Summary of TP-R and Extension Guide

Training on Rice Production
-Essence of Technical Package-

The Sustainable Rice Development Project in Sierra Leone (SRDP)

JICA-MAFFS

Technical Package and Extension Guide

Technical Package on Rice Production

- A set of recommended rice farming practices on rice production techniques suitable for IVS.
- Target yield is set at 3 ton/ha or more.
- Proper amount of fertilizer is applied at right time.
- Certain conditions are required to achieve the target.

Extension Guide

- A guidebook for disseminating TP-R to FBO farmers.
- All the recommended practices in TP-R are dealt with.
- Each practice or technique can be introduced at FFS.
- Facilitation methods are shown with extension materials.

Contents of TP-R

(1) Use of quality seed
(2) Proper land preparation
(3) Careful planning before the cropping
(4) Proper nursery management (seed rate, nursery period, etc.)
(5) Proper transplanting (planting density, the number of seedlings per hill, planting depth, etc.)
(6) Proper crop management (timely weeding, appropriate fertilizer application, adequate water management)
(7) Proper harvest, and post-harvest and handling (timely harvest, proper drying, threshing, and storage)

<u>Emphasis is put on the timeliness of the farming practices according to the growth stage of rice plants</u>

Extension Guide

1. Basic knowledge on rice production (life cycle of rice plant, yield components, cropping calendar)
2. Seed production (self-production of seed by farmers)
3. Land development and land preparation (creating better environment for rice growing)
4. Crop management (nursery, transplanting, fertilizer management, water management, weed control, insect and pest control, harvest and post harvest handling)
5. Field trial and FFS trial plot

Summary for Life Cycle, Yield Components and Farming Plan with Cropping Calendar

- ✓ The entire life of rice plants is divided into three growth stages; namely vegetative growth stage, reproductive stage, and the ripening (grain filling) stage.
- ✓ Difference between long duration and short duration varieties is its difference in duration of vegetative growth stage.
- ✓ Each of three stages determines the number of panicles, the number of grains per panicle or size of panicle, and degree of grain filling, respectively, which constitute important parts of yield component.
- ✓ Farmers are advised to make a farming plan with cropping calendar before the cropping season starts.

Summary for Nursery Preparation

- ✓ Nursery site should be established at open area exposed to sunlight. It is on either dry or wet land where water could be drained easily.
- ✓ Nursery soils should not be of heavy clay or contain too much gravel.
- ✓ Nursery bed is slightly raised and divided into small beds by footpath/water course for easy work and water control. Soils should be well cultivated before sowing.
- ✓ Nursery bed with about 1 m width is recommended.
- ✓ Sowing density is about 1 kg per 10 m^2.
- ✓ Seed rate is about 25 - 30 kg/ha, depending on the quality of seeds and planting method.
- ✓ Selection of good seeds with water, and execution of germination test are recommended.
- ✓ Proper pre-germination treatment is also recommended for wet nursery.

Summary for Transplanting

- ✓ Seedlings are recommended to be uprooted at 2 to 3 weeks after sowing when they develop four leaves.
- ✓ Uprooting should be done with care. Soils attached to roots are gently removed with water.
- ✓ Uprooted seedlings are immediately carried to the main field for transplanting. The roots of seedlings are always kept wet.
- ✓ Transplanting is made with 2 to 3 seedlings per hill at 20 cm apart between hills. Planting is done at a depth of 2 to 3 cm.
- ✓ The main field should be well puddled and leveled before transplanting.
- ✓ At transplanting, soils in the main field is soft, and saturated with water.
- ✓ After transplanting, water depth is kept shallow for several days.

Summary for Land Development and Land Preparation

- ✓ Land development works in IVS include drainage canal construction, bund construction, and leveling of paddy fields.
- ✓ Drainage canal is constructed in the lowest part of IVS to get excess water out of the plots.
- ✓ Paddy fields are divided into plots by bund and leveled.
- ✓ Bunds should be constructed on slope to reduce the work burden and avoid mixing subsoil with top soil in levelling.
- ✓ Land preparation works start with brushing, followed by clearing, digging, puddling and leveling.
- ✓ First digging aims to turn over and break soils, and to cut roots of weeds. Digging should be done as deep as possible.
- ✓ Brushing, clearing and digging should be finished before nursery preparation.
- ✓ Puddling is done to mix soils well with water so that roots of seedlings can grow and absorb water with nutrients easily.
- ✓ Leveling is made to provide rice plants with uniform environment in terms of water and nutrient for growth.

Summary for Fertilizer Management and Water Management

- ✓ Chemical fertilizer is dissolved into water and absorbed by plant. Nitrogen (N), phosphorus (P) and potassium (K) are the three major elements of fertilizer.
- ✓ Fertilizer is applied in two times: 1) when tillers are produced (at transplanting) and 2) when panicles are formed (about 2 months before harvesting).
- ✓ For lowland rice in IVS, the recommended dosage of nutrients is tentatively set at $N:P_2O_5:K_2O = 45:45:45$ kg/ha.
- ✓ Appropriate water management is necessary to provide rice plants with better growing environment.
- ✓ When fertilizer is applied, water depth in the rice field should be kept shallow to promote nutrient absorption.

Summary for Seed Production

- ✓ Seeds should be produced by farmers themselves because access to quality seeds is limited in the country.
- ✓ Seed rice should have high germination rate and high purity.
- ✓ Cultivating several rice varieties with different growth duration causes difficulty in harvesting and affects rice yield.
- ✓ Cleaning of seeds is done through sorting out, and selection of healthy seeds is done by floating.
- ✓ Germination test is conducted to confirm the viability of the seeds. Pre-germination treatment is recommended for wet nurseries to secure uniform germination.
- ✓ Single seedling per hill is transplanted in line.
- ✓ Periodical removal of off-type plants is necessary to obtain pure seed.
- ✓ To maintain its viability, seed rice should be kept under cool and dry conditions until next season.

Summary for Other Issues on Rice Production -1

- Weed management
  - ✓ Weeding should be done when weeds are still small to avoid competition with rice for light, nutrition and water.
- Plant protection
  - ✓ Insect pest and diseases
    - Caseworm and Africa Gall Midge are major insects.
    - Careful water management and/or field management are necessary to control those insects.
  - ✓ Rodents and birds
    - Clean the surroundings of the rice field (brush the bushes)
    - Shift the cropping calendar
    - Put barrier (fence) or traps

Summary for Other Issues on Rice Production -2

- Harvesting
  - ✓ Harvest at right time when 80 – 85% of panicles turn yellow.
  - ✓ When harvest, moisture content of paddy is normally 20 - 25%.
- Post-harvest handling
  - ✓ Desirable moisture content of paddy when stored is 12 - 14%.
  - ✓ Sufficient drying of paddy after harvest (before or after threshing) is a must.
  - ✓ Drying before store should be done on concrete floor or tarpaulin sheet to avoid the inclusion of impurities including small stones.

Summary for FFS and Field Trial

- ✓ FFS trial plot provides the farmers with opportunities to verify the value of new techniques on rice production.
- ✓ New techniques should be adopted when their effectiveness or value is confirmed through trials.
- ✓ Simple trial regarding only one technique is recommended. Other production techniques should be the same between two plots.
- ✓ The FFS trial plot should be established with homogenous conditions in terms of topography, soil and water, so as to eliminate other factors than techniques to be compared.
- ✓ Field trial is similar to FFS trial but more scientific. It needs more treatments to obtain reliable data.

Rice Farming Practices and Grain Yield in FBO Communal Farms

Sustainable Rice Development Project in Sierra Leone (SRDP)

1. Outline

Under the sub-component 1 of the Smallholder Commercialization Programme (SCP), viable Famer Based Organizations (FBOs) were identified by MAFFS Kambia office (MAFFS-K). They were expected to be future core business enterprises centering on Agricultural Business Center (ABC). MAFFS-K assigned a community facilitator (extension worker) to each FBO to make regular visit and supervise farmers' activities through the Farmer Field School (FFS). SRDP/JICA collaborated with MAFFS-K to support FBOs' successful activity by facilitating the production increase know-how of rice culture at their communal farms through technical cooperation and input provision.

The total number of FBO farms and net number of FBOs supported by SRDP was respectively 89 and 37 from rainy season in 2011 to dry season in 2013-2014 (Table 1).

Table 1. Gross number of FBO communal farms in six cropping seasons from 2011 to 2014.

Geo-code	Chiefdom	2011 Rainy season	2011/12 Dry season	2012 Rainy season	2012/13 Dry season	2013 Rainy season	2013/14 Dry season	Total no. of farms	Net no. of FBOs
58	Mambolo	3	0	1	0	2	0	6	5
59	Samu	3	0	0	0	1	0	4	4
60	Gbinleh Dixon	3	4	2	5	4	5	23	6
61	Magbema	5	8	0	2	4	0	19	7
62	Masungbala	3	1	3	4	4	2	17	8
63	Tonko Limba	4	2	4	5	2	0	17	6
64	Bramaia	1	0	0	1	1	0	3	1
	Total	22	15	10	17	18	7	89	37

Although SCP supports to every FBO for one year in principle, SRDP/JICA supported not a few FBOs for several cropping seasons to realize effective and efficient technical transfer to them. Such successive supports surely helped afford sufficient time for farmers to acquire knowledge on improved rice cultivation and success in attaining better production.

2. SRDP provision

SRDP/JICA provided the following support to each of the FBOs and the community facilitators.

1) Regular on-farm technical guidance and monitoring specifically rice cultivation techniques

2) Training session on rice cultivation techniques for FBO farmers and community facilitators

3) Fertilizer supply based on area cultivated and the recommended fertilizer rate in each cropping season.

4) Rice seeds: 62.5 kg/ha in 2011 and 50kg/ha in 2012 on loan basis as SCP directed. No rice seed was provided after 2013 due to poor access to reliable seed source: instead, SRDP instructed the seed multiplication technique to FBOs.

5) Fuel for motorbikes to community facilitators

3. Basic farming conditions

1) While each FBO generally worked on one communal farm, several FBOs did on several farms.

2) Each FBO normally made a group work on one day a week at least and the number of group working days per week was increased depending on busyness.

3) Farmers established dry nursery in rainy season and wet nursery in dry season.

4) Many FBOs constructed or maintained water control facilities such as bund (dike) and drainage canal to ensure the effectiveness of fertilizer application. Nevertheless, torrential rain often caused a flooding problem.

5) A recommended rate of fertilizers (N-P_2O_5-K_2O kg/ha) was 60-40-40 in the first season, 60-60-60 in the subsequent three seasons, and 45-45-45 in the last two seasons (Table 2). Fertilizers used were NPK compound fertilizer (15-15-15) and urea (46-0-0).

Table 2. Recommended and actural fertilizer rate (N-P_2O_5-K_2O kg/ha) at FBO communal farms.

Year	Cropping season	Recommended rate			Mean actural rate (total)
		Basal	Top-dressing	Total	
2011	Rainy	40-40-40	20-0-0	60-40-40	32-25-25
2011-2012	Dry	40-40-40	20-20-20	60-60-60	39-39-39
2012	Rainy	40-40-40	20-20-20	60-60-60	52-52-52
2012-2013	Dry	40-40-40	20-20-20	60-60-60	-
2013	Rainy	30-30-30	15-15-15	45-45-45	-
2013-2014	Dry	30-30-30	15-15-15	45-45-45	-

4. Farming activities and grain yield

SRDP members periodically visited the FBOs' communal farms and monitored plant growth, farming activities and swamp conditions. At full maturity, SRDP measured harvested area and grain yield. When an FBO group owned plural farms, one or several farms was randomly selected. Detailed monitoring records including FBO attributes, farming practices, crop performance, and constraint are shown in Appendix.

Note on the fertilizer rate:

1) Quantity of fertilizers applied to each of the communal farms was collected through an interview with farmers, and the fertilizer rate per unit area was calculated on the basis of measured area. Yet, actual fertilizer application rate in each of the communal farms unfortunately remained to be ambiguous.

2) An unequal application rate of elements like 55-31-31 in the Appendix might signify that a part of fertilizer (24-0-0) was top-dressed. In contrast, in a case of an equal application rate like 40-40-40, it was not clear whether all fertilizers were basally applied without top-dressing, most probably owing to flooding, or that two-third and one-third of fertilizer was applied as basal and top dressing, respectively.

5. Interpretation of records and observation

All the data were analyzed on a farm basis because farm conditions differed among farms. The terms of farm and FBO are synonymous in the text.

1) Mean grain yield

Mean grain yield averaged in respective years and seasons varied from 1.3 to 2.1 ton/ha, where it was larger in dry season than in rainy season (Fig. 1). Grain yields increased with an advancement of the year. The increase would be derived from capacity development for farmers in rice cultivation techniques through repeated training and on-farm technical guidance. Multiple year support to earnest and cooperative FBOs selected would be another reason of yield increase over the year. Changes in recommended fertilizer rate from 60-40-40 to 45-45-45 increased the amount of phosphorus and also its proportion relative to nitrogen rate, and might resulted in increasing the productivity. Phosphorus is known as the most deficient nutrient in lowland soils in Sierra Leone.

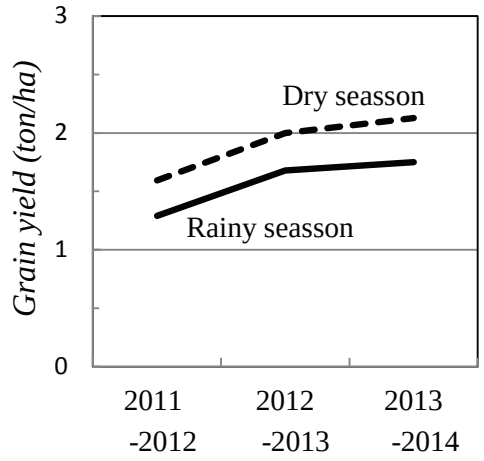


Fig. 1 Mean grain yield in two cropping seasons.

Grain yield was tended to be small when harvested (cropped) area was relatively large both in rainy and dry seasons (Fig. 2). When a farming scale was smaller, farmers would pay attention to better management and make possible to carry out timely farming practices. Area planted was

smaller in dry season than in rainy season because of limited water supply in the former. Smaller acreage might contribute to higher yield in dry season cropping.

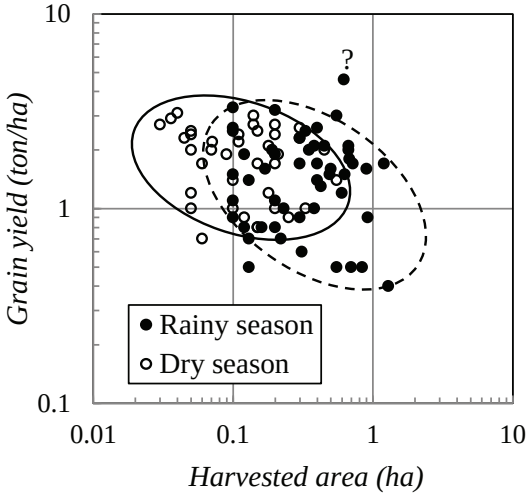


Fig. 2 Relationship between harvested area and grain yield.

2) Farming practices between high and low yielding FBO groups

Grain yield largely varied among FBO farms and its variation showed a bimodal tendency with a large peak at 0.5-1 ton/ha and 1.5-2.5 ton/ha (Fig. 3). To find the reasons why there was such a large variation in productivity, the performance of a high-yielding group and a low-yielding group was compared. They were respectively selected from FBO farms of which grain yield was larger than or equal to 2.5 ton/ha and smaller than or equal to 1 ton/ha.

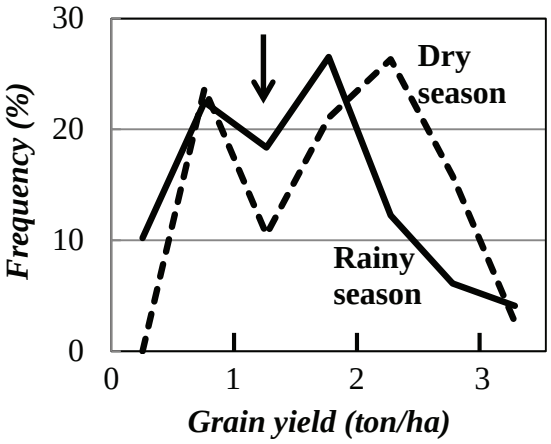


Fig. 3 Frequency distribution of grain yields in rainy and dry season cropping.

The total number of farms was 16 and 25, harvested area was 0.18 and 0.32 ha/farm and grain yield was 2.8 and 0.8 ton/ha averaged over the rainy and dry seasons respectively in the high- and low-yielding groups (Table 3).

Table 3. Number of farms, mean harvested area and grain yield of farms in high- and low-yielding groups.

	High yielding FBOs (≧2.5 ton/ha)		Low yielding FBOs (1.0≧ ton/ha)		Mean of rainy and dry seasons (a)	
	Rainy season	Dry season	Rainy season	Dry season	High Y. FBOs	Low Y. FBOs
Number of farms	7	9	16	9	16	25
Mean harvested area (ha/farm)	0.25	0.12	0.41	0.16	0.18	0.32
Mean grain yield (ton/ha)	2.8	2.7	0.7	0.9	2.8	0.8

a) Weighted mean.

As for farming practices, shallow planting was more frequently practiced by the high-yielding group than the low-yielding one, and proper leveling (land smoothing) percentage was also higher by the former (Table 4). At the same time, the proportions of cropping calendar preparation, germination test, and land preparation before sowing were high in FBOs who obtained high yield. These practices show farmers' challenging attitude towards farming activity, and their effort was rewarded with better yield. Respective farming activities will contribute to yield improvement at a limited extent, but integrated practices will greatly help to enhance productivity. Rice productivity was not analyzed in terms of fertilizer usage because of its ambiguity.

Water shortage obviously affected grain production in dry season cropping. Bird damage decreased yield in many farms. The high-yielding group too was suffered from them in dry season cropping. In fact, dry season cropping is not practiced in some areas simply because of expected serious bird damage. Disease and insect incidences were meagre under the current cultural environment in Kambia district.

Table 4. Proportion (%) of recommended farming activities practiced and constraints encountered by high- and low-yielding FBO farms.

	High yielding FBOs (≧2.5 ton/ha)		Low yielding FBOs (1.0≧ ton/ha)		Mean of rainy and dry seasons (a)		Relative evaluation	
	Rainy season	Dry season	Rainy season	Dry season	High Y. FBOs A	Low Y. FBOs B	A-B	A/B
	Proportion (%) of farming activities practiced							
Cropping calendar preparation	57	33	0	0	44	0	44	∞
Germination test	57	44	8	0	50	5	45	11.0
Sun-exposed nursery	100	67	92	67	81	81	0	1.0
Appropriate seed rate in nursery	29	0	0	0	13	0	13	∞
Proper seed density in nursery	57	78	40	33	69	37	32	1.9
Careful uprooting	83	67	27	25	73	26	47	2.8
Use of 3-week-old seedling	100	100	44	78	100	56	44	1.8
2-3 seedlings/hill	86	100	46	44	94	45	48	2.1
Shallow planting	100	100	9	33	100	20	80	5.0
Proper planting density	71	50	19	56	60	32	28	1.9
Timely weeding	43	13	0	0	27	0	27	∞
Bund construction	100	78	44	33	88	40	48	2.2
Drainage facility	71	78	31	33	75	32	43	2.3
Land preparation before sowing	71	100	25	22	88	24	64	3.7
Proper puddling	100	100	50	100	100	68	32	1.5
Proper leveling	86	89	8	11	88	10	78	9.2
	Proportion (%) of constraints encountered							
Flash flood	0	0	6	0	0	4	-4	0.0
Flooding	0	0	25	11	0	20	-20	0.0
Water shortage	0	33	19	56	19	32	-13	0.6
Weed infestation	14	22	50	78	19	60	-41	0.3
Bird damage	0	33	38	33	19	36	-17	0.5
Disease outbreak	0	0	0	0	0	0	0	-
Insect attack	0	0	6	0	0	4	-4	0.0

a) Weighted mean.

3) Growth duration affected with sowing dates

ROK 5, ROK 10 and Pakiamp were all photo-sensitive cultivars (Fig. 4). The total growth duration (sowing to harvest) of ROK 10 was longer than 180 days when the cultivar was sown in early July, and about 150 days when it was sown in late September, for example.

The total growth duration of Buttercup and NERICA L19 was somewhat extended at December sowing compared to February sowing. The prolonged growth duration of the former will be caused with low temperature at the early growth stages.

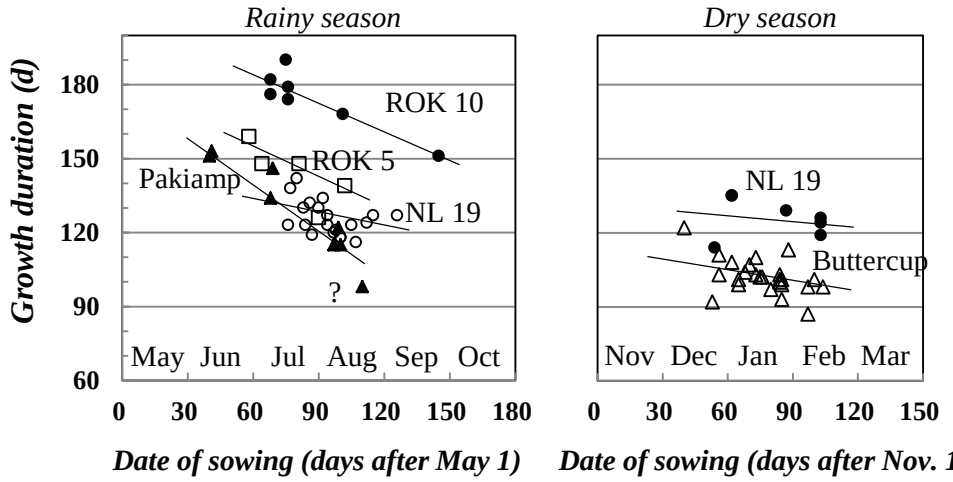


Fig. 4. Total growth duration (from sowing to harvest) of selected cultivars affected with sowing dates in rainy and dry seasons. NL 19: NERICA L19.

Note that the photo-sensibility of cultivars should have been studied on the basis of the period from sowing to heading (or flowering). Yet, it was based on the duration from sowing to harvest in the present observation, so that the result might be affected with the difference in ripening period.

6. Perspectives

1) High grain yield can be obtained when integrated improved cultural practices are applied. Grain yield beyond 3 ton/ha attained only at 3 farms out of 89 FBOs' farms, although sufficient quantity of fertilizer was provided. The result shows that fertilizer application is not effective and hardly makes a profit without integrated improved cultural practices.

2) Rice productivity was larger in dry season than in rainy season, most probably due to easier water control. Possible flooding caused by unpredictable, frequent heavy rainfall apparently lessens fertilizer efficiency in rainy season. Alternately, fertilizer application might be confined to the dry season planting provided that well controlled water facility was not prepared.

3) Several recommended cultural practices will be sustained among farmers, but others will not be. Farmers have widely accepted several cultural practices like use of young seedling and a few seedlings in each hill, because they do not require any extra cost and the benefit is apparent. Such a complicated work like water control cannot be acquired within a short time because it requests them technical know-how and experiences. SRDP wished some FBOs supported for several seasons could carry them over the subsistence level, but the earnest wish has not yet come true.

Attached: Appendix.

Appendix 1. Culture condition and grain yield of rice plants at FBO communal farms of Kambia district in rainy and dry seasons from 2011 to 2014

(1) Rainy season 2011

1	***Attribute***				
1-1	Chiefdom	Mambolo			Samu
1-2	Village (FBO site)	Kupr Yamp	Moribaya	Robana	Soribolomia
	Group name or Farm number				Limaniya
1-3	Agro-ecosystem	Riverine	IVS	Riverine	Riverine
2	***Rice culture***				
2-1	Variety	Pakiamp	ROK 5	NERICA L19	Pakiamp
2-2	Harvested area (ha)	0.13	0.13	0.38	0.55
2-3	Grain yield (ton/ha)	0.5	0.7	2.1	0.5
2-4	Date of sowing	2011/08/18	2011/07/20	2011/08/20	2011/07/08
2-5	Date of harvesting	2011/11/24	2011/12/15	2011/12/22	2011/12/01
2-6	Growth duration (d)	98	148	124	146
3	***Farming practices***				
3-1	Cropping calendar preparation	Not	Not	Not	Not
3-2	Germination test	Not	Not	Done	Not
3-3	Sun-exposed nursery	Done	Done	Not	Done
3-4	Appropriate seed rate	Not	Not	Not	Not
3-5	Proper seed density at nursery	Not	Not	Not	Not
3-6	Careful uprooting	n/s	n/s	n/s	Not
3-7	Use of 3-week-old seedlings	Not	Not	Not	Not
3-8	2-3 seedlings/hill	Done	Done	Not	Not
3-9	Shallow planting	n/s	n/s	Not	Not
3-10	Proper planting density	Not	Not	Done	Not
3-11	Fertilizer application	Done	Done	Done	Done
3-12	Fertilizer rate (N-P_2O_5-K_2O kg/ha)	55-31-31	72-28-28	38-15-15	57-30-30
3-13	Timely weeding	Not	Not	Not	Not
3-14	Bund construction	Not	Not	Not	Done
3-15	Drainage facility	Not	Not	Not	Not
3-16	Land preparation before sowing	Not	Not	Done	Not
3-17	Proper puddling	Not	Done	Not	Not
3-18	Proper leveling	Not	Not	Not	Not
4	***Constraints***				
4-1	Flash flood	None	None	None	None
4-2	Flooding	Occurred	None	Occurred	None
4-3	Water shortage	None	None	None	Occurred
4-4	Weed infestation	Severe	Severe	Less	Less
4-5	Bird damage	Some	None	None	Some
4-6	Disease outbreak	None	None	None	None
4-7	Insect attack	None	None	None	Some
5	***Remarks***	Newly developed	Newly developed	n/s	n/s

MSa: associated mangrove swamp. n/s: not specified (unidentified). T/P: transplanting.

Soribolomia Sorbeh	Soribolomia Wan word	Gbinleh Dixon Masineh	Robis	Rotifunk	Magbema Gbainkfay	Makassa	Mathoreneh
MSa	Riverine	IVS	IVS	IVS	MSa	IVS	IVS
ROK 5	Diaman	NERICA L19	ROK 10	Pakiamp	Pakiamp	ROK 10	ROK 5
0.17	0.49	0.33	0.67	0.72	0.16	0.68	0.43
1.6	1.5	2.5	2.1	1.7	0.8	1.8	1.3
2011/07/29	2011/07/08	2011/07/22	2011/08/09	2011/08/05	2011/08/08	2011/07/15	2011/08/10
2011/12/02	2011/11/25	2011/11/29	2012/01/24	2011/11/28	2011/12/01	2012/01/10	2011/12/27
126	140	130	168	115	115	179	139
Not	Not	Done	n/s	Done	Not	Not	Done
Not	Not	Not	Not	Not	Not	Not	Not
Done	Done	Done	Done	Done	Done	Done	Done
Not	Not	Not	Not	Not	Not	Not	Not
Not	Not	Not	Not	Not	Not	Not	Not
Not	Not	Done	Not	Done	Not	Not	n/s
Done	Not	Done	Not	Done	Done	Not	Done
Done	Not	Done	Done	Done	Not	Done	Done
Done	Not	Done	Done	Not	Not	Done	Not
Not	Not	Not	Not	Done	Not	Done	Done
Done	Done	Done	Done	Done	Done	Done	Done
58-35-35	41-21-21	20-20-20	40-40-40	20-20-20	21-21-21	22-22-22	28-28-28
Done	Not	Done	Not	Not	Not	Not	Done
Not	Done	Done	Done	Done	Not	Done	Done
Not	Done	Done	Done	Done	Not	Not	Done
Done	Done	Done	Done	Done	Done	Done	Done
Done	Done	Done	Done	Done	Done	Done	Done
Not	Not	Done	Done	Done	Not	Done	Done
Occurred	None	None	None	None	None	None	None
None	Occurred	None	None	Occurred	Occurred	None	None
None	None	None	None	None	None	None	None
Less	Less	Less	Less	Less	Less	Less	Less
None	None	None	Some	Some	None	None	Some
None	None	None	None	None	None	None	None
None	None	None	None	None	None	None	None
n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s

		Masungbala			Tonko Limba		
Rotain	Samu	Masimera	Mayakie	Pintekili	Badongho	Bayanday	Maseleh
IVS	IVS	IVS	IVS	IVS	IVS	IVS	IVS
ROK5	Pakambia	NERICA L19	ROK10	ROK 5	ROK 10	NERICA L19	ROK 10
0.13	0.22	0.38	1.29	0.12	0.50	0.31	0.67
1.4	0.7	1.0	0.4	0.8	1.6	0.6	2.0
2011/07/03	2011/07/21	2011/07/29	n/a	2011/06/27	2011/07/07	2011/09/03	2011/07/15
2011/11/28	2011/12/07	2011/12/06	2011/12/21	2011/12/03	2012/01/05	2012/01/08	2012/01/05
148	139	130	n/a	159	182	127	174
Not	Not	Not	Not	Not	Done	Not	Not
Not	Not	Not	Done	n/s	n/s	n/s	n/s
Done	Done	Done	n/s	n/s	Not	n/s	Not
n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
n/s	Not	n/s	Not	n/s	Done	n/s	Not
Not	Done	Done	Not	Not	Done	Not	Not
Done	Not	Not	Not	n/s	Not	n/s	Done
Not	Not	Not	Not	n/s	Done	n/s	n/s
Done	Done	Done	Not	Not	Done	Not	Not
Done	Done	Done	Done	Done	Done	Done	Not
22-13-13	58-33-33	33-33-33	n/s	10-10-10	23-23-23	20-20-20	0-0-0
Not	Not	Not	Not	n/s	n/s	n/s	Done
Not	Not	Done	Not	Not	Not	Not	Not
Not	Not	Not	Not	Not	Not	Not	Not
Not	Not	Not	n/s	n/s	Done	n/s	Done
Not	Not	Not	Not	Not	Done	Not	Not
n/s	n/s	n/s	Not	n/s	n/s	Not	n/s
Occurred	None	None	Occurred	None	None	None	None
Occurred	None	None	Occurred	None	None	None	None
None	Occurred	None	None	None	None	Occurred	None
Less	Less	Less	Severe	Less	Less	Severe	Less
Some	Some	Some	None	None	None	None	Some
None	None	None	None	None	None	None	None
None	None	None	None	None	None	None	None
n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s

Appendix 1.

(2) Dry season 2011/2012

		1				
	Bramaia	**1-1**	Gbinleh Dixon			
Sami Town	Tolokuray	**1-2**	Masineh	Robis	Rotifunk 1	Rotifunk 2
IVS	IVS	**1-3**	IVS	IVS	IVS	IVS
		2				
ROK 10	NERICA L19	**2-1**	Yeffin	CCA (Pathedeh)	Buttercup	Buttercup
0.92	0.12	**2-2**	0.21	n/s	0.18	0.12
0.9	1.9	**2-3**	1.9	n/s	1.2	0.9
2011/07/07	2011/07/16	**2-4**	2011/12/11	2012/01/31	2012/01/19	2012/02/12
2011/12/30	2011/12/01	**2-5**	2012/04/02	2012/05/10	2012/04/25	2012/05/20
176	138	**2-6**	113	100	97	98
		3				
Not	Not	**3-1**	Not	Not	Not	Not
n/s	Not	**3-2**	Not	Not	Not	Not
n/s	Done	**3-3**	Done	Not	Done	Not
n/s	Not	**3-4**	Not	Not	Not	Not
n/s	n/s	**3-5**	Done	Not	Done	Not
Not	Not	**3-6**	Not	Not	Done	Done
Not	Not	**3-7**	Done	Done	Done	Done
n/s	Not	**3-8**	Done	Done	Done	Done
Not	Done	**3-9**	Done	Not	Done	Not
Done	Not	**3-10**	Done	Done	Not	Done
Done	Done	**3-11**	Done	Done	Done	Done
63-63-63	33-33-33	**3-12**	60-60-60	n/s	46-46-46	60-60-60
n/s	Not	**3-13**	Not	Not	Not	Not
Done	Done	**3-14**	Done	Not	Not	Not
Done	Done	**3-15**	Done	Not	Not	Not
n/s	Done	**3-16**	Done	Done	Done	Done
Not	Done	**3-17**	Done	Done	Done	Done
n/s	Done	**3-18**	Done	Done	Not	Not
		4				
None	None	**4-1**	None	None	None	None
None	None	**4-2**	None	None	None	None
None	None	**4-3**	None	None	Occurred	None
Less	Less	**4-4**	Severe	Less	Less	Severe
None	None	**4-5**	None	Some	None	Some
None	None	**4-6**	None	None	None	None
None	None	**4-7**	None	None	None	None
not properly developed	n/s	**5**	n/s	n/s	n/s	floating soil

Magbema Gbainkfay 1 IVS	Gbainkfay 2 IVS	Gbainkfay 3 IVS	Mathoreneh 1 IVS	Mathoreneh 2 IVS	Mathoreneh 3 IVS	Samu 1 IVS
NERICA L19	NERICA L19	NERICA L19	Buttercup	NERICA L19	NERICA L19	Buttercup
0.06	0.06	0.05	0.05	0.07	0.04	0.15
1.7	0.7	2.0	2.4	2.0	3.1	0.8
2012/01/01	2012/01/01	2012/01/26	2012/02/08	2012/02/11	2012/02/11	2012/01/23
2012/05/15	2012/05/15	2012/06/03	2012/05/19	2012/06/14	2012/06/09	2012/05/02
135	135	129	101	124	119	100
Not	Not	Not	Not	Not	Not	Not
Not	Not	Not	Not	Not	Not	Not
Done	Done	Done	Done	Done	Done	Done
Not	Not	Not	Not	Not	Not	Not
Not	Not	Not	Not	Done	Done	Not
Not	Not	Not	Not	Not	Not	Not
Done	Not	Done	Done	Done	Done	Done
Done	Not	Done	Done	Done	Done	Not
Done	Not	Done	Done	Done	Done	Not
Done	Done	Done	Done	Not	Done	Done
Done	Done	Done	Done	Done	Done	Done
1.5-1.5-1.5	1.5-1.5-1.5	1.5-1.5-1.5	40-40-40	60-60-60	60-60-60	38-38-38
Not	Not	Not	Done	Not	Not	Not
Done	Done	Done	Done	Done	Done	Not
Not	Done	Done	Done	Not	Done	Not
Done	Done	Done	Done	Done	Done	Not
Done	Done	Done	Done	Done	Done	Done
Done	Not	Done	Not	Not	Done	Not
None	None	None	None	None	None	None
None	None	None	None	None	None	Occurred
None	Occurred	Occurred	None	None	None	None
Severe	Severe	Severe	Less	Severe	Less	Severe
None	None	None	Some	Some	Some	None
None	None	None	None	None	None	None
None	None	None	None	None	None	None
partially leveled	n/s	n/s	irrigation canal	partially bunded	Applied gypsum	flooding at T/P

Appendix 1.

(3) Rainy season 2012

1							
1-1	Samu 2	Masungbala Masimera	Tonko Limba Badongho	Bayanday	Mambolo Robis	Gbinleh Dixon Makanie	Masiaka
1-2	IVS	IVS	IVS	IVS	Riverine	IVS	IVS
2							
2-1	Buttercup	Buttercup	Buttercup	NERICA L19	NERICA L19	NERICA L19	NERICA L19
2-2	0.15	0.10	0.15	0.25	0.35	0.23	0.55
2-3	0.8	1.4	2.5	0.9	2.0	1.0	3.0
2-4	2012/01/23	2012/01/12	2012/01/24	2012/02/11	2012/07/31	2012/08/13	2012/08/06
2-5	2012/05/05	2012/05/01	2012/04/26	2012/06/16	2012/12/12	2012/12/14	2012/12/05
2-6	103	110	93	126	134	123	121
3							
3-1	Not	Not	Not	Not	Not	Not	Done
3-2	Not	Not	Not	Not	Not	Not	Not
3-3	Done	Done	Done	Done	Not	Not	Done
3-4	Not	Not	Not	Not	n/s	Not	Done
3-5	Not	Done	Not	Done	Done	Not	Done
3-6	Not	Not	Not	Not	Not	Not	Done
3-7	Done	Done	Done	Done	Done	Done	Done
3-8	Not	Done	Done	Done	Done	Done	Done
3-9	Not	Not	Done	Done	Done	Not	Done
3-10	Done	Done	Done	Done	Done	Not	Not
3-11	Done	Done	Done	Done	Done	Done	Done
3-12	38-38-38	38-38-38	60-60-60	40-40-40	63-63-63	n/s	60-60-60
3-13	Not	Not	Done	Not	Done	Not	Done
3-14	Not	Done	Not	Done	Done	Done	Done
3-15	Not	Done	Not	Done	Not	Done	Done
3-16	Not	Done	Done	Not	Done	Not	Done
3-17	Done	Done	Done	Done	Done	Done	Done
3-18	Not	Not	Done	Not	Not	Not	Done
4							
4-1	None	None	None	None	None	None	None
4-2	None	None	None	None	None	None	None
4-3	Occurred	Occurred	None	None	None	None	None
4-4	Severe	Severe	Less	Severe	Less	Less	Less
4-5	Some	None	None	Some	None	None	None
4-6	None	None	None	None	None	None	None
4-7	None	None	None	None	None	None	None
5	n/s	n/s	partially weeded	n/s	n/s	n/s	n/s

							1
Masungbala			Tonko Limba				**1-1**
Laya	Sumbuya	Tawuya Munu	Bayanday	Kukuna river	Masunthu	Sami town	**1-2**
IVS	IVS	IVS	IVS	IVS	IVS	IVS	**1-3**
							2
NERICA L19	NERICA L19	NERICA L19	Pakiamp	NERICA L19	ROK 5	Pakiamp	**2-1**
0.45	0.10	0.19	0.70	0.63	0.62	0.84	**2-2**
2.1	2.5	2.0	0.5	1.5	4.6	0.5	**2-3**
2012/07/23	2012/08/08	2012/08/08	2012/06/09	2012/08/02	2012/07/14	2012/06/10	**2-4**
2012/11/23	2012/12/04	2012/12/04	2012/11/07	2012/12/03	n/a	2012/11/10	**2-5**
123	118	118	151	123	n/a	153	**2-6**
							3
Done	Not	n/s	Not	Not	Not	Not	**3-1**
Not	Not	Not	Not	Not	Done	Not	**3-2**
Done	Done	Done	Done	Done	Done	Done	**3-3**
Not	Not	Not	Not	Not	Not	Not	**3-4**
Done	Not	Done	Done	Done	Done	Done	**3-5**
Done	Done	Not	Not	Done	Done	Done	**3-6**
Done	Done	Done	Not	Done	Done	Not	**3-7**
Done	Done	Not	Not	Done	Done	Done	**3-8**
Done	Done	Done	Done	Done	Done	Not	**3-9**
Not	Done	Not	Not	Not	Not	Not	**3-10**
Done	Done	Done	Done	Done	Done	Done	**3-11**
60-60-60	n/s	68-68-68	21-21-21	59-59-59	30-30-30	n/s	**3-12**
Done	Not	Not	Not	Not	Not	Not	**3-13**
Done	Done	Done	Not	Not	Not	Done	**3-14**
Done	Not	Done	Done	Not	Not	Done	**3-15**
Done	Done	Done	Not	Done	Done	Not	**3-16**
Done	Done	Done	Done	Done	Done	Done	**3-17**
Done	Done	Done	Not	Not	Done	Not	**3-18**
							4
None	None	None	None	None	None	None	**4-1**
None	None	None	None	None	None	None	**4-2**
None	None	None	None	None	None	None	**4-3**
Less	Less	Less	Severe	Less	Severe	Severe	**4-4**
None	None	None	None	None	None	Some	**4-5**
None	None	None	None	None	None	None	**4-6**
None	None	None	None	None	None	None	**4-7**
n/s	n/s	n/s	n/s	n/s	n/s	no cooperation	**5**

Appendix 1.

(4) Dry season 2012/2013

Gbinleh Dixon					Magbema		Masungbala
Makanie	Masiaka 1	Masiaka 2	Rotifunk 1	Rotifunk 2	Mathoreneh 1	Mathoreneh 2	Laya
IVS	IVS	IVS	IVS	IVS	IVS	IVS	IVS
Buttercup	Buttercup	Buttercup	Buttercup	Buttercup	Buttercup	Buttercup	Buttercup
0.33	0.30	0.30	0.14	0.14	0.15	0.18	0.20
1.0	2.3	2.6	2.7	3.0	1.7	2.1	2.7
2012/02/12	2013/01/04	2013/01/14	2013/01/07	2013/02/11	2013/02/05	2013/02/11	2013/01/15
n/a	2013/04/13	2013/04/26	2013/04/21	n/a	2013/05/14	n/a	2013/04/27
n/a	99	102	104	n/a	98	n/a	102
Not	Done	Done	Done	Done	Not	Not	Not
Not	Done	Done	Done	Done	Not	Not	Done
Not	Done	Done	Not	Not	Done	Done	Done
Not	Not	Not	Not	Not	n/s	Not	Not
Done	Done	Done	Done	Done	Done	Done	Done
n/s	Done	Done	Done	Done	n/s	n/s	Done
Not	Done	Done	Done	Done	Done	Done	Done
Not	Done	Done	Done	Done	Not	Done	Done
Not	Done	Done	Done	Done	Done	Done	Done
Not	Not	Done	Not	Not	Not	Not	Not
Done	Done	Done	Done	Done	Done	Done	Done
n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Not	Not	Not	n/s	Not	Not	Not	Not
Done	Done	Done	Done	Done	Done	Done	Done
Done	Done	Done	Done	Done	Done	Done	Done
Not	Done	Done	Done	Done	Done	Done	Done
Done	Done	Done	Done	Done	Done	Done	Done
Not	Done	Done	Done	Done	Done	Done	Done
None	None	None	None	None	None	None	None
None	None	None	None	None	None	None	None
Occurred	Occurred	Occurred	None	None	None	None	Occurred
Severe	Less	Less	Less	Less	Less	Severe	Severe
None	None	None	Some	Some	Some	Some	None
None	None	None	None	None	None	None	None
None	None	None	None	None	None	None	None
n/s	n/s	n/s	seepage /floating soil	seepage /floating soil	n/s	n/s	n/s

			Tonko Limba				
Laya	Tawuya Munu 1	Tawuya Munu 2	Kukuna river 1	Kukuna river 2	Masunthu 1	Masunthu 2	Masunthu
IVS	IVS	IVS	IVS	IVS	IVS	IVS	IVS
Buttercup	Buttercup	Buttercup	Buttercup	Buttercup	Buttercup	Buttercup	Buttercup
0.20	0.04	0.45	0.05	0.20	0.10	0.05	0.55
1.7	2.9	2.0	1.0	1.0	1.0	2.5	1.4
2013/01/27	2013/01/12	2013/01/24	2013/01/24	2013/02/05	2012/12/26	2013/01/09	2013/01/23
2013/05/20	2013/04/25	2013/05/05	2013/05/03	2013/05/03	2013/04/16	2013/04/26	n/a
113	103	101	99	87	111	107	n/a
Not	Not	Not	Not	Not	Not	Not	Not
Not	Not	Not	Not	Not	Not	Not	Not
Done	Done	Done	Done	Done	Not	Not	Done
Not	Not	Not	Not	Not	Not	Not	Not
Done	Done	Done	Done	Not	Not	Not	Done
Done	Not	Not	Not	Not	Done	Done	Not
Done	Done	Done	Done	Done	Done	Done	Done
Done	Done	Done	Not	Done	Done	Done	Done
Done	Done	Done	Not	Done	Done	Done	Done
Not	n/s	Not	Not	Not	Not	Not	Not
Done	Done	Done	Done	Done	Done	Done	Done
n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Not	Not	Not	Not	Not	Not	Not	Not
Done	Done	Done	Not	Not	Not	Not	Not
Done	Done	n/s	Not	Not	Not	Not	Not
Done	Done	Done	Not	Not	Not	Done	Not
Done	Done	Done	Done	Done	Done	Done	Done
Done	Not	Not	Not	Not	Done	Done	Done
None	None	None	None	None	None	None	None
None	None	None	None	None	None	None	None
Occurred	Occurred	Occurred	Occurred	Occurred	None	None	None
Severe	Severe	Severe	Severe	Less	Less	Less	Less
None	None	None	None	None	None	None	None
None	None	None	None	None	None	None	None
None	None	None	None	None	None	None	None
n/s	n/s	n/s	n/s	n/s	n/s	n/s	basal application

Appendix 1.

		(5) Rainy season 2013					
	1						
Bramaia	**1-1**	Mambolo		Samu	Gbinleh Dixon		
Tolokuray	**1-2**	Robis	Rofunk	Soribolomia	Kamba	Masiaka	Masineh
				Wan word			
IVS	**1-3**	Riverine	MSa	Boliland	IVS	IVS	IVS
	2						
Buttercup	**2-1**	NERICA L19	ROK10	Momonboy	NERICA L19	NERICA L19	Yam Gbessy
0.20	**2-2**	0.40	0.90	0.20	0.10	0.40	0.30
2.4	**2-3**	1.7	1.6	3.2	3.3	2.6	1.7
2013/01/23	**2-4**	2013/08/23	2013/09/22	2013/07/01	2013/08/05	2013/08/02	2013/07/07
2013/05/04	**2-5**	2013/12/28	2014/02/20	2013/12/17	2013/12/03	2013/12/07	2013/11/29
101	**2-6**	127	151	169	120	127	145
	3						
Done	**3-1**	n/s	Not	Done	Not	Not	Not
Not	**3-2**	Done	Not	Done	Done	Done	Not
Done	**3-3**	Not	Done	Done	Done	Done	Done
Not	**3-4**	Not	Not	Not	Not	Done	Done
Not	**3-5**	Not	Done	Done	Done	Done	Done
Done	**3-6**	n/s	Not	Not	n/s	Done	Done
Done	**3-7**	Done	Done	Done	Done	Done	Done
Done	**3-8**	Done	Not	Not	Done	Done	Done
Done	**3-9**	Done	Not	Done	Done	Done	Done
Done	**3-10**	Not	Done	Done	Done	Done	Not
Done	**3-11**	Done	Not	Done	Done	Done	Done
n/s	**3-12**	n/s	0-0-0	n/s	n/s	n/s	n/s
Not	**3-13**	Not	Not	Not	Not	Not	Done
Done	**3-14**	Done	Not	Done	Done	Done	n/s
Done	**3-15**	Not	Not	Done	Done	Done	Done
Not	**3-16**	Done	Not	Not	Done	Done	Done
Done	**3-17**	Done	Done	Done	Done	Done	Done
Done	**3-18**	Done	Not	Done	Not	Done	Done
	4						
None	**4-1**	None	None	None	None	None	None
None	**4-2**	None	Occurred	None	None	None	None
Occurred	**4-3**	None	None	None	None	None	None
Severe	**4-4**	Less	Severe	Severe	Less	Less	Less
None	**4-5**	None	None	None	None	None	None
None	**4-6**	None	None	None	None	None	None
None	**4-7**	None	None	None	None	None	None
n/s	**5**	n/s	n/s	n/s	new FBO	n/s	n/s

	Magbema				Masungbala	
Rotifunk	Gbainkfay	Gberka	Mathoreneh	Robombeh	Bamoi Bana	Banka-Makulor
IVS	IVS	IVS	IVS	IVS	IVS	IVS
Pakiamp	Pakambia	NERICA L19	ROK 10	Pakiamp	NERICA L19	NERICA L19
1.20	0.20	0.40	0.20	0.10	0.10	0.10
1.7	1.1	1.4	0.8	1.5	1.1	0.9
2013/07/07	2013/08/15	2013/08/15	2013/07/14	2013/08/07	2013/07/26	2013/07/25
2013/11/18	2013/12/09	2013/12/09	2014/01/20	2013/12/07	2013/11/22	2013/12/04
134	116	116	190	122	119	132
Not	Not	Not	Not	Not	Not	Not
Not	Not	Not	Not	Not	Not	Not
Done	n/s	Not	Done	Done	Done	Done
Done	Not	Not	Not	Done	Not	Not
Done	Done	Done	Done	Done	Not	Not
Done	Done	Done	Done	Done	Not	Done
Done	Done	Done	Done	Done	Done	Done
Done	Not	Not	Done	Not	Not	Not
Done	Not	Not	Not	Not	Not	n/s
Not	Not	Not	Not	Not	Done	Not
Done	Done	Done	Done	Done	Done	Done
n/s	n/s	n/s	n/s	n/s	n/s	n/s
Done	Not	Not	Not	Not	Not	Not
Done	Done	Done	Done	Done	Done	Done
Done	Not	Not	Not	Not	Not	Done
Done	Not	Done	Done	Done	Not	Not
Done	Done	Done	Done	Done	Done	Done
Done	Not	Not	Not	Not	Done	Done
None	None	None	None	Occurred	None	None
None	None	None	Occurred	None	None	None
None	None	None	None	None	None	None
Less	Less	Less	Severe	Severe	Severe	Severe
None	None	None	Some	None	None	None
None	None	None	None	None	None	None
None	None	None	None	None	None	None
n/s	n/s	new FBO	n/s	new FBO	new FBO	new FBO

Appendix 1.

(6) Dry season 2013/14

					1		
		Tonko Limba		Bramaia	**1-1**	Gbinleh Dixon	
Laya	Tawuya Munu	Kukuna river	Masunthu	Tolokuray	**1-2**	Kamba	Masiaka
IVS	IVS	IVS	IVS	IVS	**1-3**	IVS	IVS
					2		
NERICA L19	NERICA L19	Yam Gbessy	ROK 10	ROK 24	**2-1**	Buttercup	Buttercup
0.10	0.20	0.30	0.60	0.30	**2-2**	0.07	0.11
2.6	1.9	0.9	1.2	2.3	**2-3**	2.2	2.4
2013/07/15	2013/07/19	2013/08/02	2013/07/09	2013/07/15	**2-4**	2014/01/01	2014/01/04
2013/11/15	2013/12/08	2013/11/30	n/a	2013/12/12	**2-5**	2014/04/19	2014/04/15
123	142	120	n/a	150	**2-6**	108	101
					3		
Done	Done	Not	Not	Done	**3-1**	Not	Not
Done	Done	Not	Not	Not	**3-2**	Not	Not
Done	Done	Done	Done	Done	**3-3**	Done	Done
Not	Not	Not	Not	Not	**3-4**	Done	Not
Not	Not	Done	Done	Done	**3-5**	Done	Done
Done	Done	Not	Done	Done	**3-6**	n/s	Done
Done	Done	Done	Done	Done	**3-7**	Done	Done
Done	Done	Done	Done	Done	**3-8**	Done	Done
Done	Done	Not	Not	Done	**3-9**	Done	Done
Done	Done	Not	Not	Not	**3-10**	Not	Not
Done	Done	Done	Done	Done	**3-11**	Done	Done
n/s	n/s	n/s	n/s	n/s	**3-12**	n/s	n/s
Done	Not	Not	Not	Not	**3-13**	Not	Not
Done	n/s	Not	Not	Done	**3-14**	Done	Done
Not	Not	Not	Not	Done	**3-15**	Not	Done
Not	Not	Done	Done	Done	**3-16**	Done	Done
Done	n/s	Done	Done	Done	**3-17**	Done	Done
Done	n/s	Not	Not	Done	**3-18**	Not	Done
					4		
None	None	None	None	None	**4-1**	None	None
None	None	None	None	None	**4-2**	None	None
None	None	None	None	None	**4-3**	None	Occurred
Less	Less	Less	Less	Less	**4-4**	Severe	Less
None	None	None	None	Some	**4-5**	None	None
None	None	None	None	None	**4-6**	None	None
None	None	None	None	None	**4-7**	None	None
n/s	n/s	n/s	n/s	n/s	**5**	n/s	n/s

Masineh	Rotifunk 1	Rotifunk 2	Masungbala Laya	Tawuya Munu
IVS	IVS	IVS	IVS	IVS
Yeffin	Buttercup	NERICA L19	Buttercup	Buttercup
0.03	0.05	0.05	0.09	0.11
2.7	2.3	1.2	1.9	2.2
2013/12/05	2013/12/23	2013/12/24	2013/12/10	2013/12/26
2014/03/19	2014/03/25	2014/04/17	2014/04/11	2014/04/08
104	92	114	122	103
Not	n/s	n/s	n/s	n/s
Not	n/s	n/s	n/s	n/s
Done	Done	Done	Done	Not
Not	Done	Done	Done	n/s
Done	Done	Done	Done	Done
Done	Done	Done	Done	Done
Done	Done	Done	Done	Done
Done	Done	Done	Done	n/s
Done	Done	Done	Done	Done
Done	Done	Done	Done	Done
Done	Done	Done	Done	Done
n/s	n/s	n/s	n/s	n/s
Not	Not	Not	Not	Done
Done	Done	Done	Done	Done
Done	Done	Done	Done	Done
Done	Done	Done	Done	Done
Done	Done	Done	Done	Done
Done	n/s	n/s	n/s	n/s
None	None	None	None	None
None	None	None	None	None
None	None	None	Occurred	Occurred
Less	Less	Less	Less	Less
None	Some	Some	Some	Some
None	None	None	None	None
None	None	None	None	None
n/s	seepage /floating soil	seepage /floating soil	n/s	n/s

Note on fertilizer rate:

1) The quantity of fertilizers applied was collected through interviews with farmers, whereas the farm size was measured by the SRDP team.

2) An unequal application rate of elements like 55-31-31 might signify that a part of fertilizers (24-0-0) was top-dressed. In contrast, an equal application rate like 40-40-40 might signify that all fertilizers were basally applied without top-dressing, most probably owing to flooding.

Ministry of Agriculture, Forestry and Food Security (MAFFS), Sierra Leone

Japan International Cooperation Agency (JICA), Japan

The Sustainable Rice Development Project (SRDP) in Sierra Leone

For the Benefit of Rice Farmers at the Grass Roots

What is SRDP?

"Sustainable Rice Development Project in Sierra Leone" is a collaborative project between the Government of Sierra Leone (MAFFS) and the Government of Japan (JICA).

The Project is implemented mainly in the Kambia District and will last for four years from October 2010 through September 2014.

The Project is expected to complement the Smallholder Commercialisation Programme, the top priority programme under the National Sustainable Agriculture Development Plan of the MAFFS, through technical cooperation.

What does the project aim at? What will come out of it?

Over all goal:	To increase production and incomes of small-scale rice farmers in Sierra Leone.
Project purpose:	To establish rice production techniques and their extension method which are applicable throughout Sierra Leone.
Expected Results:	1. To elaborate the Technical Package on Rice (TP-R) through on-station and on-farm verification.
	2. To extend the revised TP-R to small-scale farmers through Farmers Based Organizations (FBOs) in Kambia district.

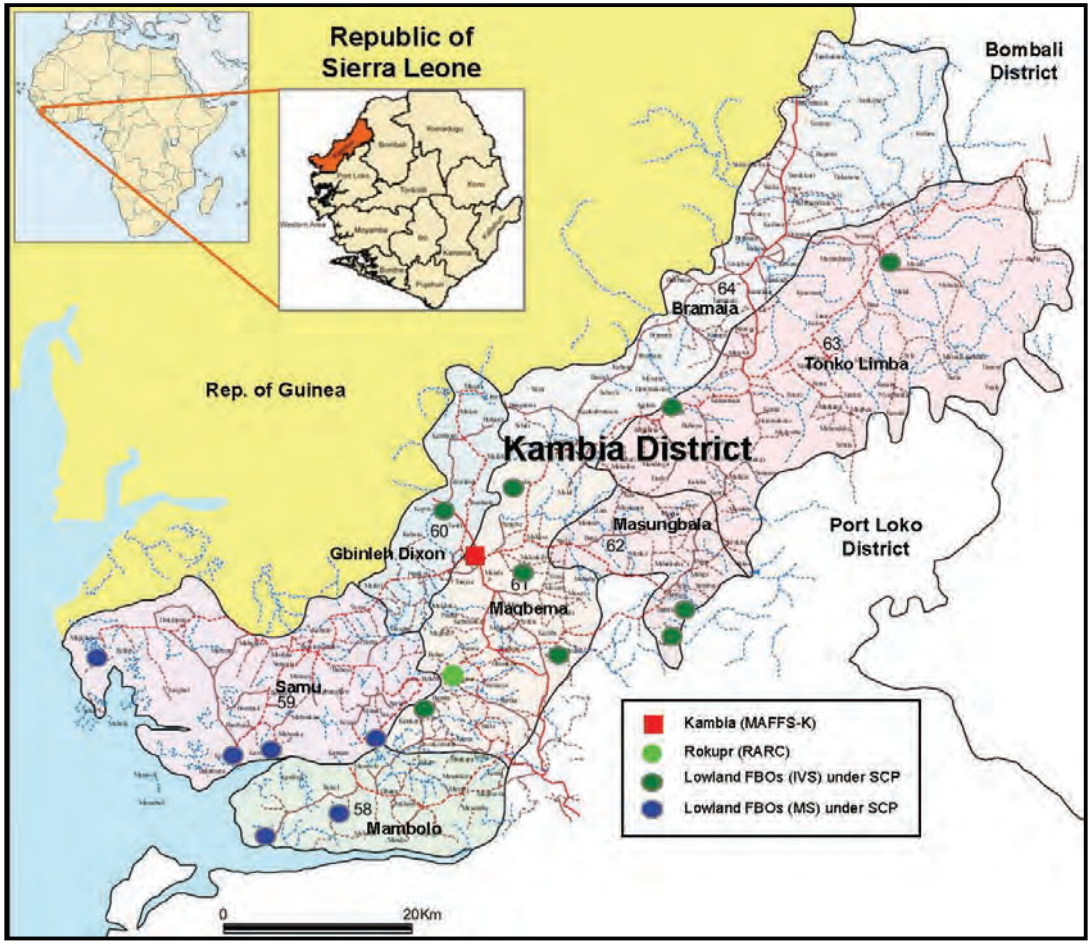
What is going to take place and when?

Year 1 Oct. 2010 – Mar. 2011	Year 2 - 4 Apr. 2011 – Mar. 2014	Year 5 Apr. 2014 – Sep. 2014
- Baseline Survey - Preparation of the detailed action plan - Training of extension workers	- Training of extension workers/farmers - Execution of trials for improving TP-R - Dissemination of TP-R through FFS - Interim evaluation of the Project	-Finalization of the revised TP-R -Preparation of the dissemination method of the TP-R - Project evaluation

JICA's Inputs to the Project

1. Sending Japanese experts (Chief advisor, Rice cultivation technologies, Extension, Post-harvest, Farmers' organizing, and Coordination)
2. Provision of machinery, tools and equipment necessary for the Project implementation
3. Training of Sierra Leonean personnel in Japan or third countries

Project Location Map



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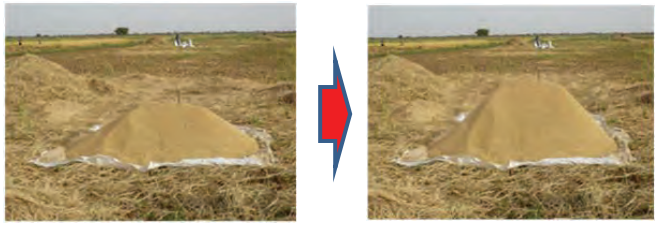
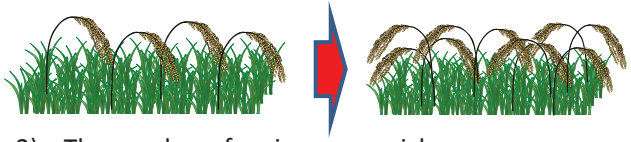
Sustainable Rice Development Project in Sierra Leone (SRDP)

1. INTRODUCTION



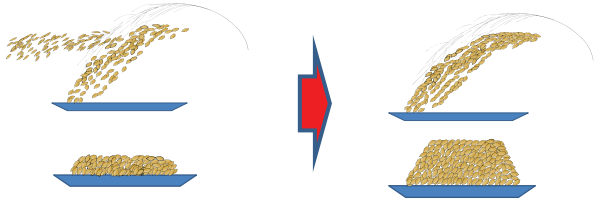
If you want to produce more rice grains, the following three factors are important.

1) The number of panicles per unit area



2) The number of grains per panicle

3) Grain filling ratio



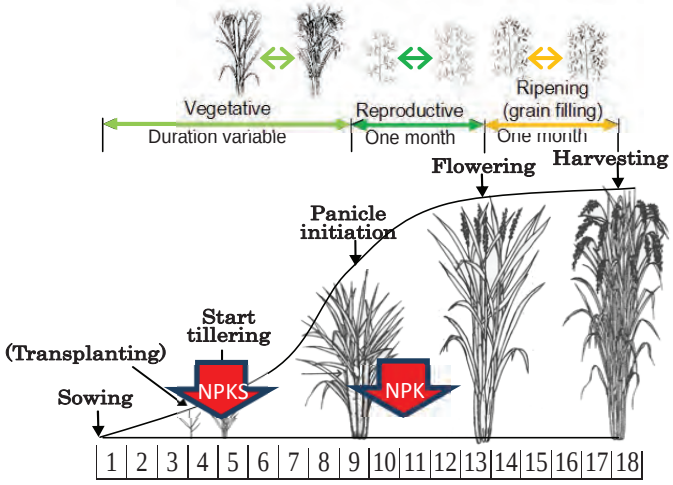
2. LIFE CYCLE OF RICE PLANT

Three growth stages

No.	Growth stage	Period	Duration
1	Vegetative	Sowing to panicle initiation	Variable
2	Reproductive	Panicle initiation to flowering	Constant (ca. 30 days)
3	Ripening	Flowering to maturity	Constant (ca. 30 days)

Three important factors are determined in different growth stages.

- ✧ The number of panicles per unit area: vegetative stage
- ✧ The number of grains per panicle: reproductive stage
- ✧ The grain filling ratio: ripening stage



Increase in the number of panicles per unit area is particularly important for yield increase.

Appropriate farming practices in the initial growth stage are a key to secure good number of panicles per unit area.

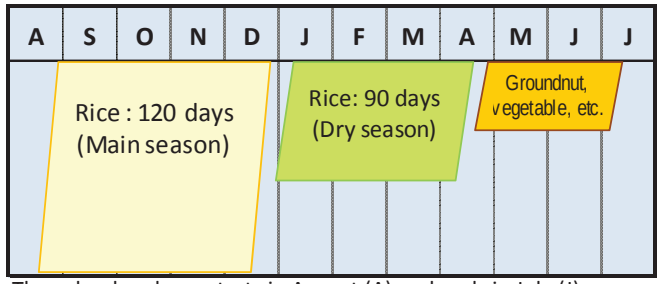
3. FARMING PLAN AND CROPPING CALENDAR

1) Faming plan
   (1) Make sure of labors and funds,
   (2) Determine the scale of farming (location, area),
   (3) Decide a rice variety to cultivate,
   (4) Calculate required amount of inputs,
   (5) Secure seed rice and conduct germination test,
   (6) Secure fertilizers, and
   (7) Prepare a farming calendar.

2) Cropping calendar
   (1) Estimate the desirable harvest time,
   (2) Decide the transplanting date taking account of the growth duration of the rice variety to be used,
   (3) Set the sowing date on nursery,
   (4) Set the date of plowing before nursery preparation,
   (5) Set the date of land development (bund making, drainage channel construction),
   (6) Set the time of slashing, burning and clearing which is to be completed before plowing start,
   (7) Set the time of weeding, top dressing, bird scaring, etc.

Example of proposed cropping pattern in IVS

- ➢ In the main cropping season (or the rainy season), late planting (nursery starts in mid-August) using a medium duration variety (4 months) is recommended to avoid the risk of heavy rain which makes fertilizer ineffective.
- ➢ The second cropping should start immediately after the main cropping season finished. Nursery preparation should start in December to January, and transplant should be done by early February. Short duration varieties like butter cup is recommended to avoid the risks of water shortage and/or bird attack.
- ➢ If the top soil contains moisture after the harvest of second cropping, the third cropping can be done using short cycle crops like groundnut and vegetables by making mound utilizing residual moisture of the soils and remaining nutrients in rice straw.



The calendar above starts in August (A) and ends in July (J).

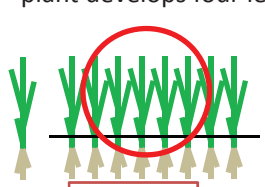
4. KEY FARMING PRACTICES

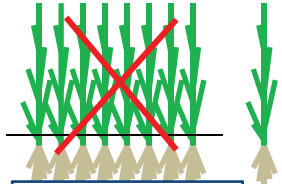
1) Seed selection
   (1) Select good seeds (pure and viable)


2) At nursery
   (1) Smaller amount of seed (refer to transplanting)
   One bushel (25kg) is good for one hectare.
   (2) Area to be exposed to the sun with water control
   (3) Uniform sowing with an appropriate density

One liter cup of seeds (ca. 500g) is good for 7m^2 of nursery bed.

   (4) Shorter nursery period
   Appropriate transplanting time is when the rice plant develops four leaves.

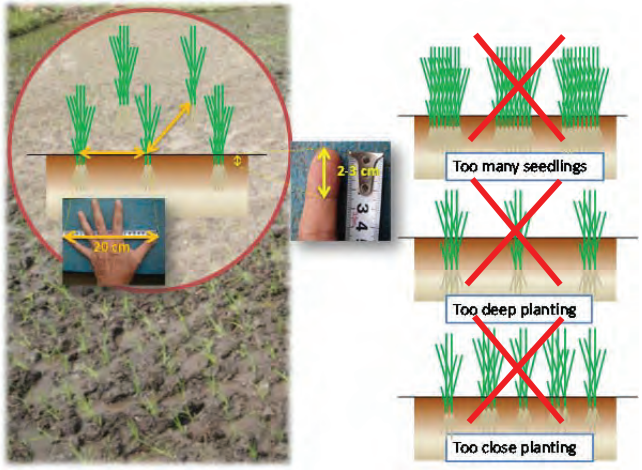

2-3 weeks


More than 4 weeks

3) Land preparation
   (1) Bund making and drainage construction
   Securing a water controlled condition is a key to make fertilizer application effective.


   (2) Good puddling and leveling
   Good puddling and leveling provides rice plants with favorable and uniform environment for their growth.

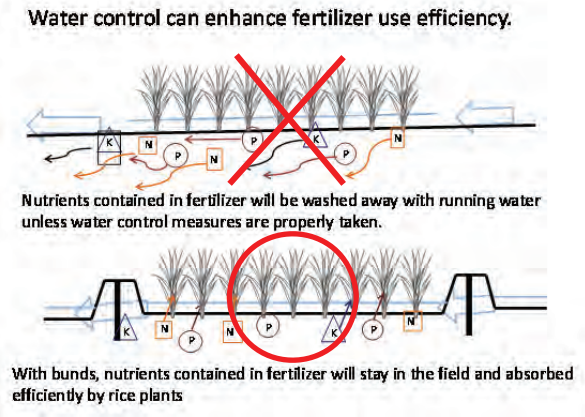

4) Uprooting and transplanting
   (1) Handling of seedlings with care (uproot the seedlings little by little, do not kick or hit the seedlings to remove soils, keep root wet)
   (2) Transplant a few (2 – 3) seedlings per hill
   (3) Shallow planting with proper spacing

5) Weeding and water management
   (1) Timing of weed
   Weed should be done at 2 to 3 weeks after transplanting to eliminate enemies of rice plants when they are still small.
   (2) Periodical drainage
   Drain water in the paddy field as much as possible to avoid iron toxicity problem.

6) Fertilizer management
   (1) Timely application with right dosage of required nutrients is important.
   - Required nutrients: P > S >> K, N
   - Dosage: to be determined.
   - Time of application: at the time of transplant, and panicle initiation

   (2) Water management is a must
   - Application of fertilizer should be done uniformly under shallow water condition so that rice plants can uptake nutrients efficiently.
   - Water should be kept for several days after the fertilizer application。



7) Harvest and Post-harvest
   (1) Timely harvest is important to reduce losses.
   The right harvest time is when 80-85% of the grains are straw colored. Over-ripening of the grains increases losses by shattering.
   (2) Proper drying before bagging
   After threshing and winnowing, the grains should be dried well before bagging. This helps reduce losses during the storage.
   (3) Proper storage
   Bags filled with grains should not be placed directly on the floor, but on a pallet or assembled timbers not to absorb moisture from the floor.

Newsletter No.1 (Apr. 2013)

Sustainable Rice Development Project in Sierra Leone (SRDP)

About the Project

1. Project Title: The Sustainable Rice Development Project in Sierra Leone
2. Implementation agency: Ministry of Agriculture, Forestry and Food Security (MAFFS)
3. Project period: 4 years (from October 2010 through September 2014)
4. Project area: Mainly Kambia district
5. Project purpose: To establish rice production techniques and its extension method which are applicable throughout Sierra Leone
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   2) To extend TP-R to small-scale farmers through Farmers Based Organizations (FBOs) in Kambia district
   3) To extend the contents of TP-R and an extension method to officials of MAFFS's district agricultural offices other than MAFFS-Kambia.

Players of the Project

Project director: Director General of MAFFS

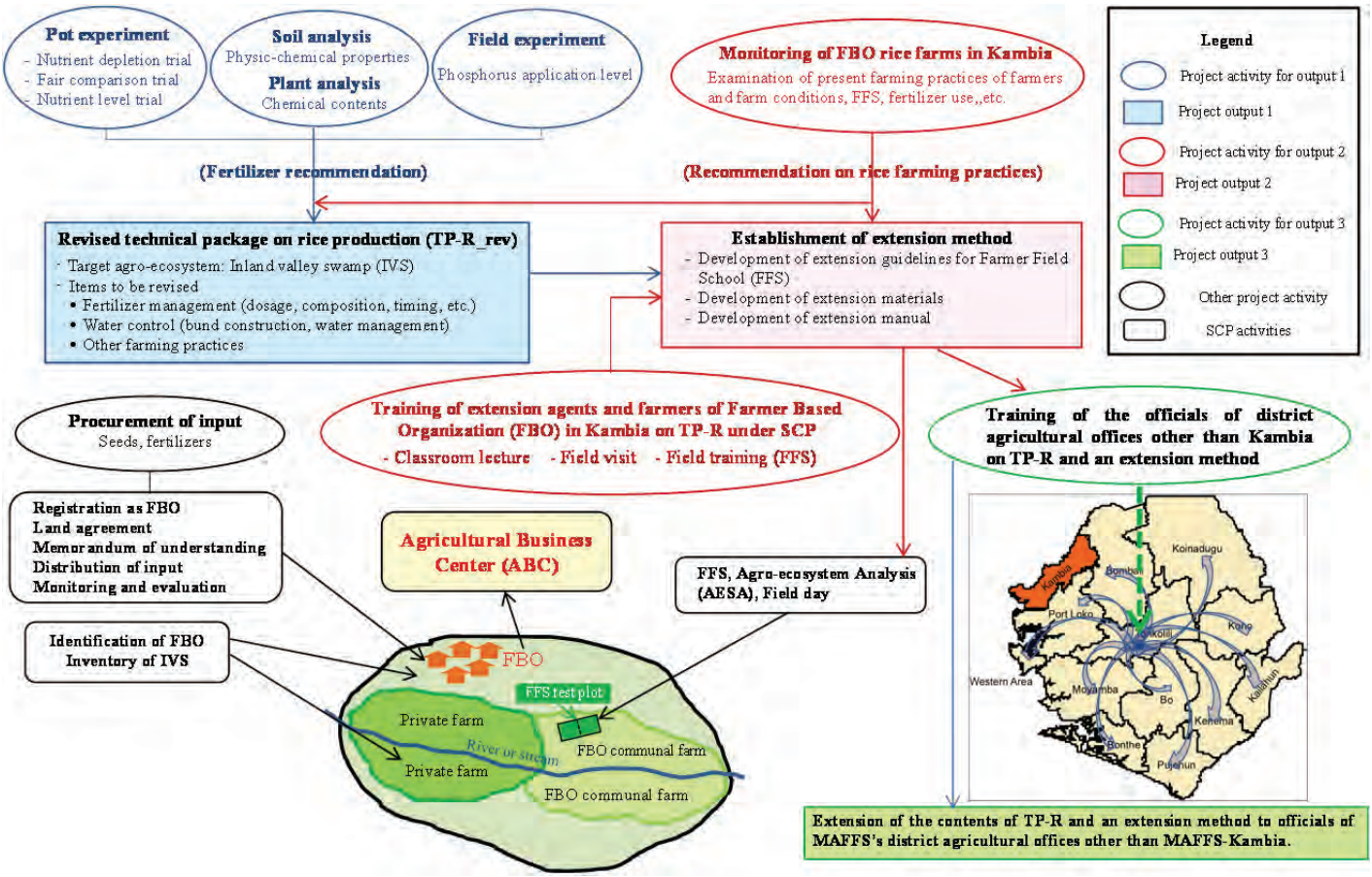
Project manager: District Agriculture Office of Kambia District

Project team personnel: Officials of MAFFS Kambia and RARC

Personnel for cooperation: Directors of Extension, Crops and PEMSD, Director General of SLARI, and Representative of RARC

Team of Japanese experts: Chief advisor, Rice researcher, Extension, Training materials, Coordination

Project Flowchart



Newsletter No.1 (Apr. 2013)

Sustainable Rice Development Project in Sierra Leone (SRDP)

Topic of the Project in April 2013

1. Site inspection by the MAFFS officials

On 19 April, 2013, inspection of the FBOs' rice fields in Kambia District supported with the SRDP in the dry season cropping was made by the officials of MAFFS HQ headed by the Hon. Minister, Dr. Joseph Sam Sesay. Rotifunk and Mathoreneh were visited. At both sites, FBO farmers explained the Minister how SRDP supported them. Through the farm guidance provided by SRDP, they could reduce the amount of seed rice, control water to maximize the effect of fertilizers applied timely, weed timely, etc., all those practices were conducive to yield increase. Hon. Minister appreciated the farmers' efforts, and told them to continue the farming practices they learned from the SRDP.

2. 5th Joint Coordination Committee (JCC) Meeting

The 5th JCC meeting of SRDP was convened at RARC, Rokupr after the site inspection. The meeting was chaired by Mr. Ban Massaquoi, Director of extension. Following the welcome speech by Dr. Taylor of RARC, Hon. Minister made a statement. He said that he was impressed with the FBO farmers acquiring correct farming techniques with the support of JICA to enhance yield and profit. He expected JICA to scale up the activities in the next phase. He also expected FBO farmers to be private enterprises through JICA's support. Then, the contents of the progress report 5 was explained by Mr. Umaro Sankoh, DAO of MAFFS-K using PowerPoint. After his explanation on the report, question and answer sessions followed. Chairman wrapped up the session by requesting JICA the following: (i) detailed data of the on-farm experiment, (ii) cost-benefit analysis, (iii) translation of pot experiment results into technical package, (iv) MAFFS-SLARI-JICA joint meeting, (v) coordination with extension office with regards to TP-R extension guide, (vi) continuance of soil research, (vii) analytical equipment for soil analysis, and (viii) coordination of district activities.

3. Dry season cropping of rice in Kambia district

FBO farmers supported by SRDP enjoyed harvesting dry season rice, 2013. Under controlled water condition with fertilizer application and improved farming practices, yield with 2.5 to 3.0 ton/ha have been obtained using a short duration variety (butter cup).

Masiaka, Gbinleh Dixon, 6 April , 2013

Rotifunk, Gbinleh Dixon, 12 April , 2013

Laya, Masungbala, 17 April , 2013

Published by JICA-SRDP Team Contact at : Tel: 079-199765, E-mail: sierra_leone_rice@yahoo.co.jp

Newsletter No.2 (May 2013)

Sustainable Rice Development Project in Sierra Leone (SRDP)

To make rice farming a profitable business

About the Project

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2. Implementation agency: Ministry of Agriculture, Forestry and Food Security (MAFFS)
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   3) To extend the contents of TP-R and an extension method to officials of MAFFS's district agricultural offices other than MAFFS-Kambia.

Topics of the Project in May 2013

1. Grain yield of dry season rice in Kambia district increased by more than 40%!

Average yield of 2.2 ton/ha was obtained in Kambia district in the dry season cropping this year (Figure below, right). Compared with the previous dry season (Figure below, left), the average yield increased by more than 40%. The highest yield with 3.3 ton/ha was recorded by a FBO field at Masineh, using a 120-days variety (Yeffine) under fertilizer application including sulfur and controlled water conditions.

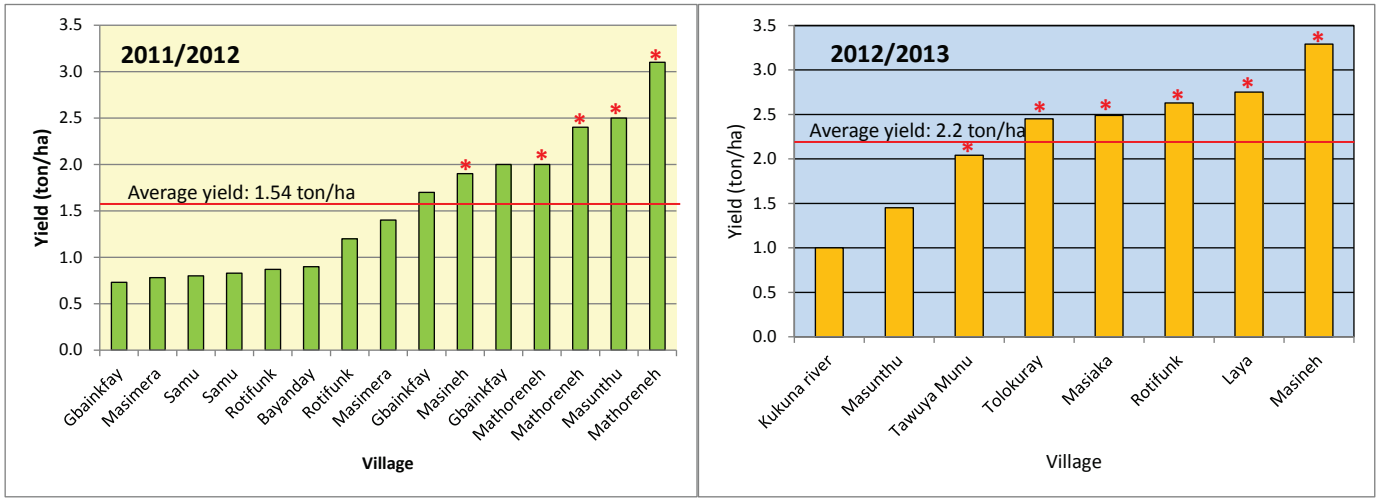

Figure: Grain yield of rice in the FBO fields during the dry season 2011/12 (left) and 2012/13 (right)

* shows the FBO field had water control structures.

In both years, seed rice of a short duration variety (butter cup; 25 - 35 kg/ha) and chemical fertilizer (15-15-15; 400 kg/ha) were provided on loan basis with periodical on-farm technical guidance by the project. Higher yield was obtained where FBO fields had water control structures like bunds and drainage channel.

Judging from the two season's records, it can be said that water control is one of the essential conditions to realize higher yield under fertilizer application.

Newsletter No.2 (May 2013)

Sustainable Rice Development Project in Sierra Leone (SRDP)

To make rice farming a profitable business

2. FBO farmers in Kambia evaluated the farming practices of rice in dry season!

A training course for the FBO farmers who received support for the rice cultivation in the dry season 2012/13 from SRDP under SCP, was held on 17th and 18th May. Objectives of the training were: 1) to compare the unit grain yield obtained in the dry season 2012/13 among FBOs; 2) to review important farming practices shown in the previous training session; 3) to evaluate the adoption of the recommended farming practices in each FBO; 4) to exchange the ideas on how to improve the present farming practices; and 5) to learn cost and benefit.

A total of 59 farmers from 10 FBOs participated in the training.

During the session, the participants exchanged the views how to improve their farming practices further. Through the session, it was realized that most farmers have understood and adopted recommended farming practices to increase rice productivity.
Finally, the cost and benefit was explained by showing a drama to help farmers' understanding of how to make profit by increasing yield under the wise use of fertilizer and adopting recommended farming practices.

3. Fertilizer issues on rice yield gap were discussed!

A policy orientation meeting on the fertilizer issue under SCP was convened on 21st May, 2012 at the conference hall of MAFFS. The meeting was chaired first by Mr. Lovell Thomas, Hon. Deputy Minister II, and next Mr. Ben Massaquoi, Director of extension. Participants included officials of MAFFS, researchers, scholars, JICA experts, etc.

Of the three presentations, two were particularly important in orienting the policy on fertilizer recommendation in Sierra Leone. One was Rice yield gap prepared by the task force team and presented by Dr. S. D. Johnson of RARC, and the other was soil fertility trial by pot experiments and its implications by Dr. J. Yamaguchi of JICA-SRDP.

While the former presentation proposed, after explaining various constraints to yield increase, a short term strategy consisting of the use of high yielding variety, increase in the dosage of fertilizer with $N\text{-}P_2O_5\text{-}K_2O$ = 60-40-40 kg/ha and timely weed, which, according to the presenter, could double the rice production in two years, the latter presentation challenged the former one by showing the results of pot experiment, which indicated that the most critically deficient nutrient in soils of Sierra Leone was phosphorus, followed by sulfur and potassium. Dr. Yamaguchi emphasized that increase in grain yield was not expected without adding those deficient nutrients to the soils. JICA-SRDP was requested to continue the research works to come up with a recommended dosage of fertilizer through on-farm trials.

Published by JICA-SRDP Team (Chief advisor: T. KIMIJIMA, Tel: 079-199765; Deputy chief advisor; M. Nishiya, Tel: 076-671585); Contact address: 1st Floor, MAFFS, Youyi Bldg. Freetown; E-mail: sierra_leone_rice@yahoo.co.jp

Newsletter No.3 (June 2013)

Sustainable Rice Development Project in Sierra Leone (SRDP)

To make rice farming a profitable business

About the Project

1. Project Title: The Sustainable Rice Development Project in Sierra Leone
2. Implementation agency: Ministry of Agriculture, Forestry and Food Security (MAFFS)
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Topics of the Project in June 2013

1. Training session for the farmers of FBOs under 2013 SCP support

SRDP provided a training session on rice production techniques to the farmers of 19 FBOs to be supported by the Smallholder Commercialisation Programme (SCP) in Kambia district in 2013. The one-day training session was held for three days from 19th through 21st June, 2013, inviting total of 65 farmers. The community facilitators, who are responsible for transferring technology of rice cultivation technique to each of 19 FBOs through the Farmer Field School (FFS), also participated in the training.

The session started with an opening address given by Mr. Umaru Sankoh, District Agricultural Officer (DAO) of MAFFS-Kambia. Main session included: 1) Lecture on important farming practices for obtaining higher rice yield, 2) Showing a drama on cost and benefit of rice production with the use of fertilizer, and 3) Practice on the preparation of cropping calendar. Lastly, contents of support to the FBOs provided by SCP and SRDP were explained.

The lecture on important farming practices and life cycle of rice plant was made by a SRDP expert using slides.

A drama played by SRDP local staff told about a farmer who invested his money in fertilizer for higher rice yield. His effort was failed at first, but he gradually gained a profit with the adoption of technical guidance provided by an extension agent of MAFFS. This drama attracted the farmers' interest very much.

The participants practiced the preparation of cropping calendar by putting the date of each farming practice on the distributed paper referring to the growth stage of rice.

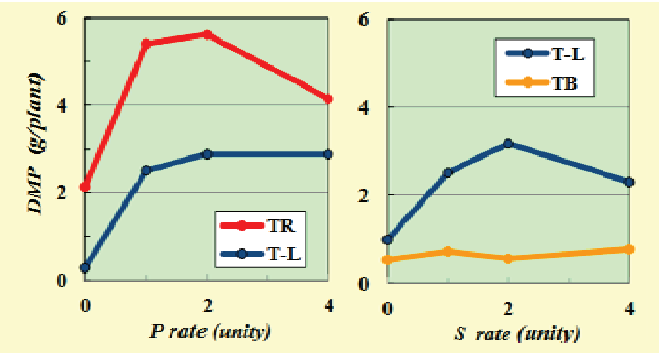
To make rice farming a profitable business

2. An approach to find a rational fertilizer composition

A series of pot trials showed that phosphorus (P) deficiency was the most severe and spread over the country, and sulfur (S) deficiency followed. Deficiency of potassium (K) and nitrogen (N) was not as serious as that of P and S.

Growth of rice plants responded to graded rates of various nutrients (Fig. and photo below). Note that over-doses of nutrients retard the growth. Although one hardly estimate a proper fertilizer rate in the field based on the results of pot trials, plants would respond to 100-200 kg P_2O_5/ha in Torma Bum and Tholokury (lower) soils, for instance. Similarly, 20% of nitrogen amount would be optimum for S application.

SRDP is projecting several field trials in the coming rainy season to verify the result by the pot trials.



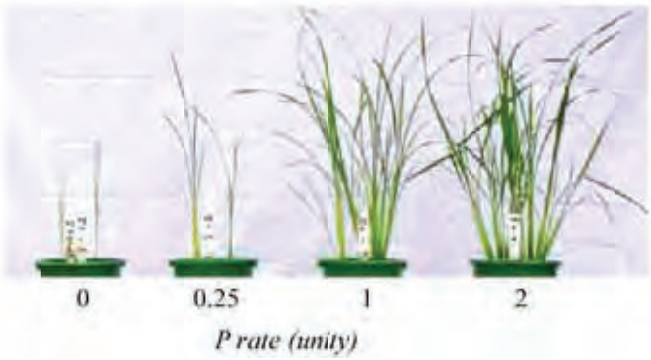


Fig.: Examples of growth response of rice plants to graded rates of phosphorus (P) and sulfur (S) application in various soils. DMP: dry matter production. Unity (1): 0.50 P_2O_5 and 0.05 S g/pot. TB: Tambi (boliland), Tonko Limba chiefdom, Kambia district. T-L: Tholokuray (lower) (inland valley swamp), Bramaia chiefdom, Kambia district. TR: Torma Bum (riverain grassland), Bum chiefdom, Bonthe district.

Photo: An example of the response of rice plant to graded rates of phosphorus application in Robana soil (riverain grassland, Mambolo, Kambia).

3. JICA senior officer visited the project site in Kambia

Mr. KUBOTA Hiroyuki, Executive Advisor to the Director General, Rural Development Dept., JICA Headquarters, Tokyo, Japan, visited Kambia on 29th June, 2013, to monitor SRDP activities and discuss the agricultural development in Sierra Leone with the SRDP experts and the Sierra Leonean counterparts. At first, Mr. Kubota made a courtesy visit to Mr. Umaru Sankoh, DAO of MAFFS-Kambia, and learned the agricultural situation and the progress of SRDP in the Kambia district.

Then, he visited inland valley swamp (IVS) at Rotifunk and Masiaka villages, Gbinleh Dixon chiefdom, to see the actual situation of the lowland rice fields under the support of SRDP and listen to the voice of farmers. He also visited Rokupr Agricultural Research Centre (RARC) to discuss technical issues on rice development with Dr. C.S. Kamara, Director of RARC and his colleagues. He exchanged ideas on further Japan's assistance in rice development in Sierra Leone with the SRDP experts.

Published by JICA-SRDP Team (Chief advisor: T. KIMIJIMA, Tel: 079-199765; Deputy chief advisor; M. NISHIYA, Tel: 076-671585);

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Newsletter No.4 (July 2013)

Sustainable Rice Development Project in Sierra Leone (SRDP)

To make rice farming a profitable business

About the Project

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2. Implementation agency: Ministry of Agriculture, Forestry and Food Security (MAFFS)
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Topics of the Project in July 2013

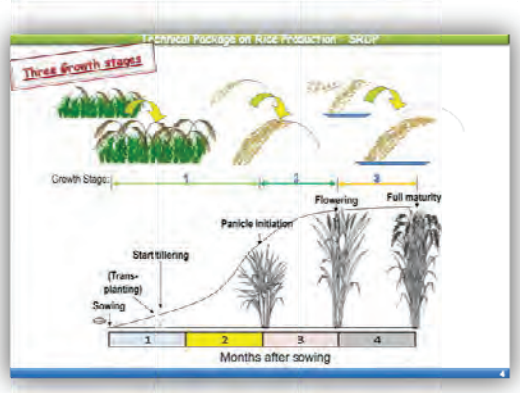
1. Extension workers in Kambia have "Extension Guide & Materials" at hand

SRDP is developing the extension method which consists of the extension guideline and materials, for facilitating the dissemination of the technical package on rice production (TP-R) to the farmers at the grassroots. The extension method is to be utilized by the community facilitators assigned to FBOs supported under SCP. The extension guideline deals with recommended rice farming practices based on the TP-R. In the guideline, each of the rice farming practices is explained in separate section with proposed facilitation procedure to fit FFS. The extension materials are a set of pictures which visually explain the recommended farming practices for the rice farmers to understand them easily. With the adoption of the extension method, uniform technology transfer to the farmers is expected.

The draft of the extension method were circulated to MAFFS and concerned donors to receive their comments on the contents.

In parallel with the preparation work, SRDP gave the SCP extension workers in Kambia district a series of training in the contents of the extension method.

After the training, the extension workers started to utilize the extension method at FFS sessions, to explain the specific rice farming techniques to farmers. Their comments and recommendations on the contents of the extension method will be incorporated into the final version which will be issued by the end of the Project.



Newsletter No.4 (July 2013)

Sustainable Rice Development Project in Sierra Leone (SRDP)

To make rice farming a profitable business

2. On-farm trial seeking for appropriate fertilizer rate

SRDP has been trying to find rational dose of fertilizer to lowland rice in IVS through a series of trials. Through the pot experiments, it has been found that phosphorus and sulfur are among others important elements to stimulate rice growth.

On-farm fertilizer trial commenced at five (5) locations in Kambia district using cooperative farmers' field in this rainy season to replicate the results obtained in the pot experiments. The trial in IVS employed five (5) treatments varying the dose of N, P and S.

Fertilizer application and transplanting were completed by the farmers at three (3) sites by the end of July. The other sites are under preparation. The trial plots are managed by the farmers under the supervision of the SRDP staffs and community facilitators.

3. FBOs start group farming of lowland rice in Kambia

Swamp in Kambia district has been developed steadily. Many FBO farmers are making great efforts to create favorable conditions for rice growth by constructing drainage canal, peripheral canals and internal bunds, expecting the better yield. It has been quite a big change in the attitudes of the farmers since SRDP started in 2010, when developed swamps were hardly seen in the district.

FBO farmers who learned improved rice production techniques through community facilitators trained by SRDP are busy in land preparation, nursery preparation, transplanting, etc. In several FBOs women members are also very active in the field.

In addition, at several FBOs' field, seed production activity to secure their own seed for the coming season was started under the technical guidance of SRDP, in the light of the current circumstances that high-quality seeds are hardly available.

Published by JICA-SRDP Team (Chief advisor: T. KIMIJIMA, Tel: 079-199765; Deputy chief advisor; M. NISHIYA, Tel: 076-671585);

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Newsletter No.5 (August 2013)

Sustainable Rice Development Project in Sierra Leone (SRDP)

To make rice farming a profitable business

About the Project

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Topics of the Project in August 2013

1. Extension workers in Kambia learn how to develop paddy field in IVS.

Because of its topographic location, inland valley swamp (IVS) is sloping from upstream to downstream, as well as from its fringe to the bottom. When establish paddy field there, land leveling is necessary to assure uniform growth of rice.

Photo 1: A sloping field plot in which water is seen only in a lower part (Rotifunk, Gbinleh Dixon)

However, visiting several IVS rice fields where swamp development has been completed, we often find the rice fields in which surface water appears only in the lower part. It means that the field is not level but sloping.

SRDP, together with agricultural engineering division (AESD) of MAFFS-K, trains extension workers of MAFFS Kambia in land leveling. Land leveling work needs lots of energy in moving earth within a plot. If the difference in elevation is large, volume of earth to be moved is also large. Internal bunds help reduce earth moving quantity for land leveling.

Photo 2: Extension workers learn the importance of land leveling in the field (Masineh, Gbinleh Dixon)

Internal bunds should be constructed along the contour line so that height of bund can be steady to store water, and so that land leveling work becomes easier.

Photo 3: Extension workers learn "A-frame", a simple tool for marking contour line (MAFFS-K, Kambia)

Contour lines for internal bund could be marked using the "A-frame", a simple device developed in the Philippines and used in many developing countries for contour farming. Using such technologies, the paddy fields in IVS will be improved further to be more productive.

Newsletter No.5 (August 2013)

Sustainable Rice Development Project in Sierra Leone (SRDP)

To make rice farming a profitable business

2. Monitoring of on-farm fertilizer trial started.

On-farm fertilizer trial is being carried out at FBOs' group farms to find rational dose of fertilizer to lowland rice in IVS. Based on the results of the pot experiments, five treatments with different dose of N, P, and S were set. Monitoring of the growth of rice in the trial sites is going on (Fig.1).

Photo 3: On-farm trial field at Masineh, Gbinleh Dixon

Although it is too premature to conclude, the monitoring results at about one month after transplanting seem to support the results of pot experiments. They are:

(1) Rice plants tend to respond well to phosphorus dosage.

(2) Effect of sulfur on the rice growth seems positive although not clear.

(3) Effect of nitrogen on the rice growth is not clear.

Monitoring works continue until panicle initiation stage when the development of tillers stops. Yield survey will be conducted at harvest.

Based on the result obtained, rational fertilizer dosage will be examined and recommended.

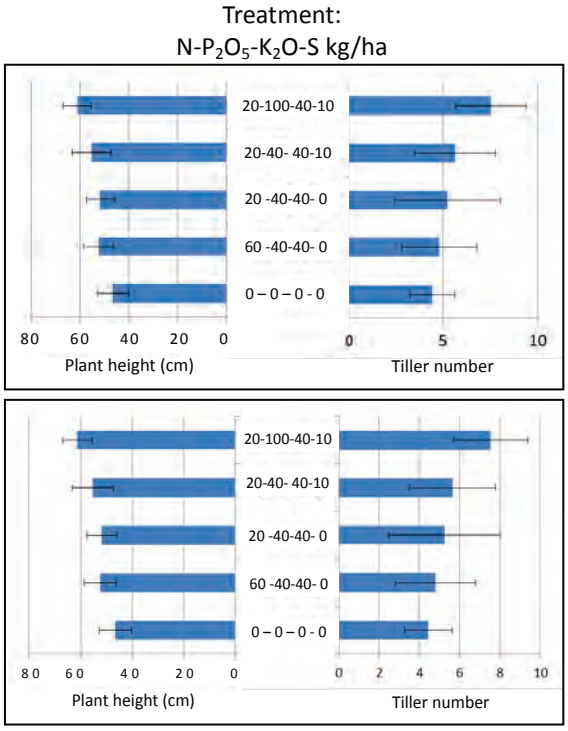

Fig 1: Monitoring results of on-farm fertilizer trial at Masineh, Gbinleh Dixon (top; 27th August, 2013), and Laya, Masungbala (bottom; 26th August, 2013) in Kambia district.
Values shown with bars are average of 20 hills in each treatment. ⊢⊣ shows standard deviation.

3. Progress Report 6 is prepared.

SRDP compiles its activities made and results obtained into a progress report every six months, and the Progress Report 6 (PPR 6) was compiled this time.

PPR 6 mainly deals with two main activities: (i) trials to find rational fertilizer dosage for productivity enhancement of rice; and (ii) capacity development of extension workers and FBO farmers.

Several output of the project is presented as Appendixes.

PPR 6 has been distributed to Sierra Leonean counterparts as well as concerned projects and donor agencies.

Sorry, we have one-month break in the Project activities

SRDP breaks its activities in September to arrange the project budget for the last year's operation. It will resume the project activities in early October.

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Newsletter No.6 (October 2013)

Sustainable Rice Development Project in Sierra Leone (SRDP)

To make rice farming a profitable business

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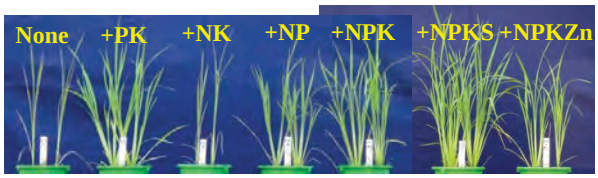
Topics of the Project in October 2013

1. Plan of operation of the project in the fourth year (Oct. 2013 – Sep. 2014)

The project resumed its activities in October 2013 for the final year of the entire project period. The project has been implemented almost on schedule so far. Many results and outcomes have been accumulated through various activities. We believe the project is well equipped to take agriculture in Sierra Leone into the next phase of growth and development.



Nutrient depletion trial : Kamaranka II (IVS, Bombali)


Training session for extension workers (MAFFS-Kambia)


Visit to the fertilizer trial field by the extension workers (Masineh)


On-farm fertilizer trial at Masine (IVS, Kambia)


Training session for FBO farmers on rice cultivation techniques (Kambia)

As the final year, the project plans to undertake important activities, among others the following:

1)	Finalization of the revision of TP-R
2)	Compilation of extension guidelines including rice production manual, extension guide and materials
3)	Provision of training session for extension workers countrywide on rice cultivation technique dissemination
4)	Reception of the terminal evaluation mission of the project
5)	Holding of a technology transfer seminar
6)	Preparation of the final report

Newsletter No.6 (October 2013)

Sustainable Rice Development Project in Sierra Leone (SRDP)

To make rice farming a profitable business

2. WFP mission visited the candidate IVS site for development in Kambia

A mission organized by the WFP West Africa Regional Office based in Senegal visited Sierra Leone for 11 days from 21 to 31 October, with the objective of formulating a project on IVS development funded by the Japanese Government. The mission exchanged the views on the development of IVS with the JICA-SRDP experts and MAFFS separately. The mission also visited prospective sites for IVS development in several districts including Kambia.

The WFP project supports small scale farmers in developing IVS to enhance rice productivity through the provision of food for work, fertilizer and farming tools, technical guidance, etc. As the aim of the WFP project is similar to the SRDP's one, both sides exchanged ideas on how to collaborate each other. For example, WFP develops IVS through the provision of food for work, tools and input, while SRDP provides the farmers with technical guidance and/or training to ensure effective use of developed facilities and enhance rice productivity.

3. MAFFS officers participated the overseas training

Five of the project counterpart personnel participated in the overseas training courses held in either Japan or Egypt. The list of training related information is shown below.

Name of the training course (host country)	Name of participant	Organization	Duration
Rice cultivation techniques for Africa (Egypt)	Daniel M. Kamara	MAFFS-K	Apr. - Sep. 2013
Agricultural extension planning and management (Japan)	Bakarr J. Bangura	MAFFS	Jul. - Sep. 2013
Planning and designing of agricultural statistics for food security policy making (Japan)	Umaru M. Sankoh	MAFFS-K	Aug. - Oct. 2013
Planning of agricultural policy (Japan)	Joseph S. Bangura	MAFFS	Aug. - Sep. 2013
Promotion of African rice development through strengthening coordination between CARD and CAADP for SSA countries (Japan)	Denis J. Taylor	RARC	Aug. - Sep. 2013

According to the participants, they learned a lot of things from the training and showed their appreciations for training. They are now expected to share the training results with other MAFFS staffs through presentation sessions and to utilize the acquired knowledge for further improvement of agriculture in Sierra Leone.

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Newsletter No.7 (November 2013)

Sustainable Rice Development Project in Sierra Leone (SRDP)

To make rice farming a profitable business

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Topics of the Project in November 2013

1. FBO Farmers produced their own seeds

The use of pure seeds is one of the key elements for obtaining high production. In this rainy season, SRDP worked with the farmers at four (4) FBOs in seed production.

Several techniques including transplanting single seedling per hill, line planting, removal of off-type plants, etc., to obtain pure seeds were transferred to the farmers. They established a small seed production plot with 100 – 200 m^2, and transplanted one seedling per hill in line. At transplanting, reasonable amount of fertilizer ($N\text{-}P_2O_5\text{-}K_2O$=45-45-45 kg/ha) was applied in the main field. During the growth period, the farmers were surprised at seeing that each seedling grew well and produced many tillers and panicles.

So far, harvest was finished at two FBO farms. At the harvest time, the farmers took off-type plants carefully out of the field and obtained heap of panicles. They enjoyed good harvest of pure seeds (both are NERICA L19) with about 40 kg from about 160 m^2 at both farms, which is more than enough for transplanting one hectare (10,000 m^2).

The produced seed rice was separated from other rice bags, and shall be kept in dry and cool condition as much as possible.

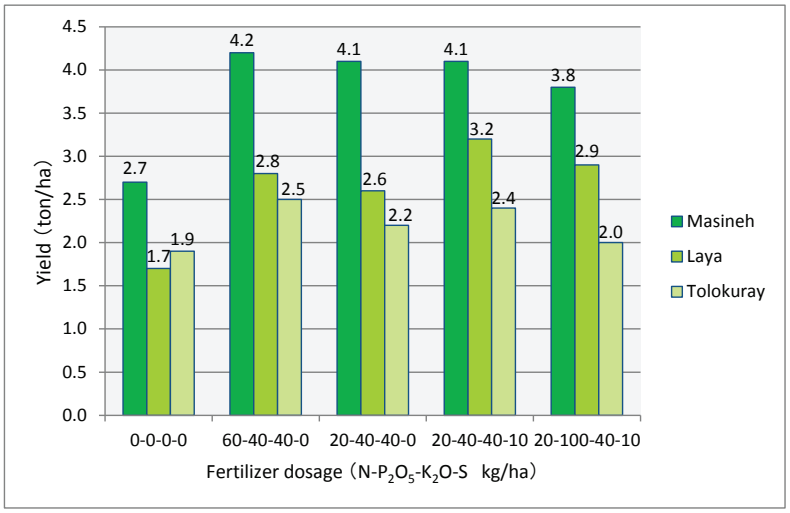
Newsletter No.7 (November 2013)

Sustainable Rice Development Project in Sierra Leone (SRDP)

To make rice farming a profitable business

2. Fertilizer trial in the rainy season cropping

SRDP implemented on-farm trial on fertilizer dosage at 5 FBO's field. So far, harvest was completed at 3 sites. The results are shown in the figure right.



Despite various hurdles including intensive rainfall and unfavorable geographical conditions existed in the trial at farmers' field during the rainy season cropping, the data may tell the following.

(1) Fertilizer application could enhance yield by up to 1.5 ton/ha under proper management condition.
(2) Response of rice performance to nitrogen dosage may reach maximum at about 20 kgN/ha.
(3) Response to sulfur is observed at Laya.
(4) Negative response to high dosage of phosphorus is observed.

We will examine the results further together with those which we already have, to come up with the fertilizer recommendations which will constitute an important part of the technical package on rice production.

3. Interview survey on adoption rate of rice production techniques

SRDP has provided improved rice production techniques to selected FBOs in these 3 years. The farmers learnt various techniques in their group farms, and they are expected to apply the techniques in the respective private farm.

To know the extent of adoption of the improved rice production techniques by those farmers, interview survey was carried out to by SRDP with MAFFS-Kambia.

So far, 165 farmers (including 54 women) from 14 FBOs were interviewed. While detailed analysis is going on, the following positive results have been obtained.

(1) Of the 18 production techniques SRDP introduced, all farmers interviewed adopted at least 4 techniques.

(2) 92% of the interviewed farmers claimed the increase in rice yield through the adoption of techniques that SRDP introduced, although the change in actual yield was hardly obtained.

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Newsletter No.8 (December 2013)

Sustainable Rice Development Project in Sierra Leone (SRDP)

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Topics of the Project in December 2013

1. Sixth Joint Coordinating Committee Meeting was convened

On 10th December, 2013, the 6th Joint Coordinating Committee (JCC) Meeting on SRDP was convened under the chairmanship of Hon. Minister of Agriculture, Forestry and Food Security, Dr. Joseph Sam Sesay. Total of 18 persons including the divisional heads of MAFFS, counterparts of SRDP, staff of JICA Sierra Leone Field Office, etc., participated in the meeting. Firstly the progress of the works to address the issues raised in the previous JCC meeting was confirmed.

Then the presentation on the contents of the progress report 6 of the SRDP was made by the SRDP Team, followed by the presentation of cost-benefit analysis of rice cultivation and proposed cropping pattern for double cropping of rice.

Question and answer session followed after the presentation. Assumptions used for cost-benefit analysis were main focus in the discussions. While it was pointed out that labor requirement seemed rather higher than reality, that high labor cost was explained by the high competition in the labor market due to recent mining industry development. Efficiency and profitability of small agro-machinery (i.e. power tiller), agro-chemicals and fertilizers were among others concerned. SRDP was asked to look into those aspects further.

Cropping pattern for double cropping of rice was also discussed among the participants. Some proposed triple cropping using short duration varieties like NERICA. Others proposed rice cropping between April and July. SRDP opposed the idea due to the unfavorable harvesting season under the condition of no drying facilities. Through the discussion of cropping pattern, it was realized that the diversity of climatic condition in the country does not allow us to come up with one concrete proposal.

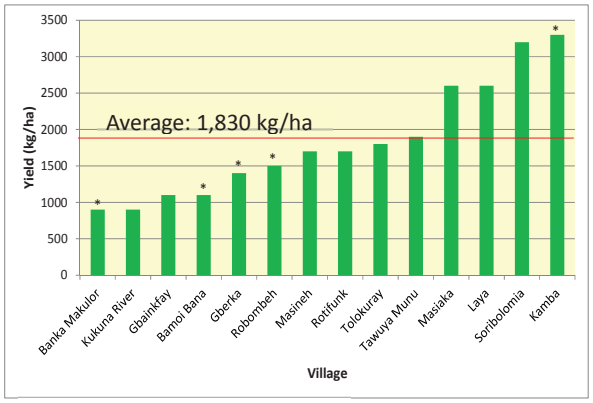
Finally, the chairman wrapped up the meeting by asking SRDP to compare the cost-benefit of rice production between Sierra Leone and Japan, and look into cropping pattern further.

Newsletter No.8 (December 2013)

Sustainable Rice Development Project in Sierra Leone (SRDP)

To make rice farming a profitable business

2. Further enhancement in rice yield seen in FBO communal farms in Kambia in the rainy season 2013



* shows the 5 FBOs newly supported

Average rice grain yield of FBO communal farm supported under SCP in Kambia in the rainy season 2013 was 1,830 kg/ha on average. Of the 14 FBOs, the top two exceeded 3,000 kg/ha, and another two got more than 2,500 kg/ha. The farmers of those FBOs adopted TP-R under the guidance of the extension workers. It should be noted that the average yield increased from the previous year by 10% despite the fact that the amount of fertilizer applied was reduced by 25% in 2013.

Several FBOs suffered from torrential rain just after fertilizer application or during the early growth stage of seedlings after transplanting. As a result, applied fertilizers were flushed away, and seedlings were damaged by caseworm with flood water, all of which lowered the yield. Unfavorable crop management was also attributed to the low performance of rice. Insufficient land preparation especially land levelling, inadequate water management, no weed management, etc. were among others important factors lowering yield.

Repeated guidance is necessary for the farmers to understand the value of timely farming practices.

3. Training session for FBO farmers on the dry season rice cropping provided

On 23rd December, a training session on rice production technique was provided to the farmers of FBOs to be supported the dry season cropping in 2013/2014. The session was conducted at two villages, and 90 farmers in 5 FBOs participated in the session.

The session focused on dry season cropping, and more important points in targeting higher yield in the dry season were highlighted. Among others, respect of cropping calendar in using short duration varieties was emphasized to secure the vegetative growth stage during which tillers develop. Other aspects dealt with in the session included technique of nursery preparation, and land preparation particularly land levelling as well as water management.

While most participants experienced the dry season cropping, they were well reminded more important farming practices to which they should pay attention in the season.

The training was provided jointly by a JICA expert and two extension workers of MAFFS-K, who have well acquired the extension skill on the rice production techniques based on TP-R. Training using local language created better environment for the participants (local farmers) to easily understand the contents of the training. It is hoped that more extension workers would acquire the extension skill to be trainers through further training.

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Newsletter No.9 (January 2014)

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Topics of the Project in January 2014

1. Terminal Evaluation Study of SRDP Executed

The terminal evaluation study of SRDP was executed for about two weeks from 8th to 24th January, 2014 by the joint evaluation team (the Team) consisting of three members each of the Sierra Leonean and Japanese evaluation teams. The objectives of the terminal evaluation study were: (i) To review the inputs, the progress and achievements of the SRDP's activities; (ii) To review SRDP based on the five evaluation criteria (Relevance, Effectiveness, Efficiency, Impact and Sustainability); (iii) To identify issues affecting SRDP to make necessary recommendations; and (iv) To draw out lessons learned from SRDP for future projects to make them more effective, efficient and sustainable.

In the evaluation, framework of the evaluation was designed first, and then data necessary for the evaluation were collected through the review of the reports, documents, monitoring data, etc., through interview with the Japanese experts and Sierra Leonean counterpart personnel, and through field visits and semi-structured interview as well as discussions with the beneficiary farmers.

The Team then analyzed the collected data, and came up with the following conclusions: (1) it was confirmed that SRDP has smoothly been implemented without any critical problem or notable delay and that the outputs have largely been achieved, and (2) It was also assured that the purpose of SRDP would successfully be achieved by the end of the cooperation period. All the evaluation results, recommendations and lesson learned were compiled into the evaluation report, which was agreed upon and signed by the leader of both evaluation teams.

The contents of the evaluation report was explained to the members of the Joint Coordinating Committee (JCC) of SRDP in the 7th JCC meeting convened on 24th January, 2014 under the chairmanship of the Minister of Agriculture, Forestry and Food Security, Dr. Joseph Sam Sesay. The evaluation report was approved by the JCC members, and the minutes of the meeting was signed by the Chairman of JCC and the leader of the JICA mission.

Newsletter No.9 (January 2014)

Sustainable Rice Development Project in Sierra Leone (SRDP)

To make rice farming a profitable business

2. SRDP Received Two Missions

The SRDP team received two missions in this month. One is from BRAC International, and the other is the delegation from Brazil.

(1) BRAC International, a Bangladesh based NGO, started its operation in Sierra Leone in 2008. Among the activities, it is working with MAFFS, DFID, and WFP in seed production, home gardening and backyard poultry, and IVS development regarding the agriculture development. They mobilize agriculture promoters as extension arms at village level to disseminate relevant technologies. However, they are still struggling with low yield of rice. Hearing the success story of JICA's assistance, BRAC decided to send its agricultural team to SRDP on 28th January, 2014.

The SRDP team received 10 members team of BRAC at MAFFS Kambia and told them about the activities of SRDP and its results so far obtained. Then a field visit was made to Masiaka and Rotifunk, where the fertilizer trial and FBO group farming were being conducted. After the field visit, broad discussion on rice development was made between the BRAC and SRDP teams. Both sides agreed to continue communication for further cooperation.

(2) Delegation from Brazil came to Sierra Leone for two weeks to study ways of establishing south-south cooperation in rice and cassava sub-sectors, including agricultural research and technology transfer. As a part of information gathering in the field, four members of the delegation; three from EMBRAPA and one from the Brazilian Agency for Cooperation – Ministry of Foreign Affairs, a FAO Senior Officer and a staff of MAFFS extension division visited Kambia on 30th January.

The SRDP team first made a presentation on the project activities to the delegation. Based on the presentation, general discussions on the rice development in Sierra Leone followed. Nutrient dosage in the fertilizer trial, extension method, rice yield increase in the FBO farms, rice farming method, adoption of new techniques by farmers, etc. were discussed. The delegation then visited Laya village where the dry season rice farming supported by SRDP as well as the fertilizer trial were carried out. The delegation members were impressed with the SRDP's step by step approach to the FBO farmers in disseminating new farming technologies, and wished to collaborate with JICA in the future.

3. Ambassador of Japan Visited Kambia

On 21st January, 2014, H. E. Mr. Naoto NIKAI, ambassador of Japan, together with Ms. Yukari HARA, the first secretary of the Embassy of Japan in Ghana, visited Kambia to inspect the SRDP activities in the field.

The SRDP team welcomed Mr. NIKAI and Ms. HARA at the MAFFS Kambia, and explained how SRDP has been implemented. They made a courtesy visit to the District Agricultural Officer of MAFFS Kambia, and Chairman of Kambia District Council. They finally visited the rice field where a FBO group farmers supported by SRDP were cultivating the dry season rice. At the site, the group leader of the FBO explained how SRDP supported them in acquiring new rice production techniques, and showed the expanded rice cultivation area as an impact of SRDP.

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Newsletter No.10 (February 2014)

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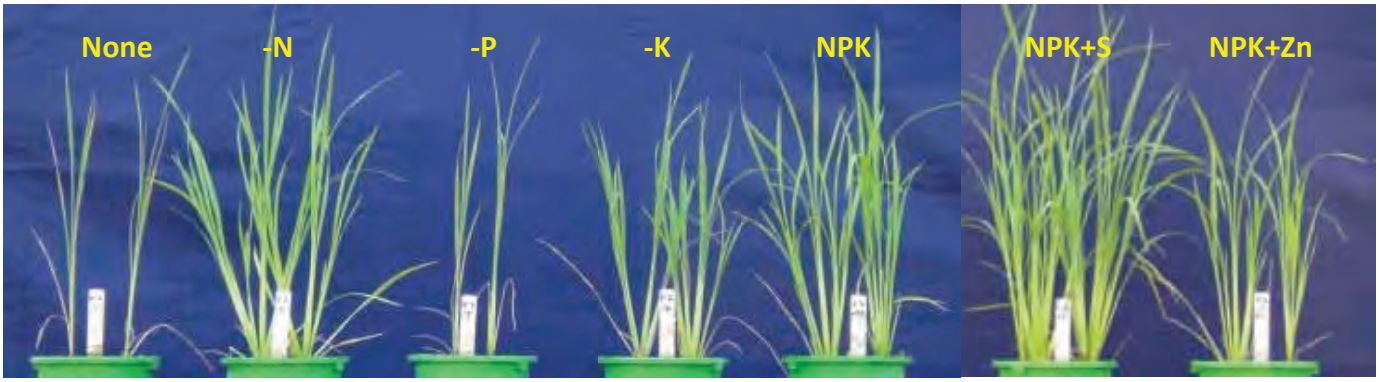
Topics of the Project in February 2014

1. *On-farm verification trial in the dry season on-going*

One of the output expected in the current project is the revision of TP-R, which was developed in the previous JICA project: "Agricultural Development Project in Kambia". The main point of the revision to the previous version is to realize higher rice yield of more than 3 ton/ha with profit under fertilizer application. To attain the target, improvement of farming practices, among others, development of rational dose of fertilizer have been pursued.

The project first conducted a series of pot trials to assess the soil fertility status of the lowland rice fields in Sierra Leone. The major findings through the trials include: (i) phosphorus (P) is the most deficient in the soils, which is widely observed over the country, (ii) sulfur (S) is also deficient next to P, (iii) deficiency of nitrogen (N) and potassium (K) appears in several soils, (iv) deficiency of zinc (Zn) was site specific, and (v) level of nutrient concentration required to the optimum growth of rice differs among the soils tested.

Based on the results of the pot experiment, a series of on-farm trials on fertilizer doses focusing on P, S and N, for lowland rice has been conducted since the rainy season in 2011, to find the rational doses of fertilizer containing the best mix of nutrients.



Nutrient depletion/addition trial: Kamaranka II (IVS, Bombali)

Based on the results of previous trials, five treatments were established in the current trial at five locations, namely Masineh, Masiaka, Rotifunk, Laya and Tawuya Munu. Yield survey will be carried out from late March, and the results will contribute to finalization of TP-R.

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Treatment	Fertilizer application rate: N-P_2O_5-K_2O-S (kg/ha)
1) Control	0-0-0-0
2) Standard	60-40-40-0
3) Low N, -S	20-40-40-0
4) Low N, + S	20-40-40-10
5) Low N, High P, +S	20-100-40-10

On-farm fertilizer trial at Masineh (IVS, Kambia)

2. Training session for MAFFS extension officers nationwide under preparation

The project plans to provide a four-day training session on TP-R in March - April 2014 for about 100 relevant extension officers in nationwide MAFFS district offices. Through the discussion with MAFFS HQ, it was decided to invite District Agricultural Officer, as well as Block Extension Supervisors (BES), crop officer, and extension officer from all MAFFS district offices to the session.

Plan of training on TP-R for extension officers of nationwide MAFFS district offices

Batch	Schedule	Venue	No. of participants					No. of the target districts
			DAO	Crop	Ext.	BES	Total	
1	Mar. 17 - 20, 2014	Kambia	4	4	4	18	30	4
2	Mar. 24 - 27, 2014	Kambia	4	4	4	20	32	4
3	Mar. 31 - Apr. 3, 2014	Kambia	5	5	5	27	42	5
Total			13	13	13	65	104	13

The draft training program contains classroom lecture, field visit and practices. A draft of "Extension guideline" will be distributed as training material. The officers of MAFFS, MAFFS-K and RARC are expected to play active role in the training session.

Summary of the training program (draft)

Day	Time	Contents	Facilitator
Day1 Mon	AM	Move to Kambia	
	PM	Registration; Brief explanation of SRDP; Field visit to SRDP sites	SRDP
Day2 Tue	AM	Opening address; Orientation; "Agricultural extension and FFS implementation"; "Introduction of TP-R/Extension Guide"; Pre-evaluation (Questionnaire, Test)	MAFFS/SRDP
	PM	"Life cycle of rice plant and yield components"; "Nursery preparation"; "Transplanting"; Discussion (rice variety, cropping calendar, etc. in each district)	MAFFS/SRDP
Day3 Wed	AM	"Land development and land preparation", "Fertilizer application and water management", "Other issues on rice production techniques"	MAFFS/SRDP
	PM	Practice on cropping calendar, Discussion (technical matter on rice production)	MAFFS/SRDP
Day4 Thu	AM	"Seed production", "Field trial and FFS trial plot", Summary of TP-R/Extension Guide, Overall discussion, Evaluation (Test, Questionnaire)	MAFFS/SRDP/RARC
	PM	Issue of certificate, Closing	MAFFS/SRDP

Through the training, the participants are expected to understand fully the essence of TP-R for its dissemination to their responsible areas. Observers are welcomed and their active participation is also appreciated.

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Newsletter No.11 (March 2014)

Sustainable Rice Development Project in Sierra Leone (SRDP)

To make rice farming a profitable business

About the Project

1. Project Title: The Sustainable Rice Development Project in Sierra Leone
2. Implementation agency: Ministry of Agriculture, Forestry and Food Security (MAFFS)
3. Project period: 4 years (from October 2010 through September 2014)
4. Project area: Mainly Kambia district
5. Project purpose: To establish rice production techniques and its extension method which are applicable throughout Sierra Leone
6. Expected output:
   1) To revise the Technical Package on Rice production (TP-R), which brings about higher yield with profit,
   2) To extend TP-R to small-scale farmers through Farmer Based Organizations (FBOs) in Kambia district, and
   3) To extend the contents of TP-R and an extension method to officials of MAFFS's district agricultural offices other than MAFFS-Kambia.

Special Issue in March 2014

Training session on TP-R for district extension officers implemented

A four-day training session on the Technical Package on Rice Production (TP-R) was provided for the extension officers of the district agricultural offices nationwide in March and April 2014 at Kambia, aiming mainly at meeting the requirement on the expected output 3) of the project.

More than 100 extension officers at district level including DAOs, Extension officers, Crop officers, and BESs participated in the training session which was repeated three times to well accommodate a large number of participants.

Number of the extension officers participated in the training session on TP-R

Batch	Schedule	Target districts	Number of participants
1	Mar. 17 - 20, 2014	Bombali, Kambia, Port Loco, Western Rural	31
2	Mar. 24 -27, 2014	Koinadugu, Kono, Moyamba, Tonkolili	31
3	Mar. 31 - Apr. 3, 2014	Bo, Bonthe, Kailahun, Kenema, Pujehun	41

The training programme consisting of field visit, classroom lecture, practices and tests was prepared. A draft of "A guide to the Dissemination of TP-R through FFS" was distributed to all the participants as training material.

Through the field visit, the participants confirmed the effectiveness of the TP-R by observing the rice field where TP-R was applied and by hearing the voices of FBO farmers who were benefited from TP-R. Through the classroom lectures, they learned about the essence of TP-R, including life cycle of rice plant and yield components, preparation of farming plan and cropping calendar, seed selection, nursery preparation, land development and land preparation, transplanting, weeding, fertilizer management, water management, pest and diseases control, harvest and post-harvest, and seed production. Important points on establishing FFS trial plots were also explained. During the session, participants practiced the preparation of cropping calendar.

Almost all participants were very much satisfied with the training course, and found the TP-R effective tool to enhance yield. They were supposed to disseminate the contents of TP-R down to the farmers at their locality through the frontline extension workers (FEW).

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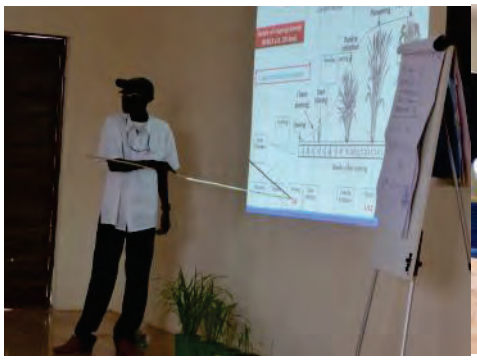
FIELD VISIT



OPENING

CLASSROOM LECTURE


CLASSROOM LECTURE




PRACTICES

PRESENTATION

GROUP PHOTO

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Newsletter No.12 (April 2014)

Sustainable Rice Development Project in Sierra Leone (SRDP)

To make rice farming a profitable business

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Topics of the Project in April 2014

1. Collaborative works with WAAPP planned

Collaboration between development partners to achieve the common objective has been pursued especially since the Paris declaration on aid effectiveness of DAC of OECD in 2005.

On 1st April, 2014, several members of WAAPP implementation support mission (ISM) visited Kambia to observe the training session on TP-R organized and implemented for MAFFS district officers by JICA-SRDP in cooperation with MAFFS. They were very much impressed with the session about not only the highly experienced facilitators, but also the presentation materials and handouts covering all the rice cultivation techniques, and came to an idea to utilize the output of JICA-SRDP as a tool for the capacity development of the beneficiaries under WAAPP. WAAPP and JICA-SRDP has a common objective of rice productivity enhancement.

The WAAPP ISM, then had a meeting with JICA Sierra Leone Field Office (SLFO) and the chief advisor of JICA-SRDP in Freetown, and asked them to train extension officers of neighboring beneficiary countries under WAAPP as well as MAFFS staff at district level.

JICA-SLFO welcomed the idea as the both projects are financed by the Government of Japan looking at the same direction.

Another training session on TP-R is planned to be conducted by JICA-SRDP in early May, 2014, inviting 5 extension staff each from Guinea and Liberia, and all crops and extension officers in the MAFFS district offices who are responsible for the implementation of seed multiplication programme and innovation platform under WAAPP.

Newsletter No.12 (April 2014)

Sustainable Rice Development Project in Sierra Leone (SRDP)

To make rice farming a profitable business

2. Fertilizer trial in the dry season 2013/2014 completed

Another set of fertilizer trial employing the same treatment as the previous trial was conducted at 5 FBO sites in the dry season 2013/2014. Source of nutrients was also the same as those used in the previous trial. Whereas all N except for 60-40-40-0, P, K and S sources were applied as basal at puddling, N application at the treatment of 60-40-40-0 was split into two. First, 40 kg N/ha was applied at puddling and the rest or 20 kg N/ha was applied at panicle initiation stage, corresponding to 50-60 days before harvesting.

Table Grain yield of rice by treatment at the trial sites in the dry season 2013/2014

	Treatment (N-P_2O_5-K_2O-S kg/ha)	Grain yield (ton/ha)						SE
		Masiaka	Masineh	Laya	Rotifunk	Tawuya Munu	Average	
1)	0-0-0-0	2.6	1.4	2.1	1.3	1.6	1.8	0.24
2)	60-40-40-0	3.8	3.4	2.7	2.2	2.4	2.9	0.30
3)	20-40-40-0	3.1	3.2	2.7	2.5	2.0	2.7	0.20
4)	20-40-40-10	3.6	2.7	3.5	-	2.2	3.0	0.34
5)	20-100-40-10	3.7	3.5	2.8	-	2.2	3.1	0.33

Used varieties are NERICA L19 for Masiaka and Laya, Yeffin for Masineh, and Butter Cup for Rotifunk and Tawuya Munu.
Yield is adjusted at 14% moisture content; -: Yield data was excluded due to very irregular growth.
SE: Standard error

Yield response to each treatment varied between the sites. General findings from the trials are in the following.

- Fertilizer application has brought about yield increment of up to 2.1 ton/ha.
- Effect of nitrogen dose seemed have peaked at around 20 kg N/ha.
- The higher dose of P has not necessarily shown the positive result on rice yield.
- Sulfur may have contributed to the yield enhancement in Laya and Masiaka.

Progress report 7 prepared

JICA-SRDP has prepared the Progress Report 7, compiling the project activities made and their results obtained in the last seven months from October, 2013 through April, 2014.

Electronic file of the report is available at the JICA-SRDP office.

Published by JICA-SRDP Team (Chief advisor: T. KIMIJIMA, Tel: 079-199765; Deputy chief advisor; M. NISHIYA, Tel: 076-671585);
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Newsletter No.13 (May 2014)

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Topics of the Project in May 2014

1. Training on technical package on rice production for WAAPP

A three-day training session on technical package on rice production was provided to the agricultural officers in Sierra Leone and Guinea assigned for West Africa Agricultural Productivity Program (WAAPP) from May 9 through 11, 2014, at Kambia. The session was planned and held by JICA-SRDP in full cooperation with MAFFS-Kambia under the finance of WAAPP. It was a unique trial that two projects collaborated each other to achieve the same objective of productivity enhancement of rice.

The officers participated in the training course were to be responsible for the innovation platform and seed multiplication program, both of which constituted important components of WAAPP. Total of 31 agricultural officers (26 from Sierra Leone and 5 from Guinea) participated in the session.

The session covered almost the same subjects as those which were dealt with at the training course provided to the MAFFS agricultural officers assigned to SCP at the district level. To facilitate the discussion and understandings, a simultaneous interpretation system was employed especially for the participants from Guinea throughout the session. During the course, calculation exercises on seed requirement, yield, and fertilizer doze were made.

At the end of the session, an achievement test was given to the participants to measure the development level of their capacity.

Newsletter No.13 (May 2014)

Sustainable Rice Development Project in Sierra Leone (SRDP)

To make rice farming a profitable business

2. Eighth Joint Coordinating Committee (JCC) Meeting Held

Upon the submission of the Progress Report 7 (PR7), the 8th JCC Meeting was held at MAFFS-HQ on May 12. The meeting was chaired by the Chief Agricultural Officer. Mr. Kimijima, Chief advisor of SRDP made presentations on the contents of PR7, followed by comparative study on labor requirement between Japan and Sierra Leone, and cost-benefit analysis of power tiller introduction.

Showing the results of the on-farm fertilizer trials, Mr. Kimijima said that the SRDP team would make further analysis to come up with rational fertilizer dose to obtain the rice yield of at least 3 ton/ha with profit in IVS in Sierra Leone. A concern about the necessity of coordination with RARC/SLARI on the finalization of the recommended fertilizer dose was raised.

The SRDP team showed that incremental yield of 1.5 ton/ha would bring about profit for the rice farmers, based on the assumptions of fertilizer dose, cost, incremental yield, rice price, etc. derived from the on-farm experiments and surveys.

3. RARC Seminar Convened

Director of Rokupr Agricultural Research Centre (RARC) organized the seminar on "Soil fertility and rice response to fertilizer application in SL" on May 28. Total number of attendants was 23 including RARC researchers and officers of MAFFS Headquarters. Dr. Yamaguchi of SRDP, as a lecturer, made presentations on 1) soil fertility evaluation by pot trial, 2) grain yield response to fertilizer application, and 3) technical package on rice production.

In the first topic, the lecturer presented main results of pot trials and discussed rational fertilizer dose for rice cultivation in soils in SL. Second, more than 200 research results on the grain yield response to fertilizer from 1970's as well as on-farm fertilizer trials by SRDP showed general tendency of the low yield response, suggesting the difficulty in the recovery of fertilizer cost. Through the discussions, it was agreed that further research to make rice farming under fertilizer application more profitable would be necessary.

4. Resident Representative of JICA Ghana Visited SRDP Site

Mr. Makino, resident representative of the JICA Ghana Office, and Mr. Hasegawa, representative of the JICA Sierra Leone Field Office visited Kambia on May 14 to inspect SRDP's field activities.

After the discussion on agriculture development with DAO of Kambia, they visited 2 FBO sites, Rotifunk and Masiaka supported by SRDP. While they observed the field condition, staff of MAFFS and SRDP explained the progress of rice production in those sites. The member farmers of the FBOs expressed their gratitude to JICA for its continuous support.

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