so many weeds, missing places and no irrigation water (17/10/2021).

Field Day (Oct. 23, 2021)

		
Harvest demonstration by combine-harvester operated by State Governor and VIPs (23/10/2021)	Neighboring farmers rejoiced to see the harvested rice (23/10/2021).	Final speech by State Governor (23/10/2021)

【Sennar State】

		
Exchange of opinion on CS production between farmers and RPU with the Project at Kassab in Sennar State (05/07/2021)	One (1) CS field (Variety: Kosti 1, 2feddan) at Kassab before 1st irrigation (05/07/2021)	Herbicide "Pendinuor" (Pendimethalin) was applied in all fields in Sennar State (05/07/2021)
		
CS fields in Maiurno (Variety: Kosti 1, Total area: 4feddan) (06/07/2021)	Insufficient irrigation water and rainfall caused occurrence of weeds and non-uniform growth of rice plants in the field (06/07/2021).	Field of Mr. Abdalla Musa (Variety: Umgar, 1feddan, Kassab) (12/09/2021)
		
Field of Mr. Alnadhif Malik (Variety: Umgar, 1 feddan, Kassab) (12/09/2021)	Field of Mr. Mhmd. Elhassan (Variety: Kosti 1, 2 feddan, Kassab) (12/09/2021)	Field of Mr. Alnour Ali Easa (Variety: Kosti 1, 2feddan, Kassab) (12/09/2021)

【White Nile State】

		
CS field (Variety: Umgar, 3feddan, there were lots of higher and lower places in the plot, and seed was sown by broadcasting (12/07/2019)	Plot size was small, but water cannot be irrigated uniformly in the plot because of uneven leveling (12/07/2021)	Sowing operation was completed without removing residues of previous crop (12/07/2021)

＜Season 2022＞

【Gezira State】

		
Discussion among RPU staff and Mr. Gilani (white cap) in Wadsawi	CS field in Wadsawi area (fewer weed than 2021, July 24, 2022)	Alsamani's CS field (uneven field levelness and germination, July 26, 2022)
		
From left, Mr. Tsukada (JICA Sudan office), Mr. Osama (Director, RPU), Mr. Alsamani (farmer) and Mr. Ahmed (JICA Sudan office)	Better growth parts in Wadsawi (Sep. 15)	Poor growth parts in Wadsawi (Sep. 15)
		
Yield survey (Wadsawi area, Nov. 2)	Threshing surveyed sample (Wadsawi, Nov. 2)	Transported harvesters (wheel type, right, and caterpillar type, left)
		
Wheel type harvester ejecting grains onto blue sheet	Grains harvested with caterpillar type harvester (Nov. 2)	Grains harvested with wheel type harvester (Nov. 2)

【Sennar State】

		
CS production field (Variety: Kosti 2, 5feddan) at Kassab: Growth delay caused by heavy rain was observed (01/09/2022).	CS production field (Variety: Umgar, 2feddan) at Kassab: Growth delay caused by heavy rain was observed (01/09/2022)	CS production field (Variety: Kosti 1, 3feddan) at Kassab: Growth delay caused by heavy rain was observed (01/09/2022)
		
Bigger amount of Urea than usual amount was applied as topdressing for recovering growth of rice plants (01/09/2022)	Growth of rice plants was started to recover steadily by proper field management such as fertilization, weeding, water management, etc. (22/09/2022).	Weeding operation by farmers and RPU (22/09/2022)
		
Starting maturity stage at CS production field (Variety: Kosti 2, 5feddan) at Kassab (29/10/2022).	Before maturity stage at CS production field with farmer (Variety: Kosti 2, 5feddan) at Kassab (07/11/2022).	

【White Nile State】

		
CS production filed at Kosti, Good growth, Fertilizer (Urea) application conducted by farmer (10/08/2022).	Visiting CS production filed by NRP staff and discussion with RPU (15/09/2022)	Head of RPU (right), Mr. Ogasawara (center) and Dr. Hassan (right) (07/11/2022)

【River Nile State】

		
CS production filed at Alyab, (04/10/2022).	Farmers, RPU and NRP staff in CS production filed at Alyab, (04/10/2022).	

＜Season 2023＞

【Gezira State】

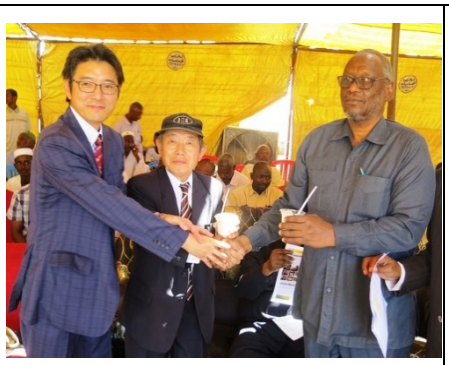
		
Mr. Jalal, a CS farmer in Medina Arab area (June 2023)	Machine sowing in Medina Arab area (June 2023)	Mr. Alsamani (right), CS farmer in Mahala and Mr. Nzar, Gezira RPU
		
Machine sowing in Mahala area (July 2023)	Machine sowing in Wadsawi area (July 2023)	Mr. Jalal's CS field in Medina Arab area (Kenana variety, Oct. 9, 2023)
		
Mr. Alsamani's CS field in Mahala area (Kanana variety, Oct. 9, 2023)	Mr. Gilani's CS field in Wadsawi area (Abassya variety, Oct.9, 2023)	Field inspection at Wadsawi area (Oct. 9, 2023)

4. Ordinary rice production in Gezira

＜Season 2018＞

		
Mr. Daffala's field of NERICA4 variety in Rahad (proper crop management is carried out) (Oct. 2018)	Mr. Aboud's field of Umgar varietyin Alkoumor in Gezira (well grown and expected harvest at the end of October) (Oct. 2018)	Mr. Galal's field in Medina Arab, Gezira (less land levelness and faced shortage of irrigation water caused by broken main canal) (Oct. 2018)

Field Day (Nov. 4, 2018)

		
Mr. Nakagaki explains rice crop to Undersecretary	(from left) Mr. Takahashi (JICA Sudan office), Mr. Nakagaki and Dr. Azhari (Undersecretary)	Explanation by Dr. Khalid (center) of ARC

＜Season 2019＞

		
Mr. Daffala's field in Block 9, Rahad (relatively good growth, but observed several holes made by rats. August 2019)	Mr. Daffala's field in Block 9, Rahad (completely inundated by heavy rainfall. Sept. 12, 2019)	Main road (front) and field (back) in Mahala, Gezira (Oct. 8, 2019)

		
Condition of access road to the fields in Mahala, Gezira (Oct.8, 2019)	Mr. Alsamani's field in Mahala, Gezira (many missing hills and poor growth. Oct. 8, 2019)	Mr. Alsamani's field in Mahala, Gezira (damaged by livestock. Oct. 21, 2019)

＜Season 2021＞

		
Mr. Abdelrahim Mohamed's ordinary rice field at Umkitera area, Rahad (Umgar variety, need weeding) (July 2021)	Mr. Hashim Abdalla's ordinary rice field at Umkitera, Rahad (Umgar variety, need resowing and weeding) (July 2021)	Mr. Ali Mokhtar's ordinary rice field at Blcok 10, Rahad (Umgar variety, need resowing and weeding) (July 2021)

＜Season 2022＞

		
Mr. Fatalrahman's ordinary rice field in Hasahisa area (Kosti1 variety, July 24, 2022)	Mr. Daffala's ordinary rice field in Rahad (NERICA4 variety, July 28, 2022)	Mr. Baderaldeen's ordinary rice field in Kamlin area(Kosti1 variety, July 31, 2022)

		
Mr. Fatalrahman's OR field in Hasahisa (Kosti1 variety, Sep. 15)	Mr. Fatalrahman's field of poor growth (Sep. 15)	Mr. Fatalrahman's better growth part (Sep. 15)
		
Mr. Daffala's OR field (Kosti1 variety, Sep. 20)	RPU staff checking rice at Rahad (Sep. 20)	Measuring paddy moisture content in Rahad (Nov. 8, 2022)
		
Harvesting in Rahad (Nov. 13, 2022)	Spreading grains on aplastic sheet for drying in Rahad (Nov. 13, 2022)	Hasahisa field missing hills and many weed (Nov. 21, 2022)

＜Season 2023＞

	
Mr. Daffala and his field in Rahad (photo obtained on Oct. 19, 2023)	Mr. Daffala's field in Rahad (photo obtained on Oct. 19, 2023)

5. Training, workshop

Training for seed production preparation (January 14, 2020)

Technical training on CS production (March 2~3, 2020)

CS production training

Chief Advisor, Mr. Nakagaki

Mr. Hag Attwa of NRP

Dr. Tawhida（DG, SMoPER）

CS farmers

Gezira RPU staff explaining different varieties

		
Practices on manual harvesting	Practice on manual threshing	

Training on Harvesting and Postharvest Handling (October 13~14, 2020)

		
Guests and lecturers	Dr. Khalid, ARC WNRS	Ms. Wahiba, SA
		
Mr. Arabi, CS farmers from Gedaref State	Practice at Gezira RPU office	Threshing practice

Wrap-up training (February 15~16, 2020)

		
Discussion with a CS farmer, Mr. Daffala (February 13, 2020)	Field of Mr. Daffala after harvesting (February 13, 2020, observed fallen rice grains)	Speech by Dr. Ayman, DG of Gezira SMoPER

		
Speech by Ms. Nafeisa, DG of Gedaref SMoPER	Mr. Hag Attwa (right), NRP and Dr. Khalid (left), ARC	Mr. Nakagaki, chief advisor
		
Training hall	Presentation of Mr. Ibn Idris, ASC	Reporting by Mr. Ogasawara

Workshop on CS production planning (April 5~6, 2021)

		
Workshop title	Workshop hall	Workshop hall
		
Speech by Mr. Hag Attwa, NRP	Speech by Mr. Ahmed, Director, Gezira RPU	Presentation by Mr. Abdelgadir, Gezira RPU, on issues on last season and measures for coming season

		
Presentation by Mr. Nzar, Gezira RPU, on CS production plan and work schedule	Question by a farmer	Speech by Dr. Ayman, DG, Gezira SMoPER
		
Presentation by a representative of Northern SMoPER	Presentation by a representative of Sennar SMoPER	Presentation by a representative of Gedaref SMoPER
		
Presentation by a representative of White Nile SMoPER	Presentation by a representative of River Nile SMoPER	Wrapping up by NRP, Gezira RPU and ARC

Wrap-up meeting (training) (March 14~15, 2023)

		
Overview of the training	Speech by Mr. Hag Attwa, NRP	Speech by Mr. Nakagaki, project Chief Advisor

		
Speech by Ms. Arafa Mahmoud, Deputy DG, Gezira SMoPER	Lecture by SA, MoAF	Mr. Osama, Director, Gezira RPU, presenting on cost analysis
		
Mr. Nzar, Gezira RPU, presenting on CS production	Mr. Daffala presenting on 2022 ordinary rice production	Presentation by River Nile SMoPER

OJT on post-harvest (Nov. 2022)

		
Guidance was given on how to separate husks and other impurities from paddy in Rahad.	Well cleaned storage by extension workers in Hasahisa	Replacing damaged air tube on the milling machine in Haj Abdhula
		
Guidance was given on adjusting roll clearance in Hosh	Showing de-husked brown rice to the locality officer in Fadashi	Cleaning work after milling operation in Fadashi