Ministry of Agriculture
The Republic of Sierra Leone

Sustainable Rice Production Project in the Republic of Sierra Leone

Project Completion Report

Annex 5: End-line Survey Report

July 2022

JAPAN INTERNATIONAL COOPERATION AGENCY

RECS International Inc.

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Ministry of Agriculture
The Republic of Sierra Leone

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Acronyms and abbreviations

ABC	Agricultural Business Centre
BLS	Base-line Survey
ELS	End-line Survey
FBO	Farmer Based Organization
FFS	Farmer Field School
GOJ	Government of Japan
GOSL	Government of Sierra Leone
HH	Household
ICT	Information and Communication Technology
IVS	Inland Valley Swamp
JICA	Japan International Cooperation Agency
MAF	Ministry of Agriculture, Forestry
MAFFS	Ministry of Agriculture, Forestry and Food Security
SRDP	Sustainable Rice Development Project
SRPP	Sustainable Rice Production Project
TP-R	Technical Package on Rice Production

1. Background and Objectives of the End-line Survey

Rice is a staple food in Sierra Leone, which consumed more than 100 kg per person per year in 2019 (FAOSTAT). However, domestic rice production does not meet the demand, and more than 400,000 tons of milled rice were imported in 2020. In the meantime, 85 percent of small-scale rice farmers own less than 1 ha of farmland. Under such circumstances, the enhancement of productivity and profitability of small-scale rice farmers was an urgent issue to be tackled for food security as well as poverty reduction in the Country.

The Government of Sierra Leone (GOSL) has made efforts with support from various development partners, among which was a previous technical cooperation project under the Official Development Assistance of the Government of Japan (GOJ), Sustainable Rice Development Project (SRDP). SRDP aimed to enhance rice productivity, piloting various activities mainly in the Kambia district, which has successfully developed a package of improved rice cultivation techniques, i.e., the Technical Package on Rice Production (TP-R), and completed in 2014. In further pursuit of increased production, GOSL requested GOJ for another technical cooperation project, in response to which this new project, i.e., Sustainable Rice Production Project (hereinafter referred to as "SRPP" or "the Project"), was agreed to be implemented jointly by Ministry of Agriculture, Forestry and Food Security (MAFFS)[1] and Japan International Cooperation Agency (JICA) for a period of 5 years starting from 2017.

SRPP aimed to promote rice production in the Inland Valley Swamps (IVS) to improve beneficiary farmers' livelihood while enhancing the capacities of relevant agricultural extension staff in the four (4) target districts, i.e., Bombali, Karene, Port Loko, and Kambia. Various activities have been conducted over the five years, including the Farmer Field School (FFS) on the TP-R, and support to the FBOs who graduated from the FFS in scaling up and sustainable application of the TP-R. At the end of the Project, in order to evaluate the achievement of the outputs, project purpose as well as the overall goal of the Project, it is necessary for the Project to precisely capture the current situation of the conditions of rice production in IVSs in the target districts and compare them with the baseline survey (BLS) data. Hence, this end-line survey (ELS) was designed to serve the following three objectives;

(1) To gather data on the status of IVS rice production in the target areas of the Project,
(2) To analyze the extent of changes in the IVS rice production in comparison with the benchmark data, and
(3) To evaluate the assumed impact of the Project interventions.

[1] Ministry of Agriculture, Forestry and Food Security (MAFFS) changed its name to Ministry of Agriculture and Forestry (MAF) in 2018.

2. Methodology and Coverage of the Survey

2.1. Methodology and the period of the survey

The ELS was conducted from the end of January 2022 through direct interviews with farmers in the target district using a questionnaire application installed in the mobile gadget. The questionnaire application was divided into two parts, i.e., the FBO survey and the household survey, the same as the one used for the BLS. The questions for the ELS were identical to the ones covered under the BLS, but some questions found unrealistic or inapplicable during the BLS were deleted. On the other hand, a few additional questions were added to capture the changes at the time of the ELS.

A total of 42 enumerators were mobilized for the ELS. They were trained on the questionnaire application and its contents during the orientation sessions held prior to the commencement of the survey. Those trained enumerators conducted the field interviews in each target district from the 24th of January 2022 to the 6th of February 2022.

2.2. Coverage of the survey and number of samples

The ELS covered the FBOs and the member farmers in the target districts of the Project. Although the target area of the Project had initially been three (3) districts, i.e., Bombali, Port Loko, and Kambia, at the time of BLS, some chiefdoms of Bombali and Port Loko were separated when a new district of Karene was established in August 2017. Therefore, the data of the BLS was sorted out based on the new districts' boundaries to make the possible comparison between the BLS and the ELS.

In the ELS, both the FBOs and member farmers with whom SRPP has intervened and those who were not intervened were identified. The number of samples of FBOs and households covered under the BLS and the ELS is described in Table 2-1.

Table 2-1: Number of households and FBOs covered under the questionnaire survey

District	Number of samples							
	FBOs				Households			
	BLS	ELS			BLS	ELS		
		Supported	Unsupported	Total		Supported	Unsupported	Total
Bombali	67	34	41	75	295	167	210	377
Karene	67	37	27	64	298	199	115	314
Port Loko	66	30	35	65	287	148	157	305
Kambia	66	31	28	59	320	131	122	253
ALL	266	132	131	263	1200	645	604	1249

2.3. Value conversion

In the questionnaire, different units such as kg, TP, buttercup, bushel, and bag could be chosen for the ease of respondent, as well as the unit of areas such as hectare, square meters, acre, and bushel. For comparative analysis, the weight/volume and area were unified in kg and ha, respectively, according to the conversion rates shown in Table 2-2.

Table 2-2: The converted value of the weight/volume and area

Weight/Volume	Area
1 TP = 0.88 kg	1 acre = 0.4 ha
1 buttercup = 0.2 kg	1 bushel = 0.4 ha
1 bushel = 25 kg	
1 bag* = 50 kg	

*If the respondent specified the value of kg/bag, the weight was calculated as the specific value.

2.4. Limitations of the survey

It should be noted that the respondents of the BLS and the ELS are not identical for 100% since the BLS was conducted to grasp the status of rice production in IVS and the livelihood of rice-producing farmers before determining the target IVSs, beneficiary FBOs, and beneficiary farmers. Some FBOs and farmers who were not covered in the BLS were selected and participated in the activities of the Project, thus, they were covered by the ELS. Also, some FBOs have been dissolved or reorganized with different membership or even with different names of the group during the five-year period, which makes it difficult to precisely identify the groups and individuals who were interviewed in the BLS. Due to these limitations, it was not possible to have accurate comparisons between the groups and individuals supported by the Project and those who were not supported. Therefore, the main focus of the analysis in this report centers around the comparison between the "before" and "after", while some additional comparisons between "with" and "without" the support from the Project have also been tried to augment the discussions in terms of the additional questions added in the ELS that are specifically meant to grasp the degree of changes.

3. Analysis of the Survey Results

3.1. Results of the FBO survey

3.1.1. Basic characteristics of the surveyed FBOs

The number of FBO members decreased slightly in ELS, as shown in Figure 3-1-1, and 26% of the FBOs answered that the number of members decreased at the time of ELS compared to 5 years ago, while the proportion of the FBOs who answered it increased was only 8%, as in the Figure 3-1-2. There have been many FBOs in which the reorganization of membership took place, excluding inactive members to carry out the group activities more cohesively. The number of members may have decreased in general.

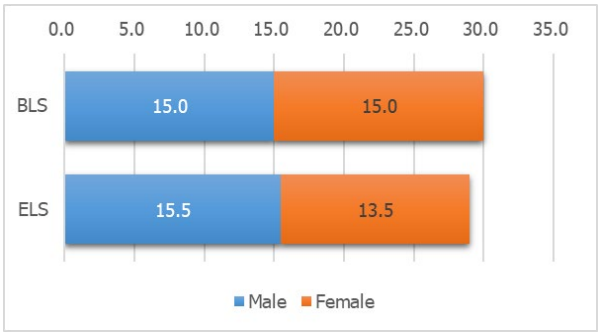


Figure 3-1-1: Median number of FBO members

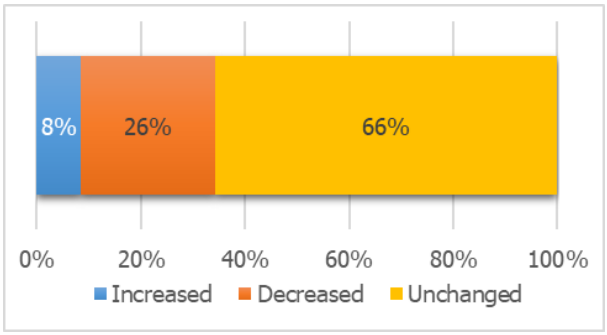


Figure 3-1-2: Change in the number of FBO members in ELS compared to five years ago

Figure 3-1-3 and Figure 3-1-4 illustrate the gender ratio of FBO heads and the educational background of FBO heads, respectively. There was no notable change in these aspects from the time of BLS.

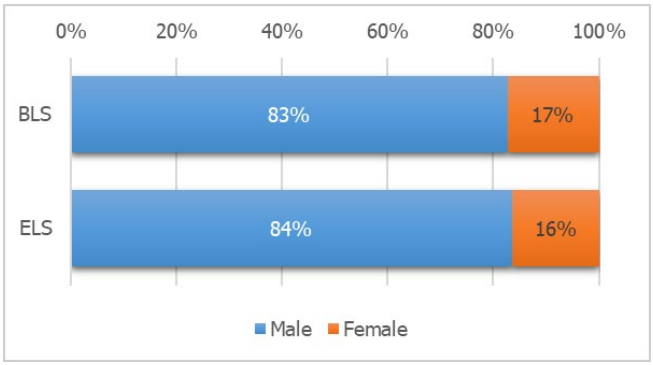


Figure 3-1-3: Gender ratio of FBO heads

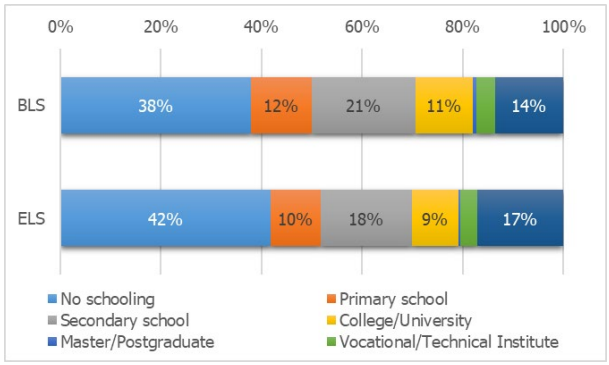


Figure 3-1-4: Educational background of FBO heads

Figure 3-1-5 shows the disaggregation of the FBOs by the years of experience as a group. Since the ELS in principle covered the same FBOs which have been interviewed in the BLS, despite the inclusion of some exceptions, the proportion of FBOs who have longer experiences as a group increased along with the time for five (5) years.

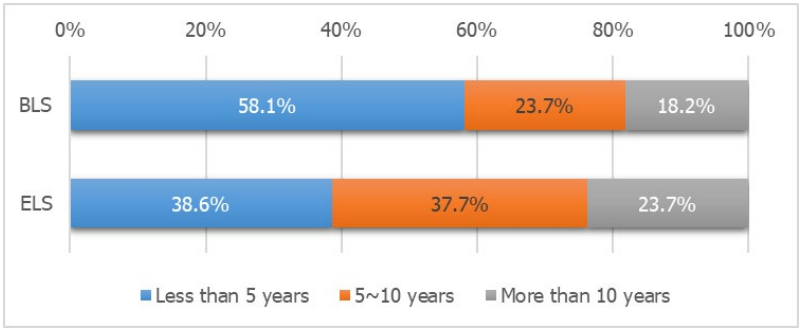


Figure 3-1-5: Proportion of the FBOs disaggregated by the experience year as a group

Figure 3-1-6 indicates how the FBOs acquired the land for the group farm. It should be noted that the percentage of the FBOs who rented or leased the land for the group farms decreased, while more FBOs were permitted to use the land by local chiefs. It may be interpreted as the expression of formal recognition by the local authorities of the FBOs' performance in their communities.

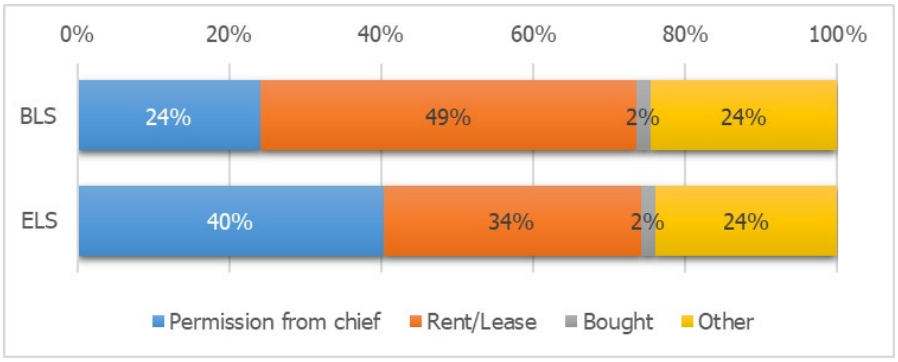


Figure 3-1-6: Method that FBOs acquired group farm

Figure 3-1-7 illustrates the ratio of the FBOs who owned the farming tools. Large hoes and cutlasses, owned by over 80% of FBOs, were not changed. Since Project provided farm tools for the FFS, including shovels and sickles, the FBOs who owned these tools increased.

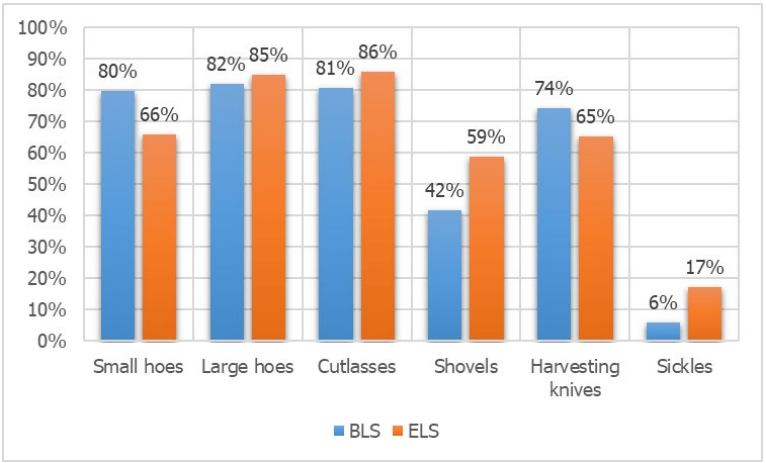


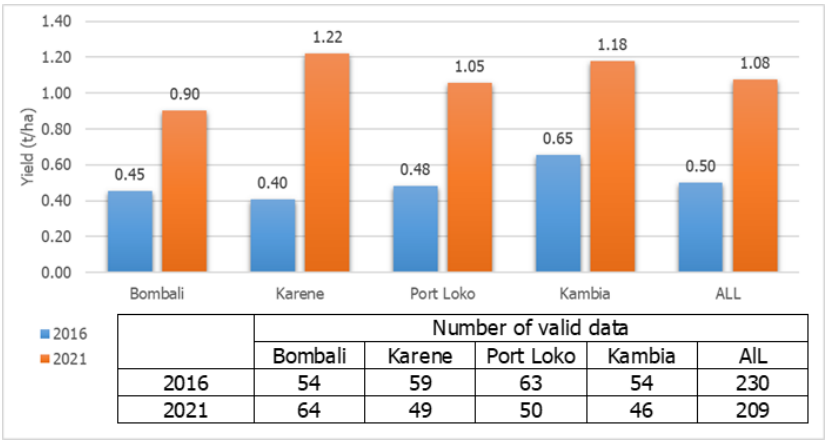
Figure 3-1-7: The ratio of FBOs who owned farming tools

Since there are no significant differences between the basic profiles of the FBOs in the BLS and those in the ELS, it can be understood that the FBOs covered under both surveys are generally of the same nature, thus data comparison on the IVS rice cultivation by the FBOs between the BLS and the ELS could be justifiable.

3.1.2. Changes in the IVS rice cultivation by the FBOs

The yields of rice cultivated in the FBOs' group farms in 2021 were higher than those in 2016, as shown in Figure 3-1-8. In all districts, the average yield in 2021 was doubled or more compared to that in 2016. It was also confirmed by the answer to their perception of the changes in yield performance compared to the ones five (5) years ago, as shown in Figure3-1-8. Among all FBOs interviewed in the ELS, 62% realized the increase in their yield from the group farm. As for the main attribute to the increased yield, 70% of the FBOs considered that the improved farming practices were the main reason for better yield performances.

These results indicate that the technical intervention by Project contributed to the improvement in rice cultivation practices of the FBOs and hence to the yield increase.



	Number of valid data				
	Bombali	Karene	Port Loko	Kambia	AlL
2016	54	59	63	54	230
2021	64	49	50	46	209

Figure 3-1-8: Average yield in the rainy season between 2016 and 2021

These trends captured in the ELS are more obvious among the FBOs supported by the Project. Around 80% of the supported FBOs recognized the yield increase, while the ratio among the unsupported FBOs with increased yield was less than 50%, as shown in Figure 3-1-9. Even among those who have realized the increased yield, more than 80% of the supported FBOs regarded the improved farming practices as the main contributing factor to the increased yield, while only 50% among the unsupported FBOs regarded the same as the main factor as shown in Figure 3-1-10. More unsupported FBOs considered that the improved yield performances were due to other factors than the improved practices, such as increased inputs or weather conditions.

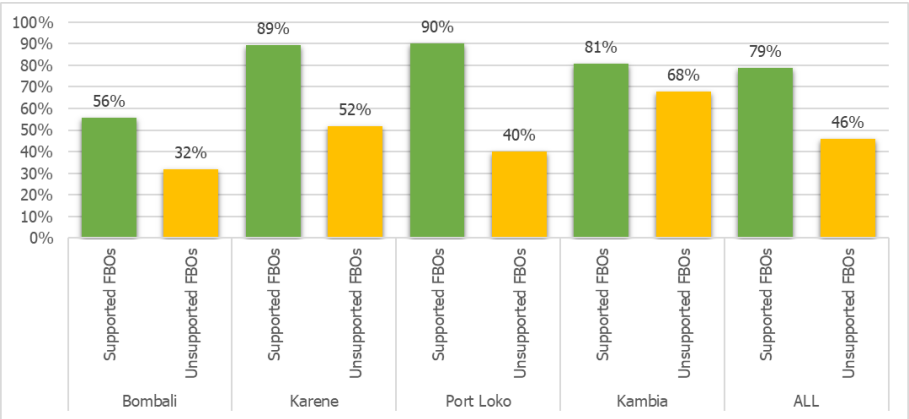


Figure 3-1-9: Proportion of FBOs whose yield increased compared to five years ago

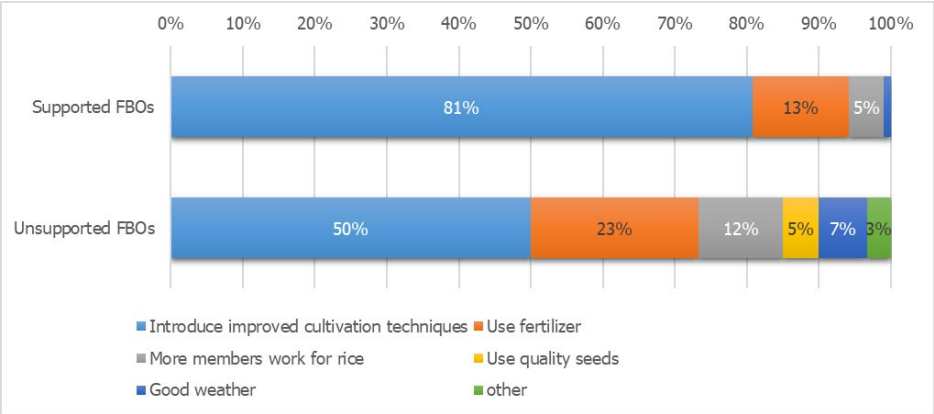
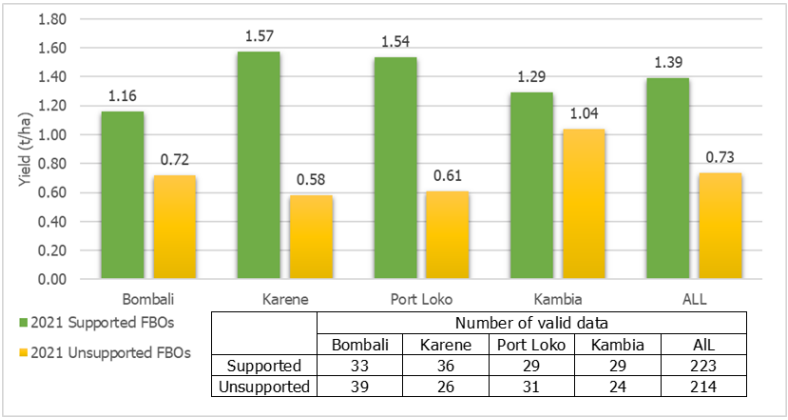


Figure 3-1-10: Perception of the reason for yield increase

Figure 3-1-11 compares the rice yields of the rainy season in 2021 between the supported and the unsupported FBOs. Although the comparison between BLS and ELS was not possible, it is clear that the supported FBOs attained a much higher yield than the unsupported FBOs.



	Number of valid data				
	Bombali	Karene	Port Loko	Kambia	AlL
Supported	33	36	29	29	223
Unsupported	39	26	31	24	214

Figure 3-1-11: Average yield of the supported FBOs and the unsupported FBOs in the rainy season in 2021

Figure 3-1-12 shows the varieties of rice which FBOs cultivated. The ratio of the FBOs who used NERICA L19 increased, offsetting the decrease in the ratio of those who used "Other" varieties. The possible reason for the increase of NERCA-L19 was that it was the main variety supplied by MAF/SRPP, which may be interlinked with the trend on the sources of seed as shown in Figure 3-1-13, where the proportion of FBOs who obtained seed from MAFFS/MAF/SRPP was found increased. The purchase of seed decreased, as more FBOs had access to seed from MAF/SRPP, while the increase in the seed prices, as shown in Table 3-1-1, may have also contributed to this change.

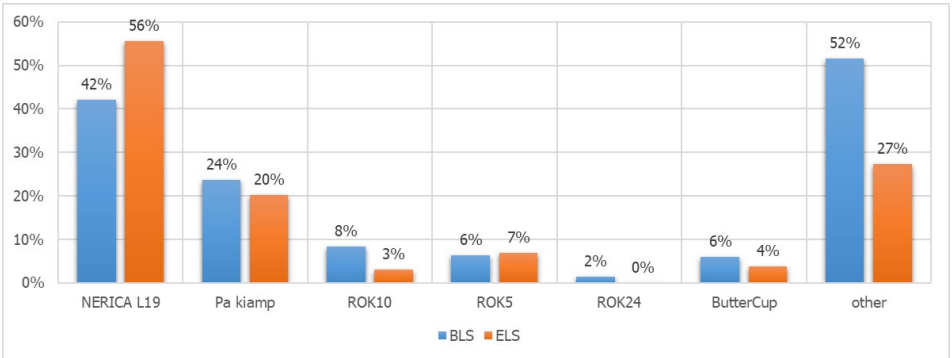


Figure 3-1-12: Varieties FBOs used

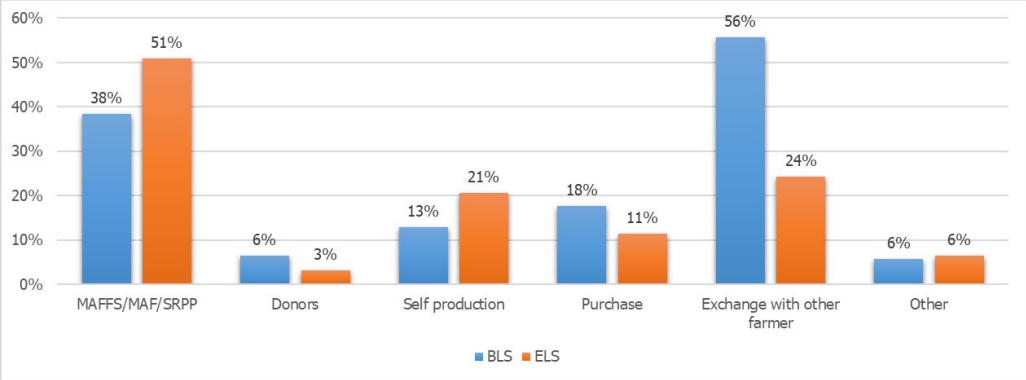


Figure 3-1-13: Seed source

Table 3-1-1: Seed price

Variety	Survey	Price	Remarks
NERICA L19	BLS	3,778	The price at the ELS was 2.0 times more than the price at the time of BLS.
	ELS	7,656	
Pa kiamp (ROK34)	BLS	3,207	The price at the ELS was 2.2 times more than the price at the time of BLS.
	ELS	7,122	
ROK24	BLS	3,720	The price at the ELS was 1.3 times more than the price at the time of BLS.
	ELS	4,857	
ROK10	BLS	3,630	The price at the ELS was 1.2 times more than the price at the time of BLS.
	ELS	4,331	
ROK5	BLS	2,929	The price at the ELS was 2.2 times more than the price at the time of BLS.
	ELS	6,391	
Butter Cup	BLS	2,754	The price at the ELS was 2.6 times more than the price at the time of BLS.
	ELS	7,270	

The reasons why the FBOs chose the variety were summarized in Figure 3-1-14. The three most important reasons are the same between the BLS and the ELS: high yielding, earliness of harvesting, and tastes. However, if the trends of other reasons are closely examined, the ratio of the FBOs who selected the variety because of "Resistance to pest and disease" decreased from 16% to 10% between the BLS and the ELS. Since some FBOs may have understood that they can control pests and disease without relying on variety's characteristics, this characteristic may have been deprioritized when an FBO selected the varieties to grow.

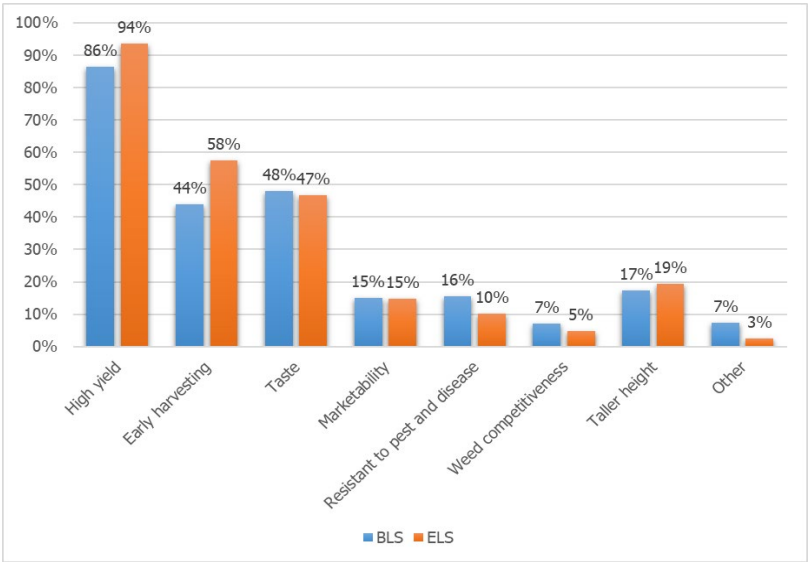


Figure 3-1-14: Reasons for the selection of a variety

Figure 3-1-15 and Figure 3-1-16 show the proportion of the FBOs who applied fertilizer and the average amount of applied fertilizer, respectively. In Bombali and Karene, both the proportion of FBOs who applied fertilizer and the amount decreased. In Port Loko, the average volume of fertilizer applied decreased to almost half, while the proportion of FBOs who applied fertilizer slightly increased. As more FBO farmers in Port Loko engaged in vegetable production with fertilizer application than in other districts, they may have more familiarity with fertilizer. Since they recognized the benefit of the fertilizer application through the FFS, the FBOs kept applying fertilizer to IVS rice, although the amount of fertilizer they could obtain was small. Contrary to these trends, the proportion of FBOs who applied fertilizer largely increased in Kambia, and the amount of applied fertilizer also increased.

As shown in Figure 3-1-17, the decrease in the governmental support for fertilizer provision may be the primary cause of the decline in the proportion of the FBOs. They applied fertilizer with a reduced amount, except in Kambia. One of the possible reasons for this notably different trend in Kambia may be attributed to the district's geographical location adjacent to the border with Guinea. There may be a considerable influx of agro-inputs, including fertilizer, in the international market, such as Barmoi Luma, by private merchants, who might have found the cease of government support on fertilizer as an opportunity for their businesses.

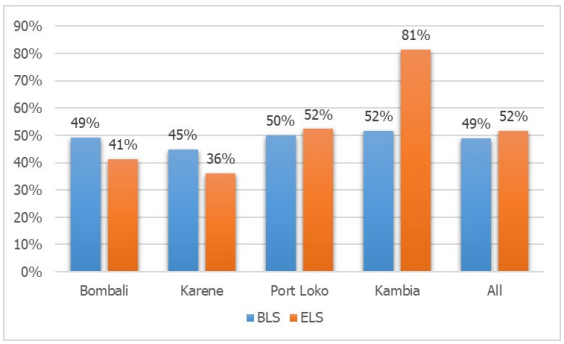


Figure 3-1-15: Proportion of FBOs which applied fertilizer

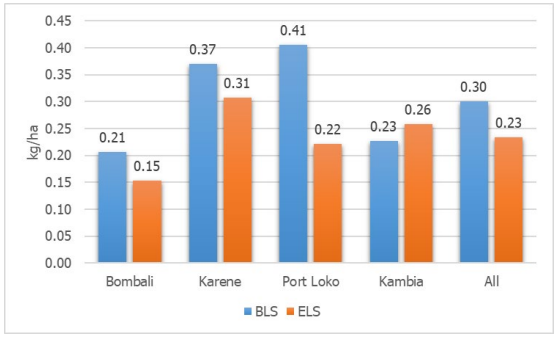


Figure 3-1-16: Average amount of applied fertilizer

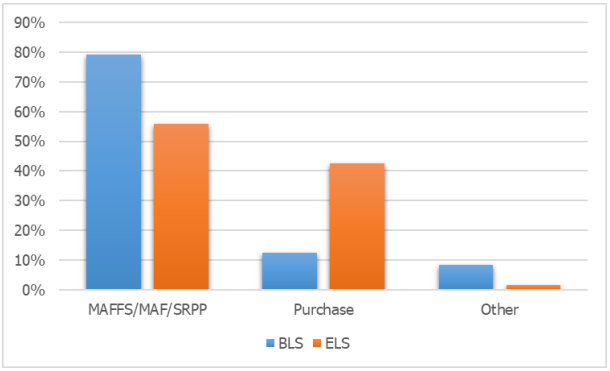


Figure 3-1-17: Source of fertilizer

3.1.3. Changes in the organizational aspects of the FBOs

The status of the registration of FBOs is shown in Figure 3-1-18. The proportion of the FBOs registered in the district council increased drastically. One of the reasons for the increase may be the strong recommendation by the Project to the FBOs to register either with MAF or the district councils in view of sustainable monitoring and support in the future.

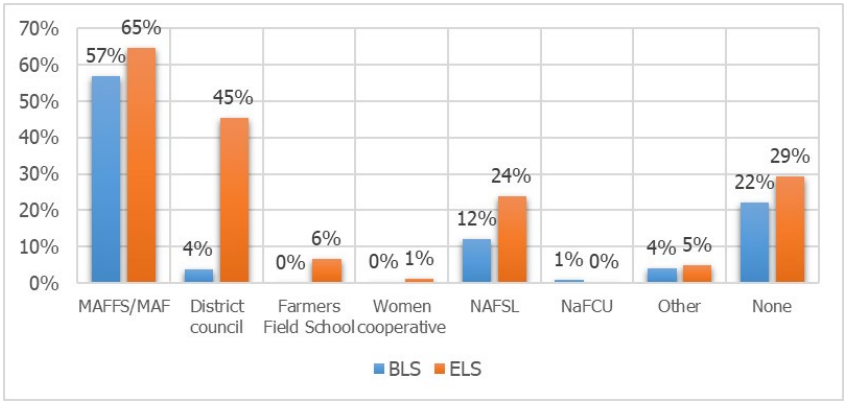


Figure 3-1-18: Registration status of FBOs

Figure 3-1-19 and Figure 3-1-20 show the frequency of the group meeting and group work, respectively. The proportion of the FBOs who hold the group meeting once a week or more increased, while those who hold meetings once in two weeks decreased in the ELS. The proportion of the FBOs who conducted the group work more than once a week increased. The implementation of Farmer Field School and regular monitoring by the Project experts and extension workers may have enhanced the organizational activities, such as the meeting and group work.

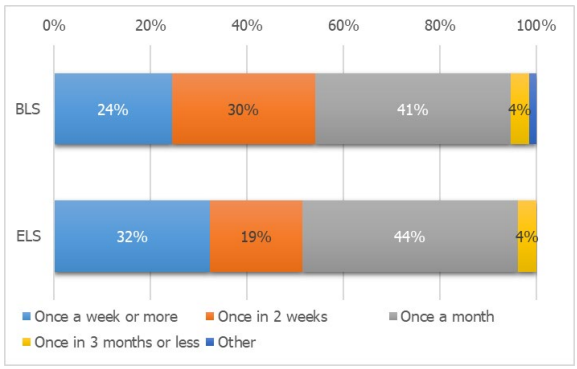


Figure 3-1-19: Frequency of group meeting

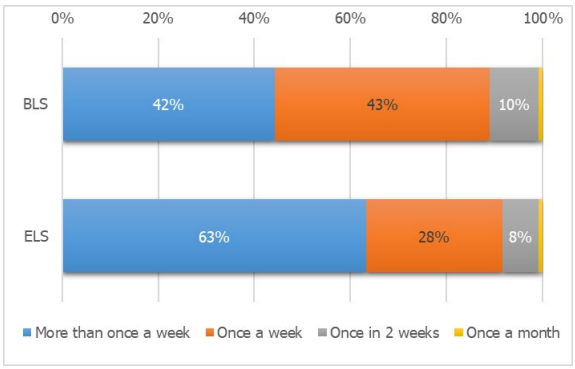


Figure 3-1-20: Frequency of group work

Figure 3-1-21 shows how the FBOs used the rice harvested from the group farms. The proportions of the FBOs who save the rice as seeds for the next season and sold the rice slightly decreased. On the other hand, the proportion of the FBOs who selected the options of "Loan to members" and "Distribute to members" increased in the ELS. It implies that more harvested rice tends to be given back to the individual members.

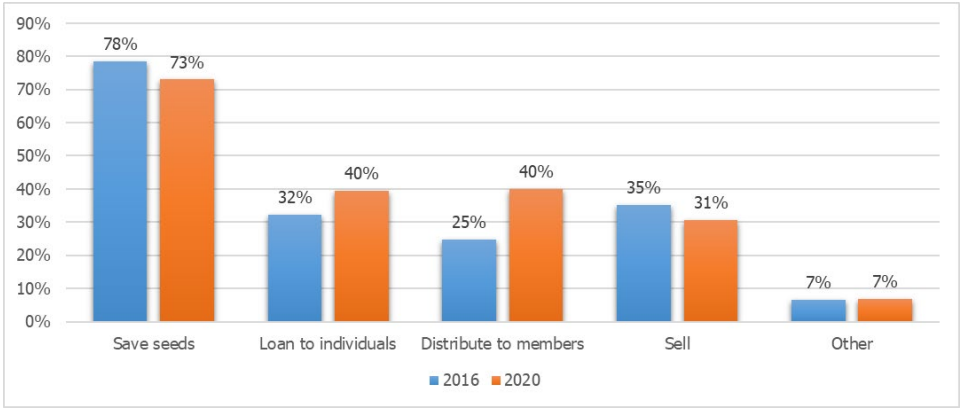


Figure 3-1-21: Use of harvested rice from group farm

The increment of the yield from the group farm and benefit for the individual members seems to have contributed to a notable increase in members' satisfaction with the affiliation FBO, as shown in Figure 3-1-22. These are considered to be the ripple effects of the Project's intervention with the FBOs.

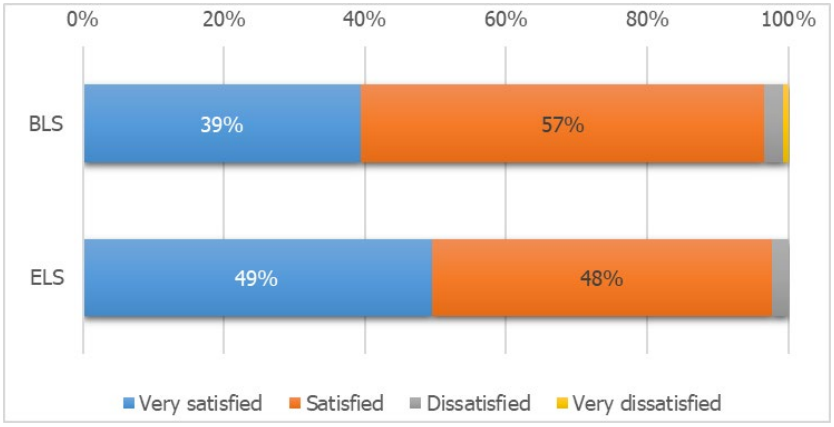


Figure 3-1-22: Satisfaction of the individual members with the affiliation FBO

3.2. Changes in the IVS rice cultivation by the farmers

3.2.1. Basic profiles of the surveyed households

Table 3-2-1 shows the number of household members, the number of household members over 15 years old, and the average age of the household heads. As a whole, there is no notable difference between the BLS and the ELS.

Table 3-2-1: The household position

Survey	Number of household members	Number of household members over 15 years old	Average Age of Household head
BLS	9.8	5.0	45.0
ELS	9.1	4.9	43.7

Although the ratio of female heads of households slightly increased in the ELS, around 70% of households were with male household heads, as shown in Figure 3-2-1.

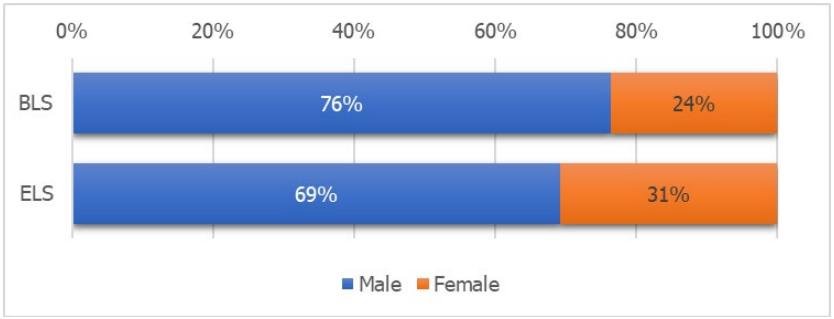


Figure 3-2-1: The gender ratio of the household head

The religious affiliation and the ethnic belonging of the household heads are depicted in Figure. 3-2-2 and 3-2-3, respectively. There was no notable change in these aspects between the BLS and the ELS.

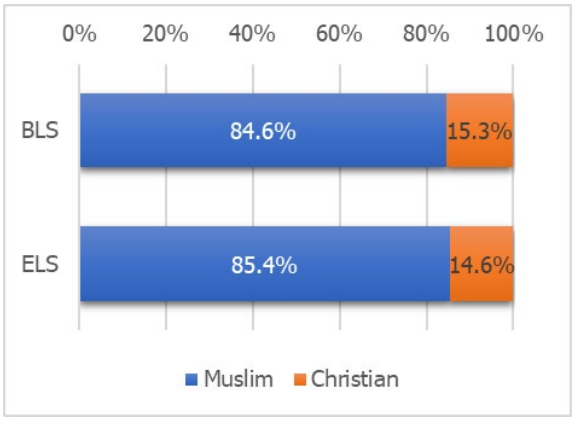


Figure 3-2-2: The religion ratio of the household head

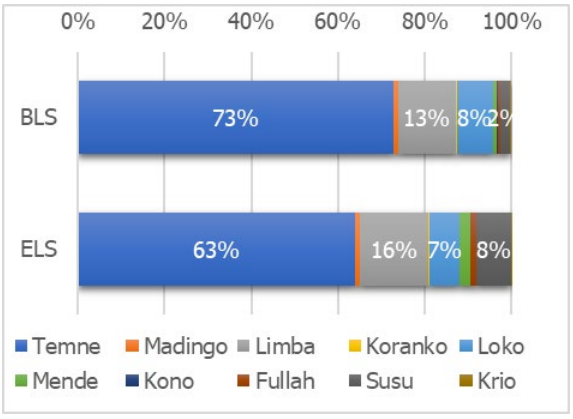


Figure 3-2-3: Ethics group of the household head

Figure 3-2-4 and Figure 3-2-5 illustrate the educational background of the household heads and the engagement of household heads and spouses in rice cultivation, respectively, which, again, did not show any significant difference.

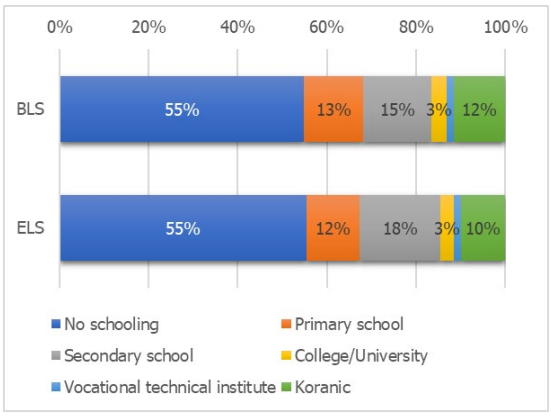


Figure 3-2-4: Educational background of HH heads

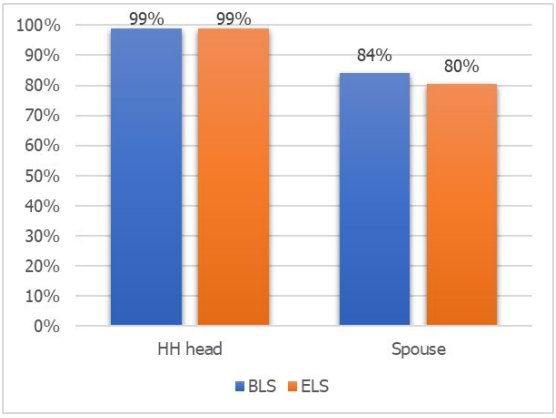


Figure 3-2-5: Engagement of HH head and spouse in rice cultivation

Figure 3-2-6 and Figure 3-2-7 show the proportion of households disaggregated by land area for IVS rice cultivation and by the land tenure of farmland, respectively. Most households used less than 1.0 ha of farmland for IVS rice cultivation, and over 60% of the land was owned by themselves or their family clan. These trends found in the ELS were almost the same as the ones in the BLS.

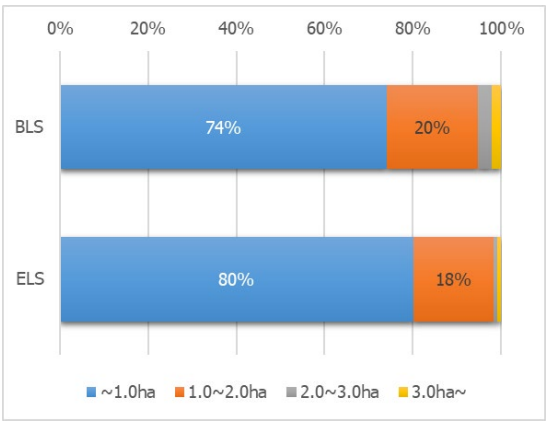


Figure 3-2-6: Proportion of households disaggregated by land area for IVS rice cultivation

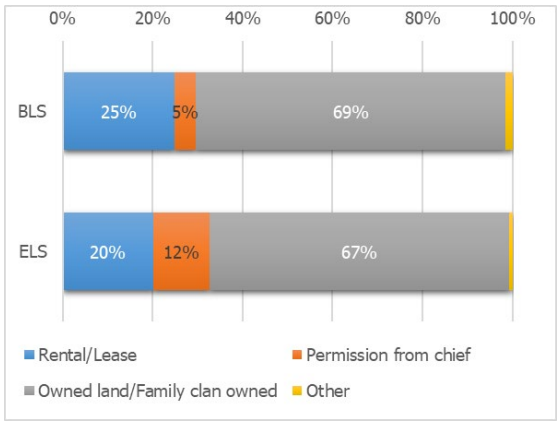


Figure 3-2-7: Land tenure of farmland

Although the proportion of households who owned farming tools slightly increased in general, there was no notable change in the status of ownership of farming tools, as shown in Figure 3-2-8.

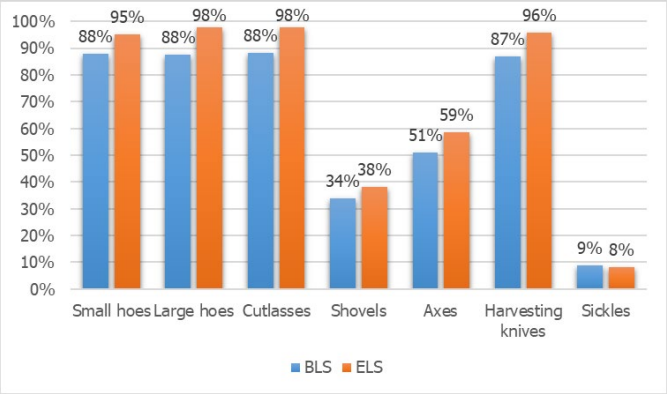


Figure 3-2-8: Proportion of households that owned each farming tool

Figure 3-2-9 summarizes the crops chosen by the surveyed households as the "three most important crops" cultivated by them. As the target respondents of the BLS and the ELS were the farmers engaged in IVS rice farming, IVS rice remains the most important crop by most of the farmers in the ELS as in the BLS.

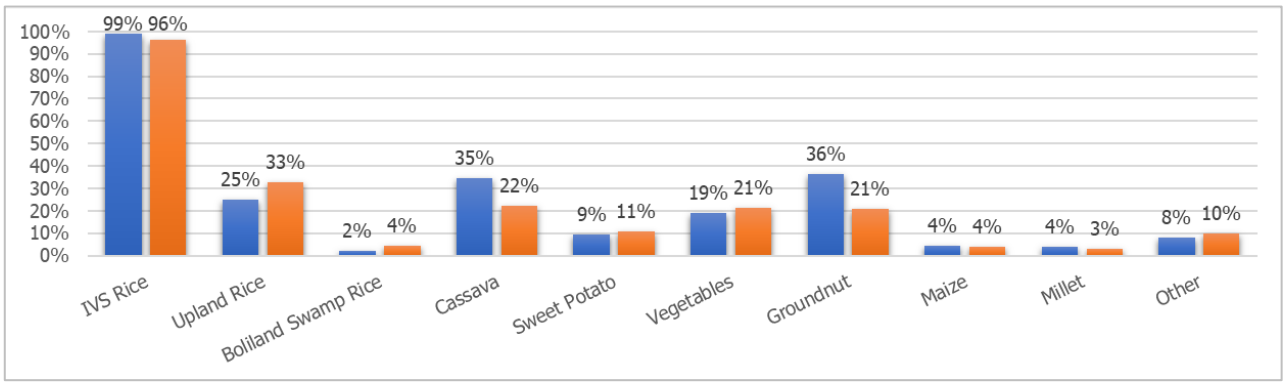


Figure 3-2-9: Three most important crops cultivated by households

Since there are no notable differences between the basic profiles of households surveyed in the BLS and the ELS, as confirmed above, it can be justifiable to treat the households covered under the ELS as identical to the ones in the BLS, thus analyzing the data for comparison on the IVS rice cultivation by the farmers between BLS and ELS could also be considered rationale.

3.2.2. Changes in the IVS rice cultivation by the farmers

Figure 3-2-10 and Figure 3-2-11 show the varieties of rice the farmers used and the reasons for their selection. Although the percentage of NERICA L19 increased, which offsets the decrease in "other" cultivars, there was no notable change. It should also be noted that there was no noteworthy distinction in the reasons for selecting varieties between the ELS and the BLS.

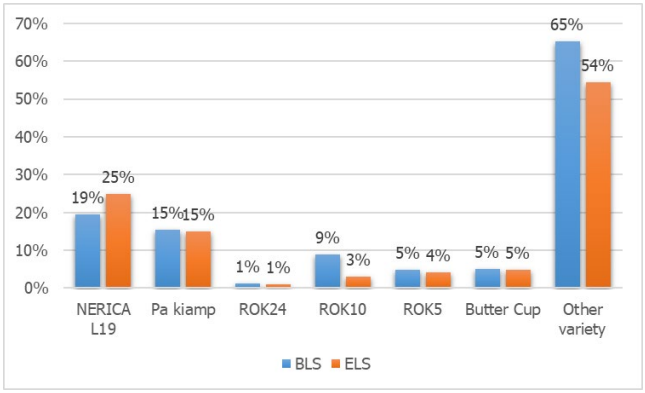


Figure 3-2-10: Varieties of rice

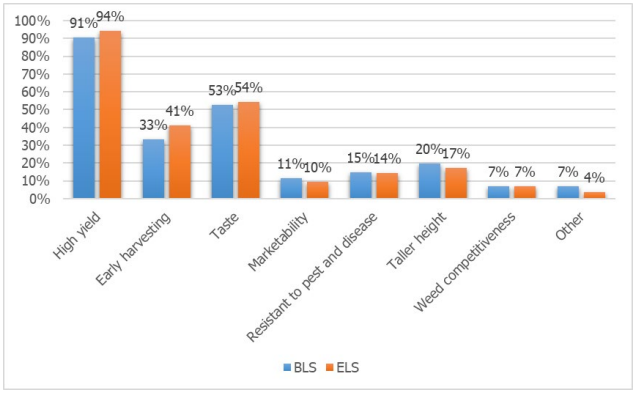


Figure 3-2-11: Reasons for selection of the varieties

Figure 3-2-12 shows the sources of seed rice. The ratio of the farmers who produced seed rice decreased drastically in Bombali, while those in Karene tripled in the ELS. The farmers in Bombali could get seeds by purchase or exchange from other farmers rather than producing the seed by themselves. On the other hand, it became more difficult for the farmers in Karene to get seeds from other farmers, and they might need to produce seeds by themselves.

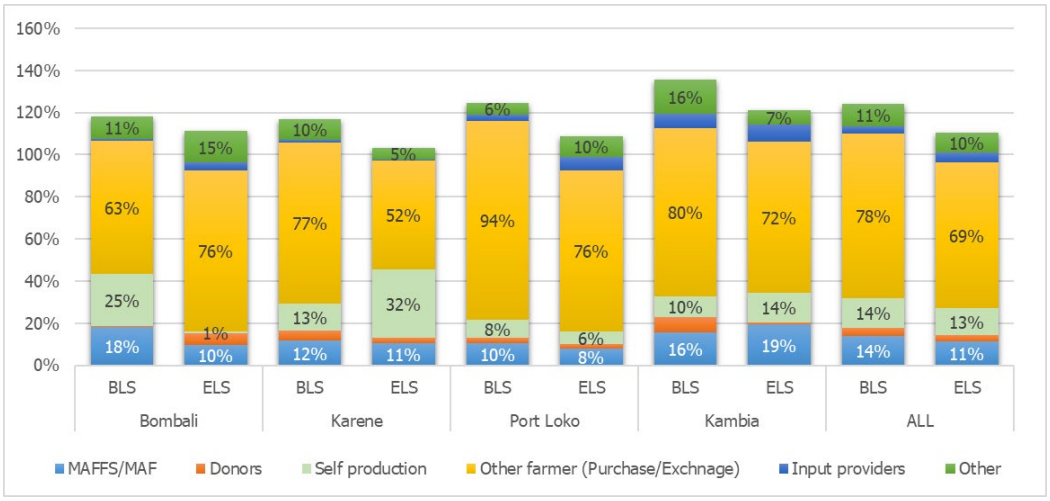


Figure 3-2-12: Sources of seeds

As in Figure 3-2-13 and Figure 3-2-14, the percentage of the households who applied fertilizer and the amount of the applied fertilizer decreased in all districts except for Kambia. One of the possible reasons for the decline in the fertilizer application was that the provision of fertilizer by MAF reduced drastically by the time of the ELS, as shown in Figure 3-2-15. Although most farmers had to purchase fertilizer by themselves, most of them could not access fertilizer except in Kambia. Drastic soaring of fertilizer prices, as summarized in Table 3-2-2, could have further restricted fertilizer application. On the other hand, since Kambia is near the boundary of Guinea, they could procure fertilizer from Guinea. That is the possible reason that the ratio of households that applied fertilizer did not change, and the reduced amount of applied fertilizer was small. In Port Loko, the reduction of the ratio of household applied fertilizer and the amount of applied fertilizer was relatively smaller than those in Bombali and Karene. It might be easier for the farmers in Port Loko to procure fertilizer from Guinea than those in Bombali and Karene since Port Loko is nearer to Kambia than Bombali and Karene.

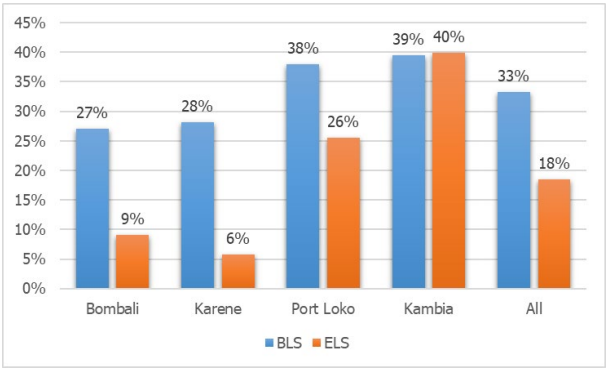


Figure 3-2-13: Ratio of households applied fertilizer

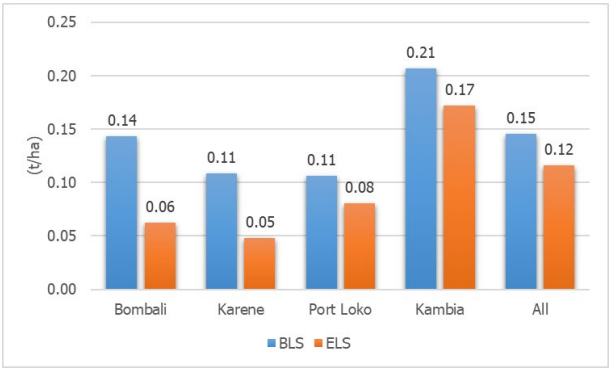


Figure 3-2-14: Average amount of applied fertilizer

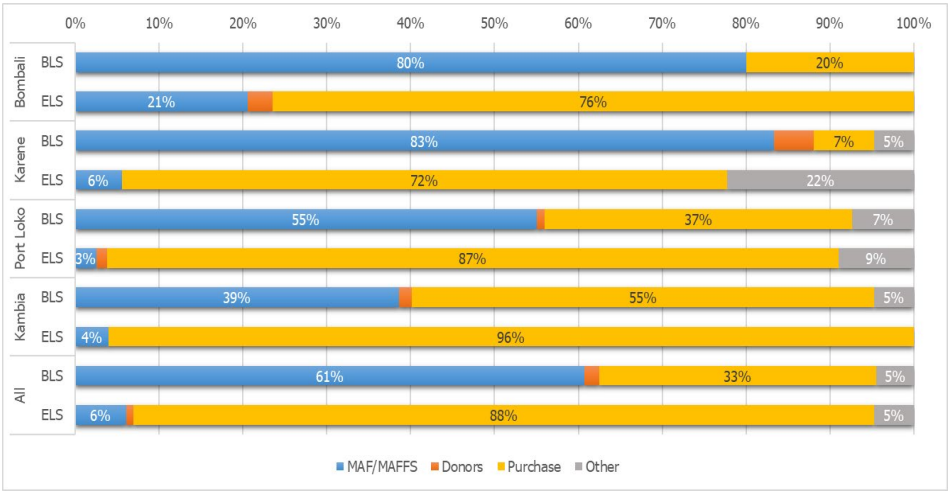


Figure 3-2-15: Sources of fertilizer

Table 3-2-2: Fertilizer (NPK 15-15-15) price

District	Survey	Price (SLL)	Remarks
Bombali	BLS	164,444	The price at the ELS was 3.0 times more than the price at the time of BLS.
	ELS	491,667	
Karene	BLS	213,333	The price at the ELS was 2.4 times more than the price at the time of BLS.
	ELS	516,667	
Port Loko	BLS	237,059	The price at the ELS was 2.2 times more than the price at the time of BLS.
	ELS	522,692	
Kambia	BLS	200,000	The price at the ELS was 2.5 times more than the price at the time of BLS.
	ELS	508,615	
ALL	BLS	211,529	The price at the ELS was 2.4 times more than the price at the time of BLS.
	ELS	512,889	

Figure 3-2-16 shows the activities of IVS rice production conducted by the households. The rate in all activities increased in the ELS. The household ratio who conducted puddling and weeding increased by around 15%, and the rate of those who conducted leveling doubled, despite these activities being considered very laborious.

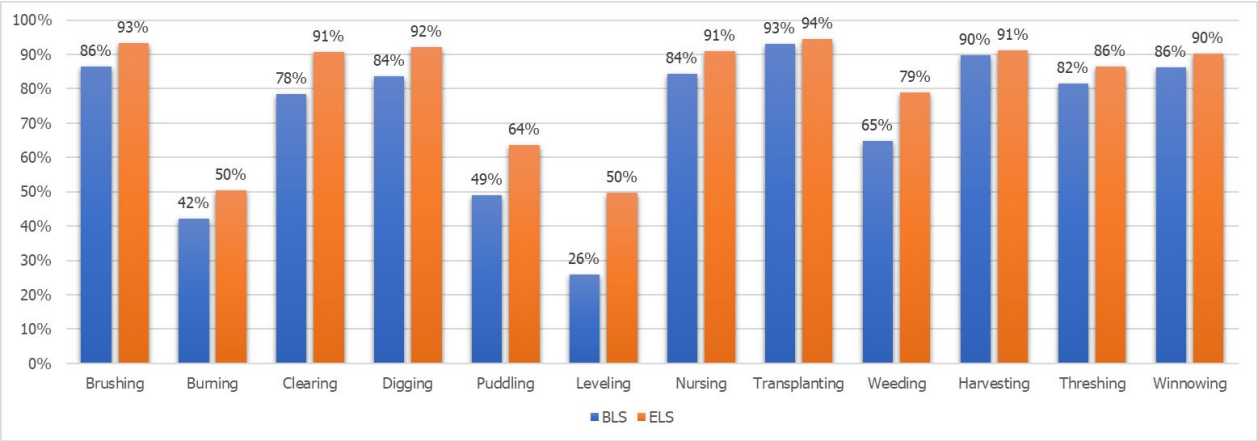


Figure 3-2-16: Activities of IVS rice production HH conducted

As shown in Figure 3-2-17, the household ratio who sowed less than 30 kg/ha increased drastically in the ELS, which was offset by the decrease in the ratio sowed more than 60 kg/ha. As the recommended seed rate of the TP-R is 30kg/ha, which was well appreciated and accepted during the FFS, it should be considered that many households have now recognized the benefits and importance of a lesser seed rate in their IVS rice cultivation.

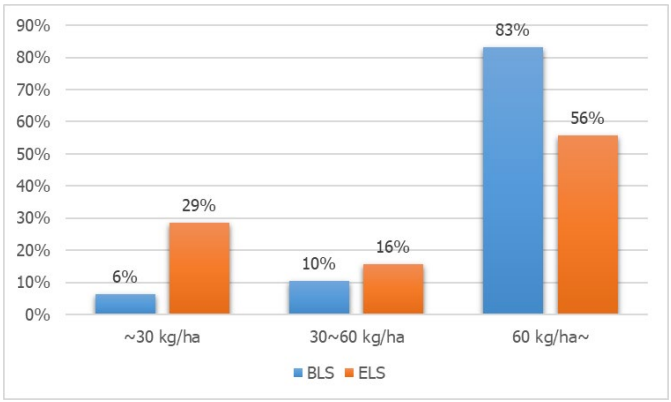


Figure 3-2-17: Proportion of the households disaggregated by the seed rate

Figure 3-2-18 shows the proportion of the households disaggregated by frequency of weeding. More households conducted weeding in 2021 than in 2017. The farmers might realize the importance of weeding by the time of ELS, which had been emphasized in FFS as well as in the field guidance by the extension staff and the Project team members.

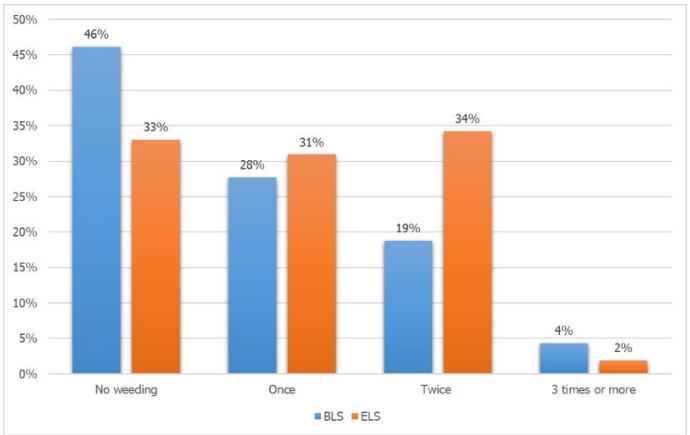


Figure 3-2-18: Proportion of the households disaggregated by the frequency of weeding

Figure 3-2-19 and Figure 3-2-20 show the proportion of households who experienced pest/disease damages in the rainy season and the proportion of households who took any countermeasure, respectively. Compared with the rainy season in 2017, fewer farmers experienced pests and disease in 2021. In addition, the proportion of the farmers who took any countermeasure against pests and disease increased. Since the farmers were advised to follow the cropping calendar, they went to observe their farms more frequently as well as at a critical timing; thus, they could detect the signs of pests and disease earlier. It is also considered that the farmers have become more aware of the healthy growth of rice plants, which also contributed to the reduced damages.

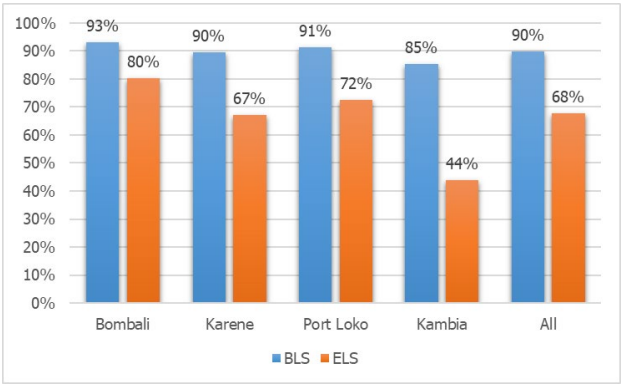


Figure 3-2-19: Proportion of households who experienced pest/disease

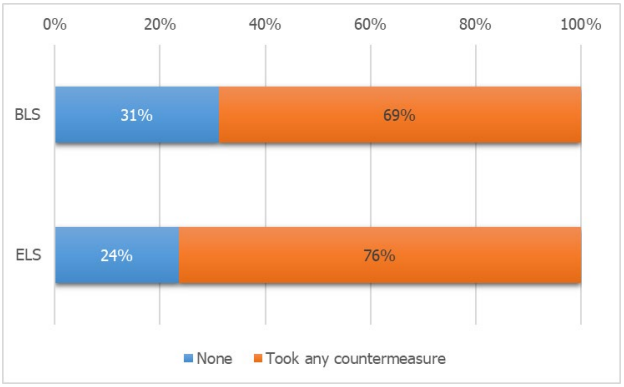


Figure 3-2-20: Proportion of households who took any countermeasure

Figure 3-2-21, Figure 3-2-22, and Figure 3-2-23 show the method of threshing, the method of drying, and the storage site of the harvested rice, respectively. There were no notable changes observed.

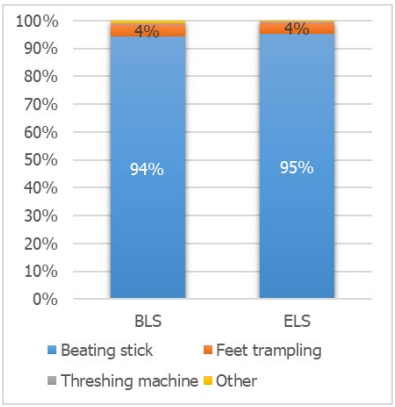


Figure 3-2-21: Method of threshing

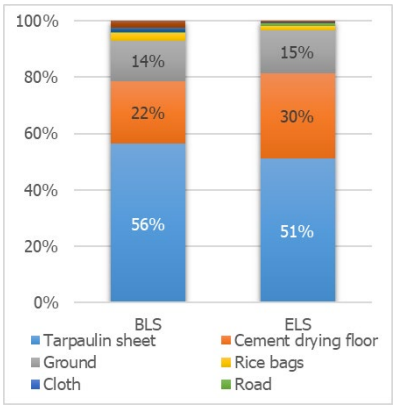


Figure 3-2-22: Method of drying rice

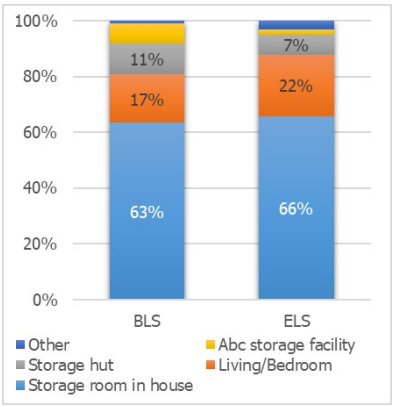


Figure 3-2-23: Storage site of rice

Figure 3-2-24 shows the status of post-harvesting losses. Although there was no notable change in the post-harvesting handling, the percentage of farmers who experienced the loss decreased in all target districts in ELS. Especially in Kambia, the percentage of households who experienced post-harvest losses at the time of the ELS became less than half compared with those in the BLS. As shown in Figure 3-2-25, there was no change in the main causes of the post-harvesting loss, and pests mainly caused the losses among those who suffered from them. It is assumed that the farmers have become more careful of those possible causes and could manage to avoid their occurrence.

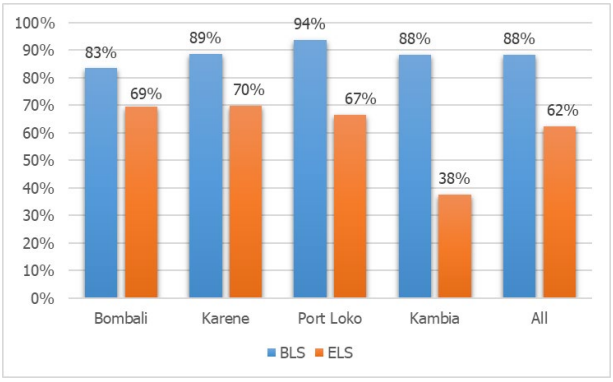


Figure 3-2-24: Post-harvesting loss

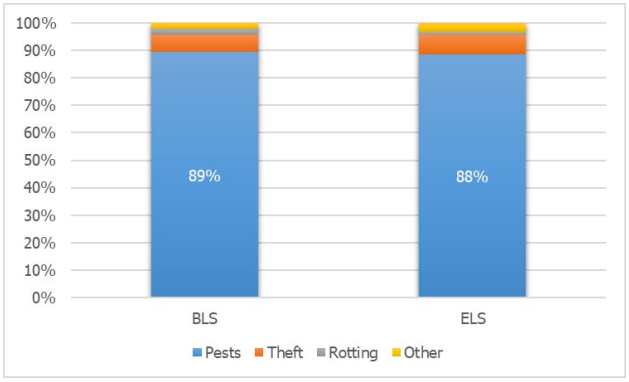
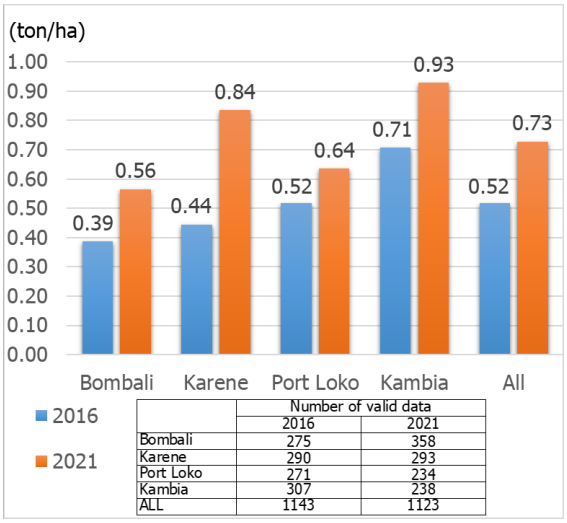


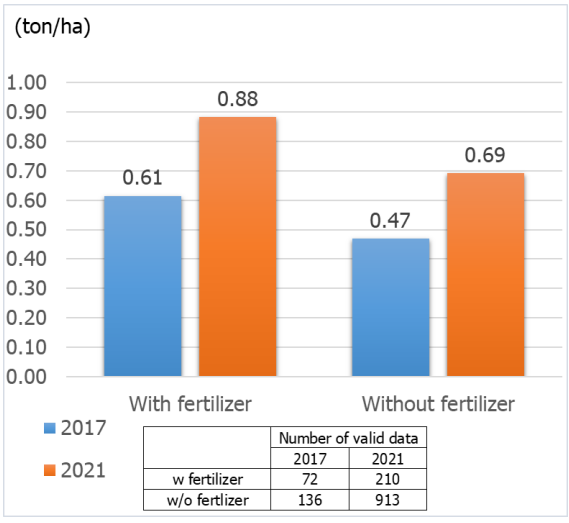
Figure 3-2-25: Main cause of post-harvesting loss

Figure 3-2-26 and Figure 3-2-27 show the yields in the rainy season in 2016 and 2021, and those in 2017 and 2021, respectively. Since many households had not completed harvesting when conducting BLS in 2017, the number of samples was insufficient for analyzing the yield in each district. Therefore, the data for 2016 were compared with the ones in 2021 to grasp the overall trend in each district. On the other hand, since the details of the farming practices, especially the status of fertilizer application were not available for the data of 2016, the yield data of 2017 and 2021 were compared to analyze the yield from the viewpoints of the effect of fertilizer application.



	Number of valid data	
	2016	2021
Bombali	275	358
Karene	290	293
Port Loko	271	234
Kambia	307	238
ALL	1143	1123

Figure 3-2-26: Yield in the rainy season in 2016 and 2021



	Number of valid data	
	2017	2021
w fertilizer	72	210
w/o fertlizer	136	913

Figure 3-2-27: Yield in the rainy season in 2017 and 2021 by the fertilizer application condition

In all districts, yield in the rainy season in 2021 increased compared to 2016, as shown in Figure 3-2-26, which implied that the Project's intervention contributed to the yield improvement. It is important to note that the yield increased from 2017 to 2021 with or without fertilizer application, as highlighted in Figure 3-2-27. The farmers could enhance the yields by introducing the TP-R recommendations, regardless of whether they applied fertilizer or not.

Figure 3-2-28 shows the proportion of households disaggregated by the use of the harvested rice. The ratio of the households who sold the harvested rice decreased in 2020 compared with those in 2016. Instead, the ratio on "Exchange with seed rice", "Kept for loan payment", and "Kept for next planting" increased. The reduction in the ratio of the households selling rice might be caused by the market shrink associated with the preventive measures against the outbreak of COVID-19. Another possible reason may be the higher costs of transportation, which was also implied by the fact that more farmers sold their rice

at the nearer market in 2020 than in 2016, as shown in Table 3-2-3. It seems that the farmers could not access the farther markets because of the high transportation cost in 2020 and restrictions on transport caused by COVID-19.

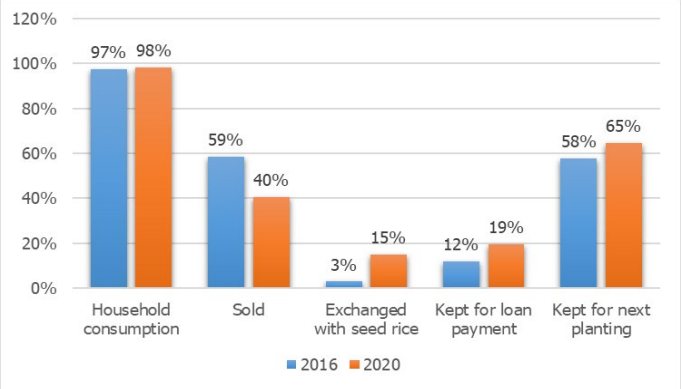


Figure 3-2-28: Proportion of households by the use of harvested rice

Table 3-2-3: Market distance and transportation cost

District	Survey	Market distance (miles)	Transportation fee (SLL/mile)
Bombali	BLS	13.7	1,400
	ELS	5.3	8,090
Karene	BLS	5.3	2,862
	ELS	5.4	6,250
Port Loko	BLS	10.2	3,682
	ELS	2.7	6,126
Kambia	BLS	13.2	1,822
	ELS	8.6	13,124
Total	BLS	10.7	2,685
	ELS	5.2	9,069

3.2.3. Status of knowledge and adoption of the TP-R by the households

As a whole, the ratio of the farmers who applied TP-R recommendations increased. It can be considered that the farmers noticed the usefulness of TP-R since those techniques enhanced the yields, although some techniques were laborious.

According to Figure 3-2-29, a few interviewed farmers learned TP-R in Bombali and Karene, and around 30% of the interviewed farmers in Kambia, where the previous project (SRDP) had been implemented, had learned the TP-R at the time of BLS. It should be appreciated that the percentage of the farmers who learned TP-R increased in all target districts by the time of the ELS and that the majority of those farmers who learned the TP-R applied its recommendations to their rice cultivation. Almost all farmers who tried TP-R thought that TP-R helped improve the yield in both the BLS and the ELS, as shown in Figure 3-2-30. Additionally, more farmers in the ELS found it contributed to effective crop management and reduction of input.

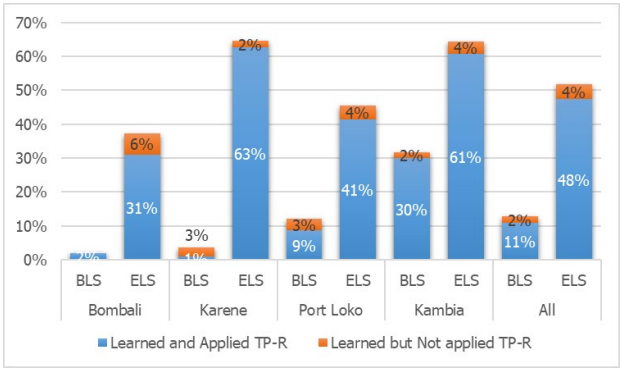


Figure 3-2-29: Proportion of farmers who learned TP-R and application status

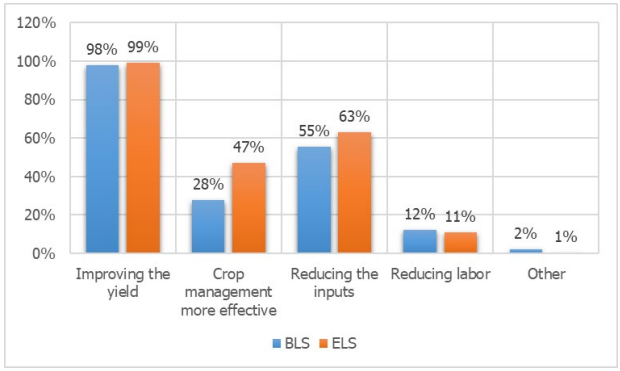


Figure 3-2-30: Recognition of the benefit of the TP-R

As the ELS was also to dig further into the TP-R's adoption status, some additional questions were added in the ELS, focusing on the specific technical recommendations. Here, the farming practices of those farmers the Project supported are compared with those not supported.

Figure 3-2-31 illustrates the proportion of the farmers who conducted various land preparation activities. More supported households conducted all these activities than the unsupported households, with notable differences found in digging and bund construction/rehabilitation.

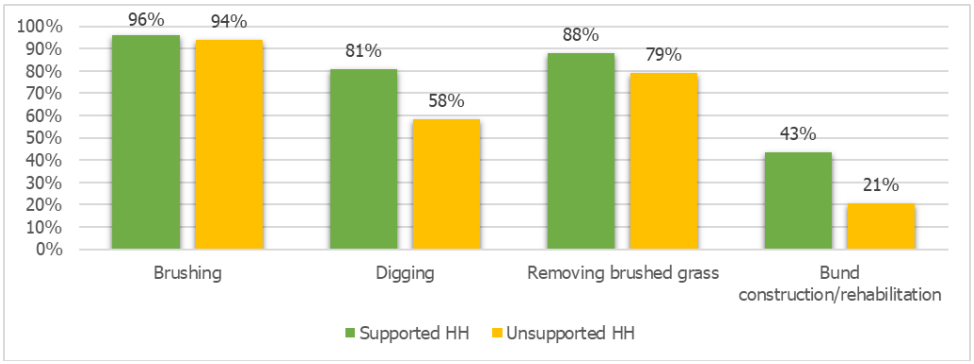


Figure 3-2-31: Land preparation activities conducted by the households

As shown in Figure 3-2-32, over 60% of the supported farmers made nursery beds, while only around 30% of the unsupported farmers made them in the rainy season in 2021. The ratio of supported households who sowed the seeds with less than 30 kg/ha as per the TP-R recommendation was higher than that of the unsupported households, as shown in Figure 3-2-33. The supported farmers have realized that the lesser seed rate was sufficient to cultivate rice.

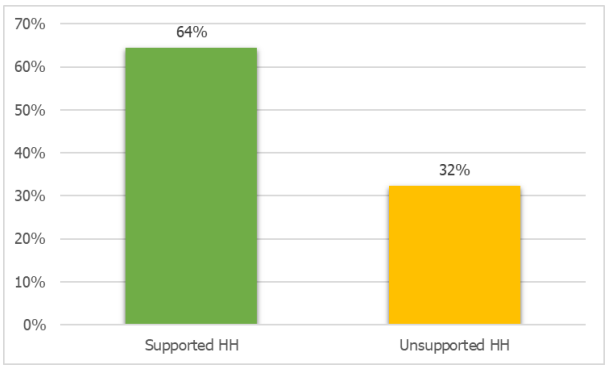


Figure 3-2-32: Proportion of households who made nursery beds

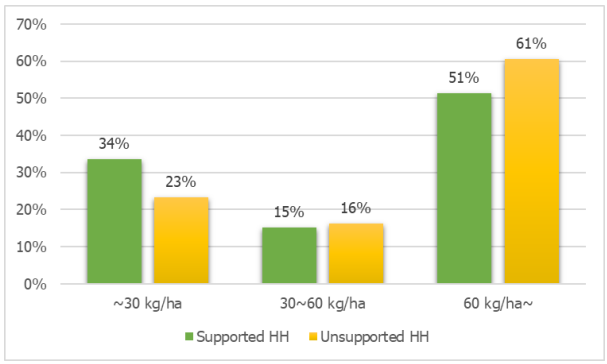


Figure 3-2-33: Proportion of the households disaggregated by seed rate

As for puddling and leveling, more supported farmers tended to do both puddling and leveling than the unsupported farmers in 2021, as shown in Figure 3-2-34.

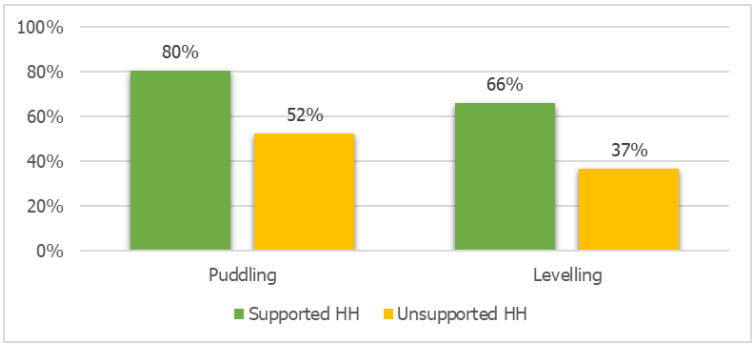


Figure 3-2-34: Proportion of the households who conducted puddling and leveling

Figure 3-2-35 shows the proportion of the households disaggregated by the nursery period. The ratio of households who used young seedlings was twice as much among the supported households as among the unsupported households. Figure 3-2-36 shows the proportion of the households disaggregated by the number of transplanted seedlings per hill. About 70% of the supported households transplanted two or three seedlings per hill, as recommended by the TP-R. On the other hand, the unsupported farmers tended to transplant more seedlings. Similarly, nearly 70% of supported households kept the transplanting distance of 16~20 cm between hills, while less than 50% of the unsupported households kept the distance of 16~20 cm, as shown in Figure 3-2-37. According to Figure 3-2-38, most of the supported farmers transplanted at less than 4cm depth, while the unsupported farmers tended to transplant deeper.

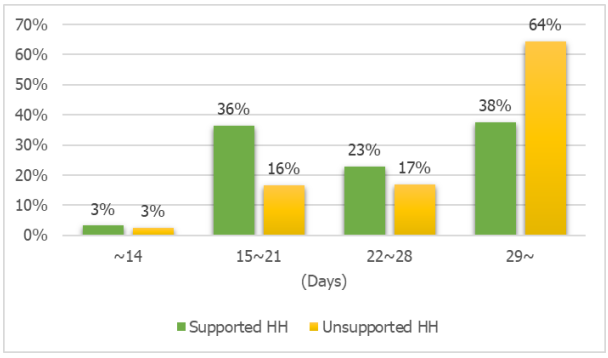


Figure 3-2-35: Proportion of the households disaggregated by the nursery period

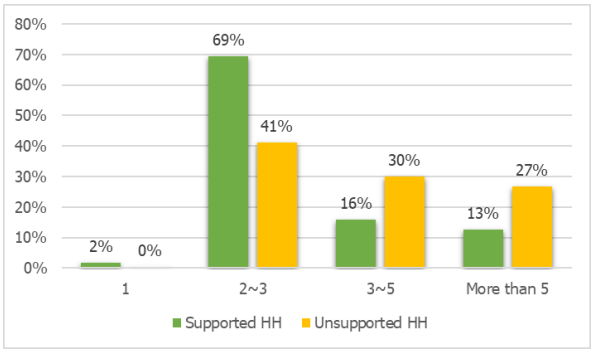


Figure 3-2-36: Proportion of the households disaggregated by the number of transplanted seedlings

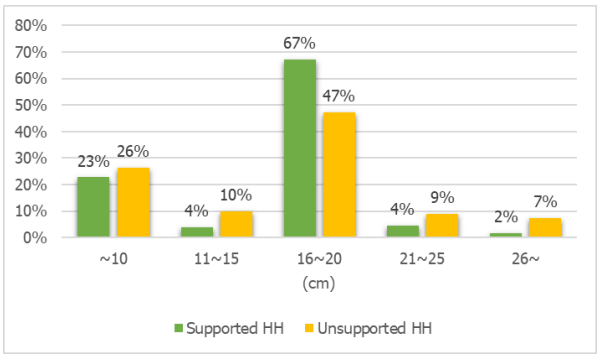


Figure 3-2-37: Proportion of the households disaggregated by the transplanted distance between hills

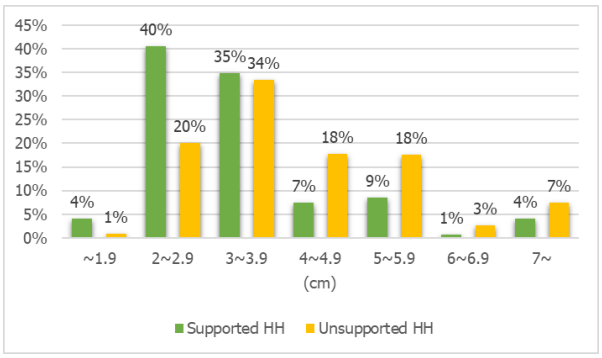


Figure 3-2-38: Proportion of the households disaggregated by the depth of transplanted seedlings

Figure 3-2-39 shows the proportion of the households disaggregated by the frequency of weeding. The proportion of the supported households who conducted weeding is 15% higher than that of the unsupported households. Additionally, nearly 50% of the supported households conducted weeding twice, which was 2.5 times more than the rate among the unsupported households.

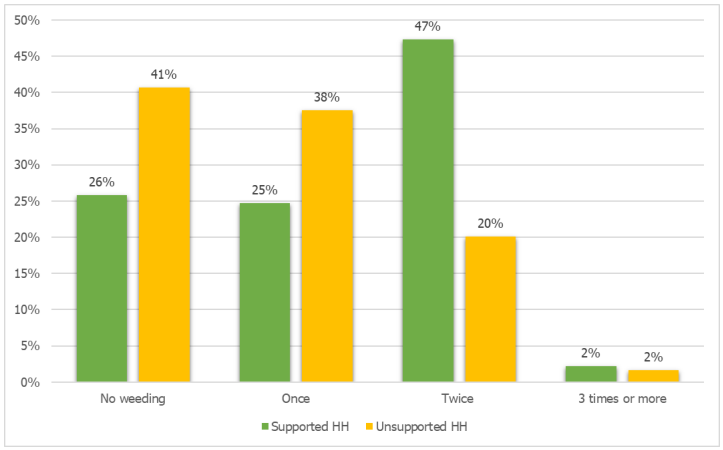
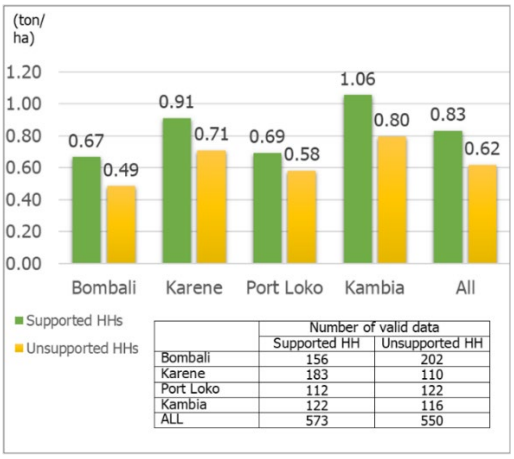


Figure 3-2-39: Proportion of the households disaggregated by the frequency of weeding

The yield of the supported farmers was higher than that of the unsupported farmers, as shown in Figure 3-2-40. Most of the supported farmers thought that the yield was improved compared with five years ago, while the proportion of the unsupported farmers who found the improved yield was less than half, as shown in Figure 3-2-41. These results imply that the technical guidance by the Project considerably contributed to the yield improvement. It can also be said that the proportion of the supported farmers who answered that improved techniques contributed to the yield increase was much higher than the one among the unsupported farmers, as shown in Figure 3-2-42.



	Number of valid data	
	Supported HH	Unsupported HH
Bombali	156	202
Karene	183	110
Port Loko	112	122
Kambia	122	116
ALL	573	550

Figure 3-2-40: Yield in the rainy season in 2016 and 2021

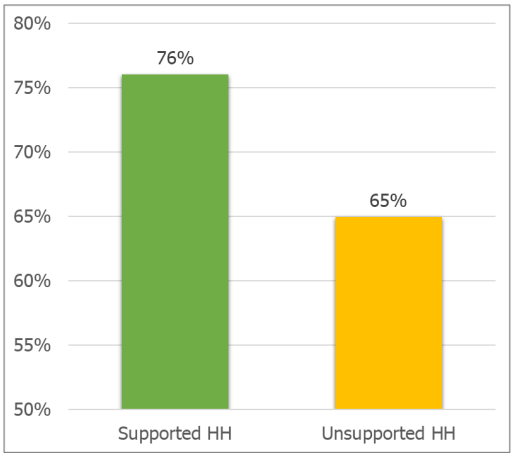


Figure 3-2-41: Proportion of households who answered yield increased compared to five years ago

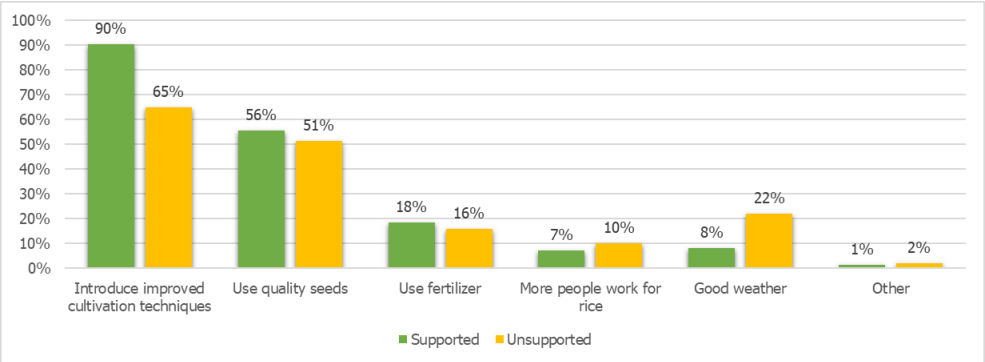


Figure 3-2-42: Reason for yield increase that the farmers thought

3.2.4. Changes in the other relevant aspects

Figure 3-2-43 shows the farmers' satisfaction with the extension service. Around 30% of farmers had been dissatisfied with the extension service at the BLS, while almost all were satisfied with it at the ELS. As the extension workers of the District Agricultural Offices were the ones who conducted FFS on the TP-R to teach the improved techniques, as well as to visit the farmers frequently for field monitoring and guidance during the project activities, the farmers appreciated their services, which enabled the farmers to realize the improvement of yields

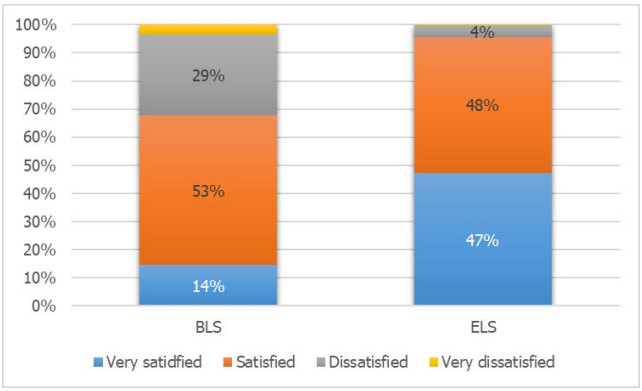


Figure 3-2-43: Satisfaction with the extension service

Figure 3-2-44 indicates the proportion of households running out of harvested rice in less than a year and those who experienced a hunger period during the past 12 months. It should be noted that both rates decreased by the time of the ELS. It is considered that the food security conditions of the households have been improved, although it was not to a great extent.

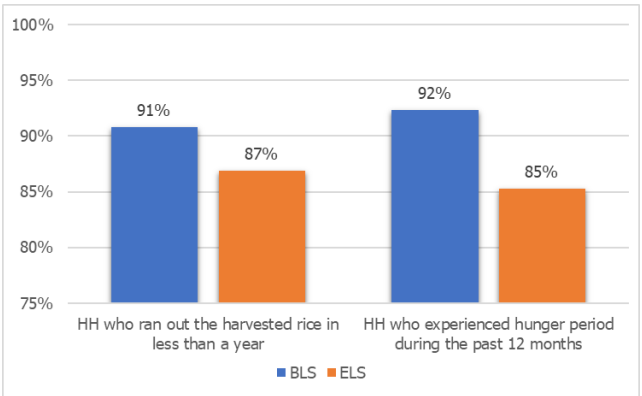


Figure 3-2-44: Proportion of households who ran out of the harvested rice in less than a year and experienced a hunger period during the past 12 months

4. Conclusion

Through the analysis of the results of the ELS in the previous sections, it was observed that there were positive changes in the rice yields among the FBOs and households in all districts. Especially, the FBOs and households with whom SRPP has intervened increased rice yield more than those whom the Project has not supported. In addition, the increase of yield in the group farms contributed to strengthening the cooperation among the FBOs' members, exemplified in the frequency of the meetings and group work. It could have also reinforced the knowledge of TP-R among the members.

The farmers who have learned the TP-R also applied its recommendations. For example, the rate of those who conducted puddling and leveling notably increased in ELS, despite these techniques requiring laborious work. The proportions of the farmers who made nursery beds, sowed less seeds than conventional practices such as 30 kg/ha, and transplanted young seedlings properly, as the TP-R recommended, increased considerably. The farmers may have recognized that these farming techniques contributed to the yield increase, and it is worth applying the TP-R, although some recommendations require intensive labor. The FBO representatives and farmers who have been involved in the activities of SRPP showed a higher tendency to attribute the yield increase to the improved rice cultivation techniques. It was also noted with appreciation that some of these recommended techniques were applied not only by the supported farmers but also by some unsupported farmers. It suggests that the TP-R techniques have been spreading among farmers in the target districts, which should further be encouraged.

The survey results also indicated that the extension workers trained by the Project seem to have contributed to the TP-R dissemination to the farmers. The enhancement of the farmers' satisfaction with the extension service in all districts implies that the farmers appreciated and accepted the guidance from the extension workers, which could serve as a firm basis for future extension activities in the target areas. The good rapport established through the activities of the Project should be sustained by continuous efforts by District Agricultural Offices to keep these trained staff working in the field.

On the other hand, the survey also indicated that there are still challenges to be addressed. The current yield performance did not reach the target yield (3 t/ha). Even among those who were trained on the TP-R, the adoption rate of some key techniques, such as bund construction, leveling, and more frequent weeding are still low. Although many farmers have accepted the TP-R recommendations, they should further be disseminated in wider coverage so that more farmers would improve their rice cultivation.

Also, there is still room for improvement in each technique's proficiency level. For example, the water cover in FBO's group farms was found uneven when the Project experts paid ocular visits to some group farms during the rainy season in 2021 since the farmers could not sufficiently or properly conduct puddling and levelling. An unevenness of water caused the growth difference and resulted in a decline in yields. Further conversance on the recommended techniques is anticipated by the farmers' continuous application of the TP-R, which should be followed up through proper monitoring by the trained extension staff.

Another serious constraint was the unaffordability of fertilizer, especially for the individual farmers. Although the survey results show that the yield can be improved even without fertilizer, the effect of fertilizer application should not be ignored. With the proper adoption of the TP-R, fertilizer application will increase yield by 50% to 100% compared with no fertilizer application, according to the experiences

during the Project. Any system to support the farmer to obtain sufficient fertilizer at the proper timing should be established, which should be one of the recommendations to MAF in the ministry's future pursuits of nationwide dissemination of the TP-R.