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POUR LA SÉCURITÉ ÉCONOMIQUE ET ENVIRONNEMENTALE

## STUDY REPORT

# Adoption and Adaptation of the System or Rice Intensification (SRI) in the Northern Corridor of Haiti

AVANSE Project, Cap-Haitian, Haiti



Consultancy Report for DAI Global LLC

Erika Styger, PhD

October 20, 2019

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Cover photo: Farmers discussing their SRI plots in Ouanaminthe, November 2018

Photo by Erika Styger

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Erika Styger, PhD

## EXECUTIVE SUMMARY

The Feed the Future North (FTFN) Project AVANSE (*Appui à la Valorisation du potentiel Agricole du Nord, pour la Sécurité Économique et environnementale*) operated over the past five years in the Northern corridor of Haiti to improve agricultural productivity and strengthen markets for rice, cacao and plantains. The AVANSE rice program has been active in the six communes of Acul-du-Nord, Milot, and Plaine-du-Nord in the North Department and in Fort Liberté, Ferrier and Ouanaminthe in the North East Department. The program adopted the Farmer Field School (FFS) approach for training and extension of the agro-ecological methodology known as the System of Rice Intensification (SRI), combined with input subsidies and small equipment for farmers. SRI is a knowledge-based and agronomic approach that allows farmers to increase rice productivity by 30-50% and more, while using 90% less seed, 30-50% less water and 30-100% less agro-chemicals. SRI has been introduced to Haiti since 2010, led by the USAID-funded projects WINNER (2010-2013), Chanje Lavi Plantè (2015-2018), and AVANSE (2013-2019). Over five years, or nine rice growing seasons, AVANSE trained 5910 rice farmers in SRI and supported its implementation on 2952 hectares of SRI farmer plots.

This study was designed to improve the understanding of farmer adoption and adaptation of the new SRI practices in the Northern corridor, to assess the constraints associated with improving rice production, and to identify recommendations for any follow-on programs.

The study was carried out from May to October 2019 using a mixed-method approach. 206 AVANSE farmers and 47 control farmers were interviewed individually during two separate visits. A total of 26 focus group interviews were held in 13 localities. 17 Control farmers were randomly selected from within the project zone and 30 farmers were from the St Raphael commune, which is geographically separated from the project zone. Four rice systems were identified in the project zone. Two were traditional systems, one where seedlings are transplanted (SRT), and one where seeds are broadcast (SD), the System of Rice Intensification (SRI), and an improved system (SRA) that uses a set of new practices that lie between SRT and SRI. The project focused on five SRI practices: age of seedlings, number of seedlings/hill, planting in line or at random, spacing between hills, and alternate wetting and drying irrigation. For farmers participating in this study, rice was their dominant crop and main cash crop. 84% of the farmers grow rice on only one plot with an average of 0.52 ha in size. Only 30% of the farmers have access to credit. They are highly dependent on contracted tractor services for soil preparation in the northeast, on hand-tilling in the north, and on paid labor for transplanting and weeding. 50% of farmers own their rice plots through either inheritance or purchase, while the other 50% lease or sharecrop their plots.

The winter rice growing season of 2019 was a failure due to the absence of rainfall from November 2018 to May 2019. Both growing seasons in 2018 were also subject to drought conditions, and many farmers were not able to plant rice during either the first or second season. Most of the irrigation schemes in the Northern corridor depend on rainfall and are unreliable, unable to either bridge water deficits or evacuate excess water when necessary. The uncertainty makes rice production very risky. The drought situation had considerable impacts on households, especially with the loss of capital and savings, it will

make it difficult for farmers' economic situation not to weaken further, unless future cropping seasons show significant improvements.

The change in rice production practices as influenced by the SRI system was studied i) by inventorying the practices AVANSE and Control farmers used for the past three cropping season, and ii) by comparing the practices farmers used before the AVANSE project and today. In regards to the five key practices:

- **Age of seedlings** dropped from 35 days prior to the project to 25 days at present for the AVANSE farmers, which is less than the 32 day old seedlings used by the Control farmers. Constraints to planting 12 day old seedlings, as recommended by SRI, are: i) apple snail damage, ii) flood risks, iii) delays in soil preparation, and iv) farmers not accustomed to handle small seedlings.
- **Number of seedlings/hill:** All farmers in the project zone as well as in St Raphael plant today 3 seedlings/hill. This is a remarkable reduction from the traditional 7-15 seedlings/hill. Constraints to planting only one seedling/hill, as recommended by SRI, include: i) apple snail damage, ii) flood or drought risk, iii) farmers not accustomed to transplanting single seedlings, and iv) nursery bed quality problems that impair fast transplanting.
- **Plant spacing and line planting:** AVANSE farmers adopted line planting and the recommended 25 cm x 25 cm spacing only when they had access to the roller marker, otherwise they used a closer 15 cm x 15 cm spacing and random planting, as did the Control farmers. Farmers sometimes prefer closer spacing to limit weed growth. It can be predicted that with the introduction of an efficient weeder model, farmers will be able to save on cost and labor to control weeds, and the adoption of line planting and wider spacing would automatically follow.
- **Water management:** Alternate wetting and drying was adopted on average by 85% of all farmers in the project zone. This was between 14 and 65% in three seasons for the farmers in St Raphael. Explanations for this fairly high adoption rate could be two-fold i) AVANSE farmers have witnessed the positive effect when intermittent irrigation is intentionally managed, and have adopted it. Control farmers in the project zone have copied the practice from their fellow AVANSE farmers, and ii) continuous water availability is not guaranteed in most the irrigation schemes, thus farmers are exposed to involuntary intermittent irrigation (which might explain the responses from St Raphael)
- Additionally, AVANSE farmers **burned less straw** and **incorporated straw** more frequently into the soil than the control farmers. AVANSE farmers **managed their fertilizers more efficiently** and kept the amounts more constant while control farmers' use at present 27-47% more fertilizers than AVANSE farmers.
- Paddy yields were estimated by farmers in local units. It is difficult to have high confidence in the data. Ideally yields should have been directly measured in the field but that was not possible. AVANSE farmers and Control farmers from the project zone reported similar yields of 3-4 t/ha for all three seasons. Farmers in St Raphael reported consistently higher yields of 3.35-4.5 t/ha. This could either be due to environmental factors, better water availability, higher fertilizer use, or a difference in calculating yields, which cannot be excluded.

Evaluating farmers' knowledge about SRI, it became clear that Farmers in the project zone know the SRI system well, based on their training and a multi-year exposure through the AVANSE Farmer Field School Program. They have the skills to implement the practices properly and are confident in their ability to do so. Farmers unanimously agree that the SRI system produces the best yields and the highest economic benefits. They recognize that the SRI plants are more resilient to environmental stress, and produce the most tillers, best-filled panicles and the most viable seed. But they confess that although they would like to implement SRI, conditions hardly permit them to do so. In fact, none of the AVANSE farmers practice the SRI system every season. Only 20% of the farmers can do it often or occasionally. The remaining 80% can implement SRI only rarely, or never. The three major constraints that prevent farmers from properly adopting the SRI system are i) the inability to control irrigation water, ii) working funds are not available when needed, and iii) necessary equipment is not available. But there is no doubt that SRI has positively influenced the rice production systems in the Northern corridor, resulting in the new SRA system that is more productive, saves more seed, and manages fertilizers more efficiently and organic matter better compared to the traditional system. Most AVANSE farmers have adopted the SRA system, and it is used by almost 70% of the Control farmers, a very high adoption rate. This indicates that the dissemination of the SRA system, derived from SRI practices, is spreading beyond the project participants in the Northern Corridor.

The Northern Corridor is one of the main rice producing zones of Haiti. Rice farmers depend on rice as their main cash crop. The natural capacity to plant two rice crops per year, including the possibility to grow a third ratoon crop, represents a significant economic potential. It is therefore hoped that future investments can focus on i) improving irrigation and drainage infrastructure to allow farmers to manage water independently of rainfall and weather variability, ii) providing farmers access to better financing and credit services with reasonable conditions, and iii) assisting the rice farming communities to build up appropriate equipment ownership at the local level. This will permit farmers to plan their rice season well, to adopt the SRI system, benefit from higher yields and a better quality crop, creating a vibrant and healthy rice production sector that strengthens the local economy.

## 1. INTRODUCTION

After the January 2010 earthquake, it was hoped that the Haitian agriculture sector could serve as a near-term engine for economic recovery and to generate employment opportunities, as it accounted for nearly 25 percent of GDP and employed more than 60 percent of the population. This emphasis on improving agricultural productivity is shared by the Government of Haiti, the U.S. Government, and other international donors. USAID/Haiti developed the Feed the Future North (FTFN) Project AVANSE (*Appui à la Valorisation du potentiel Agricole du Nord, pour la Sécurité Économique et Environnementale*) to improve productivity in the Northern corridor, one of three regions targeted for U.S. Government support since the January 2010 earthquake. The project has worked since 2013 to create inclusive, sustainable economic growth in productive agricultural areas. In addition to improving selected watersheds, the project focused on three crops: rice, cacao, and plantain, to increase agricultural productivity and strengthen agricultural markets (Phanol et al, 2017).

Rice is a staple of the Haitian diet, accounting for 23% of total calories consumed each day (Cochrane et al, 2016). Current imports total some 500,000 tons annually, which is 87% of consumption. Only 77,000 tons were produced in Haiti during 2018/2019, with the irrigated Artibonite Valley accounting for 70-80% of the national production (USDA 2019). The Artibonite irrigation system covers 35,000 hectares, of which 30,000 ha are currently irrigated. Other larger rice producing areas are located in the Maribahoux Plain (8,000-10,000 hectares) in the North-East Department, and in the Torbeck Perimeter (2,000–3,000 hectares) at Les Cayes in the South Department. Over the past 20 years, rice productivity levels have remained low and stagnant with yields of about 2 t/ha (Cochrane et al, 2016).

In the Northern Corridor, rice is produced in St-Raphael, Milot, Acul-du-Nord, Limbé, and Bas-Limbé (North Department), and in Ferrier, Fort-Liberté, and Ouanaminthe (Northeast Department). Rice production can satisfy about 25% of the regional demand in the Northern Corridor (Jean-Pierre et al., 2013). Here, the climate is warm and humid tropical with average annual rainfall ranging from 1700 mm to 2000 mm. Vulnerability to extreme climate events is high, including potential damage from tropical cyclones from June through November, which coincides with the second rice-growing season. Research by climate scientists Herrera et al (2018) on the 2013-2016 Pan-Caribbean drought suggests that anthropogenic warming has increased drought risk in the Caribbean.

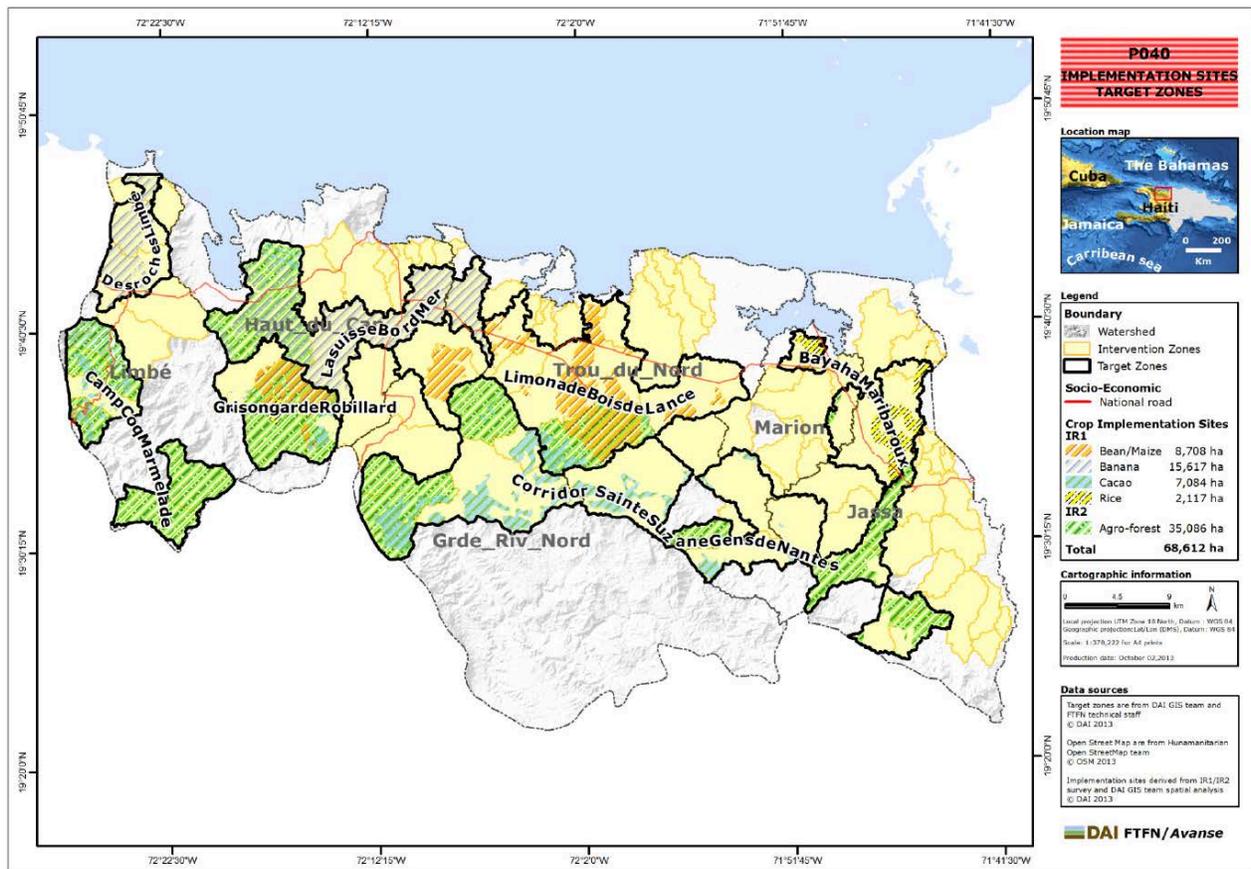
The AVANSE rice program has been active in the six communes of Acul-du-Nord, Milot, and Plaine du Nord (North Department), and Fort Liberté, Ferrier and Ouanaminthe (North East Department) (Figure 1). These are major rice growing communes, with an estimated 7000 farmers planting rice on more than 8500 ha (Table 1)

Table 1: Rice-growing area and number of rice farmers in five communes in N and NE of Haiti

Commune	Rice area (ha)	Number of rice farmers
Ouanaminthe	3350	2200
Ferrier	2981	1900
Fort Liberté	1559	1600
Acul-du Nord	250	700
Milot	119	500
<b>Total</b>	<b>8509</b>	<b>6900</b>

Source: Rice program, AVANSE

Figure 1: AVANSE project zone and implementation sites for all Crops (2013)



AVANSE adopted the Farmer Field School (FFS) approach for training and extension of improved rice production practices, based on the agro-ecological methodology of the System of Rice Intensification (SRI). Twenty farmers were grouped into each FFS. One farmer leader from each FFS was chosen to participate in a 3-day SRI training by the AVANSE technical rice team. Upon returning home, each farmer leader trained the other members of the FFS directly in their fields. Farmers worked together in each FFS

to implement the different practices in each other's fields. AVANSE technicians followed up with farmers two to three times a week, responding to questions and problems as they arose. Each season, new farmers from an adjoining area were selected to participate in each FFS. A small number of farmers from the previous season's FFS were integrated into the new groups to reinforce the training. At the beginning of the AVANSE project, farmers received subsidies for inputs (seeds, fertilizers, equipment), but these were phased out during the last two years of the project. Types of equipment introduced included roller markers, conical weeders and motorized threshers.

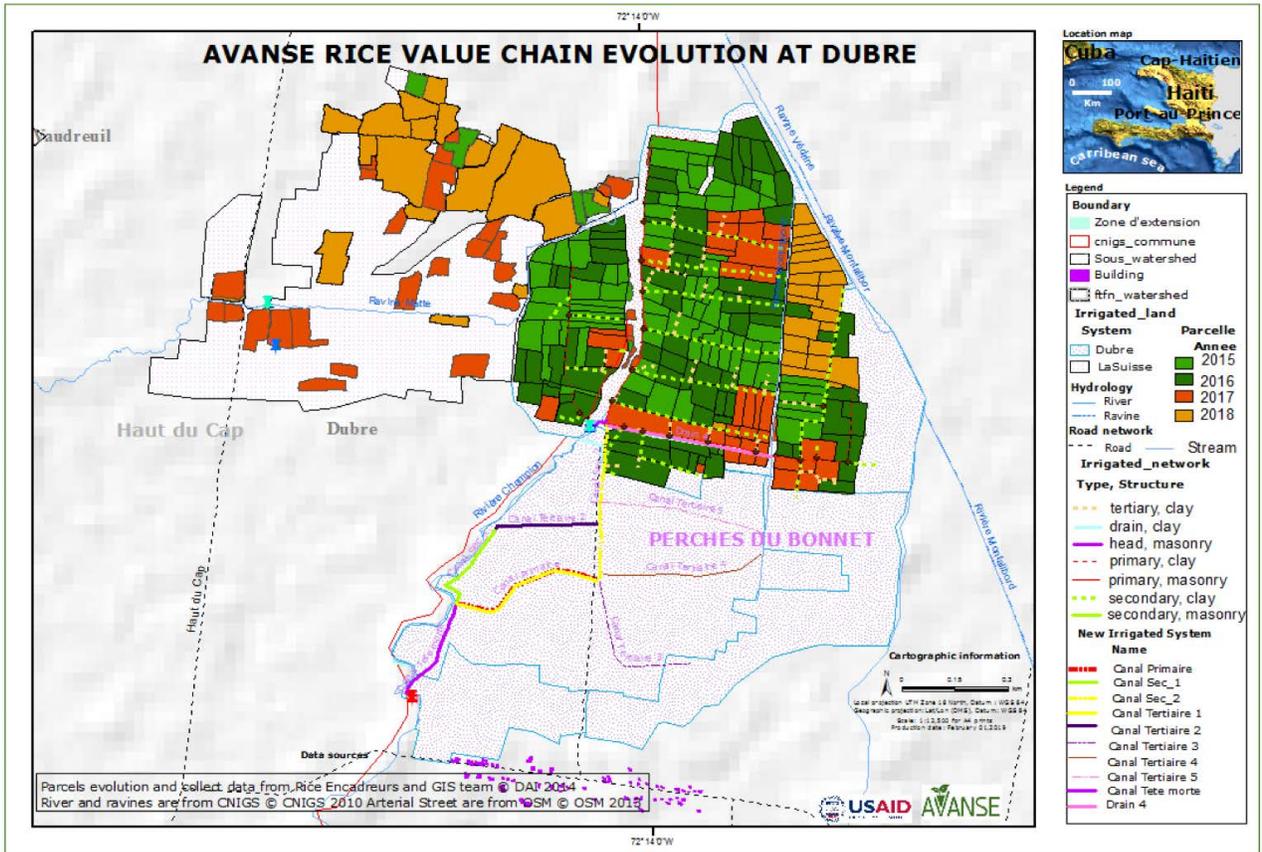
From 2014 to 2018 (over 5 years, or 9 rice growing seasons), 5910 farmers were reached and 2952 hectares of SRI farmer plots were implemented. The details are provided in Table 2. As some farmers participated in the program for more than one season, the total number of farmers (section a) outnumbers the total number of individual farmers the project reached (section b).

Table 2: Total number of farmers reached and SRI area implemented by AVANSE's rice program from 2014 to 2018

a)	Commune	Milot, Plaine du Nord		Grison Garde		Ouanaminthe		Ferrier		Fort Liberté		Total	
		Ha	Farmer #	Ha	Farmer #	Ha	Farmer #	Ha	Farmer #	Ha	Farmer #	Ha	Farmer #
2014	Saison 1	25	45	12	34	58	97	54	90	45	100	184	366
	Saison 2	35	64	32	67	75	120	100	195	50	125	282	571
2015	Saison 1	30	70	42	105	120	210	120	220	60	150	372	755
	Saison 2	35	85	53	125	135	275	150	245	80	210	453	940
2016	Saison 1	40	90	60	145	150	280	200	310	110	315	560	1140
	Saison 2	40	85	55	110	175	320	220	345	110	309	600	1169
2017	Saison 1	30	72	45	95	200	325	250	390	95	255	620	1137
	Saison 2	25	54	43	60	200	320	175	215	64	135	498	784
2018	Saison 1	15	35	20	41	75	125	65	106	60	121	235	428
	Saison 2												
												<b>3804</b>	<b>7290</b>
b)													
Total rice area and number of farmers AVANSE worked with during the 5 years of the project													
Total		75	350	161	492	1118	1932	1004	1736	594	1400	2952	5910

The project set up Farmer Field Schools in defined sections of the irrigation perimeters, progressing to adjacent sections from year to year, as illustrated by the map (Figure 2) from the Dubré irrigation scheme (commune of Milot). Maps for the other project zones a) communes of Ouanaminthe and Ferrier, b) Chalopin in Fort-Liberté, and c) Grison Garde are shown in Appendix 1abc.

Figure 2: Rice area coverage of AVANSE project interventions from 2015 to 2018 for the Dubré rice production scheme (Commune of Milot).



The AVANSE project focused on introducing the System of Rice Intensification (SRI) to the project zone. The System of Rice Intensification (SRI) is an agro-ecological and climate-smart rice production methodology that allows farmers to increase rice productivity by 30-50% and more, while using 90% less seed, 30-50% less water and 30-100% fewer agro-chemicals. SRI is a knowledge-based crop management approach that allows plants to better express their genetic potential, which leads to improved plant growth, productivity and seed quality. SRI is based on four crop management principles which interact and reinforce each other: i) favor early and healthy plant establishment, ii) minimize competition between plants, iii) build fertile soils rich in organic matter and soil biota, iv) manage water carefully and maintain aerated soils. When implementing SRI, the principles remain the same, but the practices can vary and can be adjusted to suit the local conditions with the goal to maximize the effect of SRI management (Styger and Uphoff, 2016).

SRI was introduced to Haiti in 2010 (after the earthquake) by the USAID-funded project WINNER with assistance from the Better U Foundation/Cornell University (Styger and Joelibarison, 2010; Styger 2010). Other organizations joined with WINNER to train farmers and provide technical assistance, primarily the international NGO Oxfam in collaboration with ODVA (*Organisation de Développement de la Vallée de*

*l'Artibonite*) in the Artibonite Valley, and the US-based IF Foundation operating in the North Department. To date, three USAID-funded projects have led in dissemination of the SRI methodology in Haiti: i) WINNER, active in the Cul-de-Sac area, Mirebalais and Montrouis from 2010-2013 (Joelibarison, 2012), ii) followed by the Feed-the-Future Project Chanje Lavi Plantè working in the St Marc commune and in the Cul de Sac Area from 2015 to 2018 (Styger and Joelibarison, 2016), and iii) the Feed-the-Future Project AVANSE active in the Northern Corridor from 2013-2019.

The AVANSE FFS extension approach worked well, having trained and supported nearly 6000 rice farmers during the project period. Although the project collected data on rice activities by the farmers participating in the FFS during a given season, it did not collect any data for the following seasons, after farmers were no longer formally in a FFS. For this reason, there was no clear understanding of the extent to which the SRI practices have been adopted across the project zone over the life of the project. Did farmers continue with the newly learned SRI practices? Did they entirely or partially adopt the new system? Did they drop some SRI practices, and if so why? Did farmers who did not participate in the project adopt any SRI practices? What was the overall impact on rice farming and rice production practices in the North and Northeastern region?

In an attempt to respond to these questions, this study was designed to examine rice production practices farmers in the region use at present, how practices have changed over the past years, how well farmers have mastered and adopted the new SRI practices, and to evaluate the ongoing constraints that limit the development of a vibrant and productive rice sector in the N and NE of Haiti.

### **1.1. RICE STUDY OBJECTIVE**

This study was designed to improve the understanding of farmer adoption and adaptation of the new SRI practices in the Northern corridor, to assess the constraints associated with improving rice production, and to identify recommendations for any follow-on programs.

## 2. STUDY METHODOLOGY

### Study timeline

- Study design: November 2018
- Study redesign: May 2019
- Study data collection: June and July 2019
- Data entry and analysis: July to October 2019
- Study Report: October 2019

**Mixed-method approach:** The study implemented a mixed-method approach by i) using a quantitative survey to identify rice production practices, and ii) holding interviews with individual farmers and with farmer groups. This obtains both i) an enumeration of adoption of improved rice production practices, and ii) an in-depth understanding of the drivers that influence decision-making in adopting practices. The method was divided into two instruments:

- i) Quantitative and qualitative individual farmer interviews to study rice production practices (planned: 300 farmers, actual: 253 farmers)
- ii) Qualitative key informant and focus group interviews (planned 12 locations, actual: 13 locations)

### Data collection was done in three stages:

1. Individual farmer interviews: First visit: inventory of practices for past three cropping season, and collecting general information (PART 1 of the individual farmer interview questionnaire, Appendix B1)
2. Individual farmer interviews: Second visit: discussion about adoption of SRI practices and four rice production systems (PART 2 of the individual farmer interview questionnaire, Appendix B1)
3. Focus group interviews in 12 locations (2 questionnaires, Appendix B2 and B3)

**Circumventing potential biases:** Given that AVANSE introduced SRI to the project zone and assisted farmers in its implementation, there is a risk that that project participants might give inaccurate information to please the interviewers. To minimize potential bias in the answers, interviews were done in two separate visits. During the first visit, practices were simply inventoried without discussing the different rice systems or SRI. During the second visit, focus was turned towards the adoption of SRI practices, advantages and disadvantages of the different rice systems and the main constraints farmers were facing.

**Study redesign:** The initial study design, developed in November 2018, was based on an inventory of rice production practices through direct observation in the field by both interviewers and farmers to be carried out during three field visits over the 2019 winter cropping season. However, due to the severe drought across the entire project zone from November 2018 to May 2019, the winter cropping season (January to May) failed entirely. Thus the study methodology had to be redesigned in May 2019 to be based on farmer recollection of previous seasons.

**Sampling approach:** The study was implemented in all the AVANSE rice-growing zones except Grison Garde in the Acul-du-Nord commune. It covered five communes: Ferrier, Fort Liberté, Milot, Ouanaminthe, and Plaine-du-Nord. From the 4170 farmers recorded in the AVANSE project database, 206 farmers were randomly selected in proportion to the total number of farmers reached by the project in each of the communes. There were two control groups: (Control 1) 17 farmers from within the project zone who were not reached by the AVANSE project, and (Control 2) 30 farmers from St Raphael, geographically separate from the project zone. St Raphael is 48 km from Cap Haitian and sits in a valley surrounded by high mountains. There is a road to Cap Haitian, which passes through the commune of Milot, but there are no direct roads from St Raphael to the project zone in the NE Department.

**Number of farmers participating in the study:** Although the study was designed to interview 240 AVANSE farmers, only 206 were actually interviewed. Because Control 1 farmers had to be identified by interviewers while in the field, there were only 17 interviews instead of 30 as planned. For Control 2 the planned number of 30 farmers was maintained. Some farmers did not answer all the questions, or data was not clear and had to be set aside. This explains the variation in the number of farmers in presentation of the results in this report (indicated by either N= or n=). (Table 3)

Table 3: Total number of AVANSE rice farmers, number of farmers selected for the individual farmer interviews, including the number of farmers for two study control zones.

Communes	Number of all AVANSE farmers	Percentage	Number of AVANSE farmers in this Study	Percentage	Number of farmers:	
					Control 1	Control 2
Acul-du-Nord	361	NA	NA	NA	NA	NA
Ferrier	814	22%	27	13%	6	0
Fort-Liberté	1721	45%	100	49%	4	0
Les Perches	38	1%	0	0%	0	0
Milot	225	6%	31	15%	0	0
Ouanaminthe	930	24%	38	18%	7	0
Plaine-du-Nord	81	2%	10	5%	0	0
Saint-Raphaël	0	0	0	0	0	30
<b>Total</b>	<b>4,170</b>	<b>100%</b>	<b>206</b>	<b>100%</b>	<b>17</b>	<b>30</b>

**Focus group and key-informant interviews:** 13 locations were selected for focus group and key informant interviews (Table 4). For the **focus group** interviews, although it was originally planned for only 6-10 farmers to share their opinions and perceptions about SRI and to discuss context and constraints for rice production improvements, an average of 20 farmers attended. A 10-question questionnaire-guide (Appendix B2) was used for the 60-minute interviews. At each location, two to three **key informants** were interviewed to characterize the irrigation perimeters and local conditions that influence rice production schedules and practices (questionnaire-guide in Appendix B3). The focus group and key

informant interviews complemented the individual farmer interviews, and provided additional insights into farmer decision-making and the external conditions beyond their control.

Table 4: Focus group and key-informant interview information for 13 localities

	Locality	Commune	Date	Number of Participants	Number of Women
1	Merande	Ferrier	13-Jun	20	5
2	Massacre	Ferrier	13-Jun	21	2
3	Lagarenne	Ferrier	4-Jun	22	4
4	Dumas	Fort-Liberte	june	20	7
5	Coicou I and II	Fort-Liberte	1-Jun	19	3
6	Malfety	Fort-Liberte	June	21	2
7	Coicou III	Fort-Liberte	June	19	0
8	Dubre	Milot	31-May	15	1
9	Tallasse	Ouanaminthe	June	21	4
10	Duhaut	Ouanaminthe	june	20	1
11	Jalindor	Ouanaminthe	24-Jun	20	3
12	Melrene	St Raphael	9-Jul	21	4
13	Porte OD4SS	St Raphael	9-Jul	21	3

**Data analysis:** Data analysis was limited to totals, averages and percentages as presented in tables, figures, in the text and in the appendices. No additional statistical analysis was performed.

**Rice Systems Characterization:** Four rice production systems can be identified in the AVANSE project zone (Table 5). Under the first traditional system, seedlings are transplanted (SRT). For the second traditional system, seeds are directly broadcast into the paddy fields (DS). The System of Rice Intensification has a specific set of practices (SRI), and the Improved System (SRA) either makes partial use of SRI practices or adapts the SRI practices to constitute a new set of practices that lie between SRI and SRT.

Table 5: Acronyms, French and English names of four production systems distinguished by AVANSE and as used in this study

Acronyms	French	English
<b>SRI</b>	Système de Riziculture Intensive	System of Rice Intensification
<b>SRA</b>	Système de Riziculture Améliorée	System of Improved Rice Production
<b>SRT</b>	Système de Riziculture Traditionnelle	System of Traditional Rice Production
<b>SD or DS</b>	Semis Direct	Direct Seeding

The following table (6) shows the practices that characterize the four rice production systems in N and NE Haiti as used in this study. These systems were discussed with farmers during the second visit of the individual farmer interviews and during the focus group discussions on SRI.

Table 6: Characteristics of the different rice production systems found in the N and NE, Haiti

PRACTICES	SRI	SRA : between SRT et SRI	SRT	Direct Seeding
Direct Seeding	-	-	-	yes
Age of seedlings (days)	8-12 (to 14)	15-30	31-45 (to 60)	-
Number of plants/hill	1	2-5	6-15	-
Planted in Line or Random (L/R)	L	R or L	R	-
Spacing in cm x cm	25x25	20x20	15x15	-
Permanent Flooding (PF) or Alternate Wetting and Drying (AWD)	AWD	PF or AWD	PF	PF

### 3. GENERAL CHARACTERISTICS OF THE STUDY ZONE AND PARTICIPATING FARMERS

#### 3.1. Study zone, localities and farmer characteristics

A total of 253 farmers were interviewed by seven staff members of the AVANSE monitoring and evaluation team during two visits between June 10 and July 15, 2019. Of the 253 farmers, 78% were men and 22% were women, with an average age of 47 years. These farmers lived in 75 localities, found in nine sections of the six communes (Table 7).

Table 7: Communes, sections and characteristics of participating farmers

Communes	Residence Localities	Farmers	Men	Women	Av age
Sections	Number	Number	Number	Number	Years
<b>Ferrier</b>					
1ere Bas-Maribahoux	11	34	23	11	39.5
<b>Fort Liberte</b>					
1ere Dumas	8	27	20	7	47.3
1ere Haut des Perches	2	2	2	0	75.5
2eme Bayaha	22	70	56	14	49.3
4eme Haut-Madeleine	1	1	1	0	60.0
<b>Milot</b>					
1ere Perches de Bonnet	2	34	33	1	49.8
<b>Ouanaminthe</b>					
1ere Haut Maribahoux	17	45	26	19	49.3
<b>Plaine du Nord</b>					
2eme Basse Plaine	1	10	7	3	46.8
<b>St Raphael</b>					
4eme Sanyago	11	30	29	1	42.0
<b>Total Numbers</b>	<b>75</b>	<b>253</b>	<b>197</b>	<b>56</b>	
<b>Percentage</b>		<b>100</b>	<b>78</b>	<b>22</b>	
<b>Age average (all farmers) in years</b>					<b>47.2</b>

Often farmers did not live in the same location as their rice plots. In this study, the term “localities” therefore refers to the locations of the rice plots, not to where the farmers live.

Rice plots were identified at 55 localities in six communes. The distribution of farmers who participated in the AVANSE project (**AVANSE farmers**) and farmers who did not participate in the project’s activities (**Control farmers**) is shown in Table 8. The detailed list of localities and number of farmers in each locality, identified as either AVANSE or Control farmers, is reported in Appendix 2.

Table 8: Number of AVANSE and Control farmers participating in the study for the six communes.

Communes	AVANSE farmer numbers	Control	Total
Ferrier	27	6	33
Fort Liberté	100	4	104
Milot	31		31
Ouanaminthe	38	7	45
Plaine du Nord	10		10
St Raphael		30	30
<b>Total</b>	<b>206</b>	<b>47</b>	<b>253</b>

**AVANSE Farmers:** The majority of interviewed AVANSE farmers participated in project activities prior to 2018. Hence, they have multi-year knowledge of SRI. Table 9a shows in which years the interviewed farmers participated in the project. Many farmers participated more than one season in the project activities. 21% of farmers reported to have benefited from the project for one season, whereas 68% participated between 2-4 seasons, and 11% between 5-8 seasons (Table 9b).

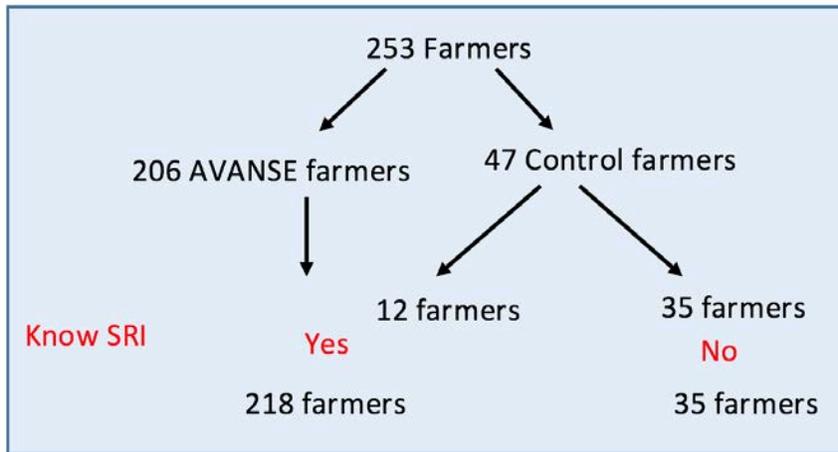
Table 9: Years and number of seasons farmers participated in the project

a) Year of participation	AVANSE farmers Number	b) Number of seasons participated	AVANSE farmers Number
2013	1	1	44
2014	29	2	54
2015	64	3	24
2016	88	4	62
2017	43	5	10
2018	5	6	10
2019	1	7	0
NA	22	8	2
<b>Total</b>	<b>--</b>		<b>206</b>

NA: Answer not available.

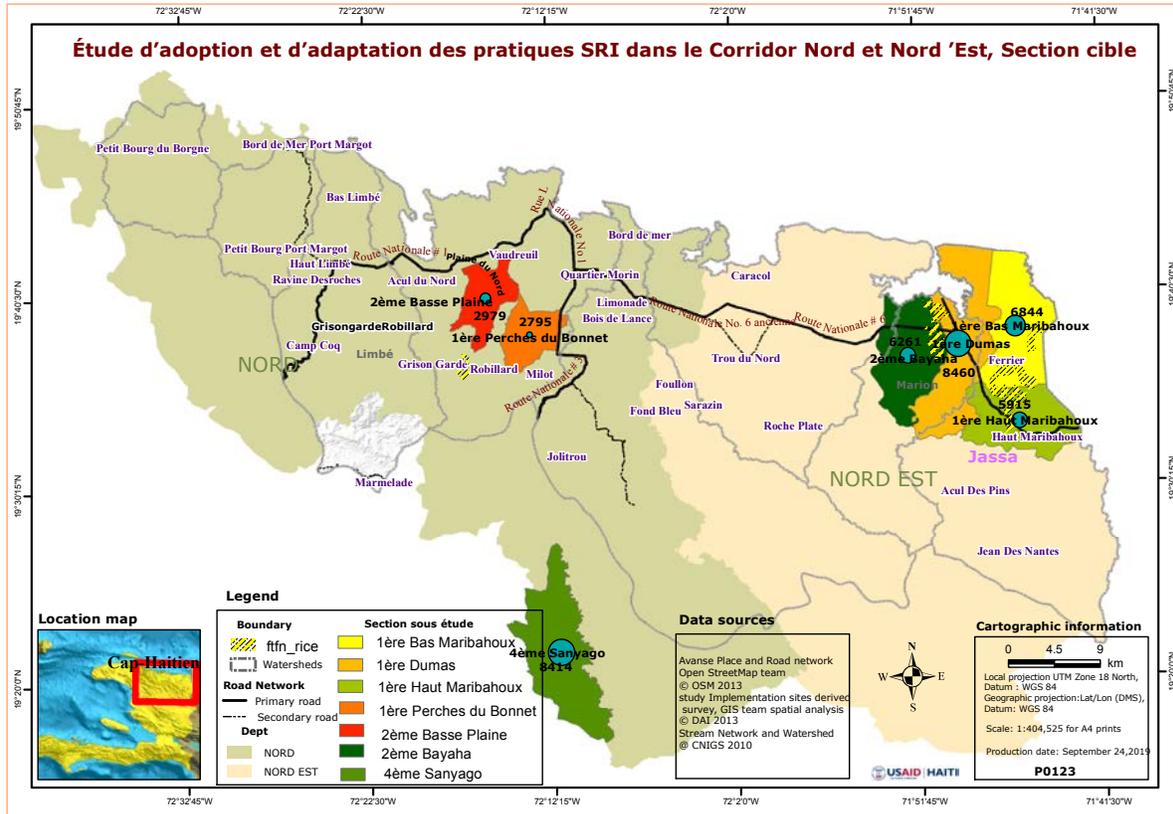
**Control Farmers:** 12 of the 47 control farmers mentioned they knew about SRI, while 35 did not (Figure 3). The distribution across localities for both sub-groups can also be found in Appendix 2.

Figure 3: Number of study participants who knew about SRI and who did not know SRI



The following map shows the delimitation of the study zone: in the northeast cluster, four sections in the communes Fort-Liberté, Ferrier and Ouanaminthe; in the north cluster, two sections in the communes Milot and Plaine-du-Nord (in orange and red colors); and in the southern part of the map, the control commune of St Raphael (in green color, indicated as section 4ème Sanyago). The names of the sections are found in Figure 4.

Figure 4: Delimitation of the study zone (seven sections as part of six communes)



### 3.2. General farming characteristics

Farmers were asked about their agricultural and economic activities (Table 10). The dominant crop and economic activity is clearly rice production, which is also the main cash crop. Corn, okra, and beans are produced by 20-30% of farmers. Most crops are produced for both home consumption and for the market. That only 83.8% and not 100% of the farmers mentioned they produced rice can be explained by the failed season in 2019 due to drought. Most farmers own livestock: more than 50% own cattle, a third own goats, and 13% own pigs. However, horses, oxen or donkeys, important transportation and draft animals, are owned by less than 5% of the farmers. 39% of the farmers said they produce charcoal, but otherwise, the exploitation of various natural resources, such as fishing, salt production, or wood extraction (other than for charcoal) is little pursued. Very few farmers pursue other trades such as masonry, carpentry or mechanics. Only 12 farmers of the 253 interviewed, or 6%, leave home for seasonal work, either to the Dominican Republic as agriculture workers (11 farmers) or to a Haitian city (1). Of these, eight farmers leave between the growing seasons, and four during the cropping seasons. The main reasons for seasonal migration are lack of money and failed rice plots.

Table 10: Agriculture, livestock ownership, natural resources extraction and other economic activities by the farmers participating in this study

Plant crops	% farmers	Own livestock	% farmers	Extract natural resources	% farmers	Pursue other activities	% farmers
Rice	83.8	Cattle	53.0	None	58.8	Masonry	6.7
Mais	35.6	Goat	33.6	Charcoal	38.7	Carpentry	1.6
Okra	22.9	Pig	12.6	Fishing	1.5	Mechanic	0.4
Beans	20.9	Chicken	5.5	Salt	0.5	Sawyer	0.4
Pois inconnu	19.0	Horse	4.7	Wood	0.5	Teacher	0.8
Sugar cane	14.6	Oxen	2.8			Agriculture technician	0.8
Pigeon pea	13.0	Donkey	1.6			Moto taxi driver	1.2
Manioc	9.5	Sheep	1.2			Others	3.2
Hot pepper	9.1	Aquaculture	0.4				
Banana	8.3						
Leek	7.5						
Peanut	7.1						
Sweet potato	5.5						
Beets	4.3						
Onion	4.0						
Carrot	2.4						
Plantain	1.6						
Taro	0.8						
Papaya	0.8						
Melon	0.4						
Spinach	0.4						

### 3.3. Rice production characteristics

#### ***Number of rice plots planted and average plot sizes***

84% of farmers planted only one rice plot, 13% of farmers had two plots and only 3% of farmers planted rice on three plots. Plot size was on average a half hectare. In total, the 253 farmers planted 299 plots of rice (Table 11).

Table 11: Number of rice plots planted per farmer and average plot sizes

Number of plots/farmer	Number of farmers	% farmers	Total number of plots	Average size (ha)
1	214	84	214	0.52
2	32	13	64	0.49
3	7	3	21	0.48
<b>Total / Average</b>	<b>253</b>	<b>100</b>	<b>299</b>	<b>0.52 ha all plots</b>

The number of plots per farmer in each of the six communes was very similar, 81% to 89% of farmers had only one plot, 9% to 17% of farmers had two plots, and 0% to 10% had three plots. In St. Raphael, none of the farmers had a third plot, in Fort-Liberté it was only 1%, and in Ouanaminthe 2%.

Plots in Milot, Plaine-du-Nord, and St Raphael were smaller, where average plot sizes ranged between 0.23 and 0.32 ha, whereas in Ferrier, Fort-Liberté and Ouanaminthe, average plot sizes were larger, between 0.48 and 0.96 ha (Table 12).

Table 12: Number of rice plots planted per farmers for six communes and associate plot sizes

Communes	Number of farmers with 1, 2 or 3 plots					Average plot sizes (in ha) for 1st, 2nd and 3rd plots				
	Plot 1	Plot 2	Plot 3	NA	Total	Plot 1	Plot 2	Plot 3	NA	Average
Ferrier	21	4	1	1	27	0.59	0.48	0.64	0.44	0.57
Fort Liberté	85	9	1	5	100	0.6	0.6	0.81	0.71	0.6
Milot	25	3	3		31	0.26	0.23	0.23		0.25
Ouanaminthe	40	4	1		45	0.65	0.6	0.96		0.65
Plaine du Nord	8	1	1		10	0.26	0.75	0.25		0.31
St Raphael	24	5		1	30	0.29	0.32		0.32	0.3
NA				10	10					
<b>Total/Average</b>	<b>203</b>	<b>26</b>	<b>7</b>	<b>17</b>	<b>253</b>	<b>0.52</b>	<b>0.49</b>	<b>0.48</b>	<b>0.62</b>	<b>0.52 ha all plots</b>

### ***Credit access for rice production***

Only 30% of the farmers access credit for rice production: 80% in cash and 20% in services. Credit is used for soil preparation (60%), to buy inputs (30%), and for rice field management (10%).

There is a significant difference between the communes (Table 13). 55% and 64% of farmers in Ouanaminthe and Ferrier, respectively, access credit from the Haitian rice processing company CLES, based in Ouanaminthe, and from tractor service providers for soil preparation coming from the Dominican Republic. Access to credit in the other communes is highly limited: 24% of farmers take credit in St Raphael, less than 20% in Fort-Liberté and Milot, and 0% in Plaine-du-Nord. Without credit, all expenses for rice production, including soil preparation, seeds, fertilizer, or labor must be paid up front in cash.

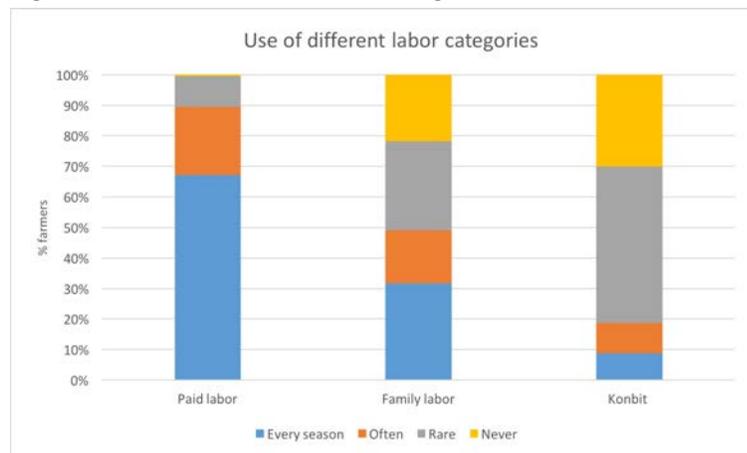
Table 13: percentage of farmers accessing credit for six communes

Communes	Acces credit	Do not access credit
	% farmers	% farmers
Ferrier	64	36
Fort Liberté	19	81
Milot	16	84
Ouanaminthe	55	45
Plaine du Nord	0	100
St Raphael	24	76
Average	30	70

**Access to labor for rice production**

Labor for rice production is categorized as either i) paid labor, ii) family labor, or iii) “Konbit,” a traditional form of communal labor, where community members join together to work in each other’s fields (Figure 5). Farmers report that paid labor dominates as 90% of all farmers use paid labor often or every season, while this is the case for only 50% of family labor, and 20% of Konbit. The importance of Konbit seems to have declined in recent years and to depend on the commitment of the communities to maintain it.

Figure 5: Use of different labor categories for all farmers



There are significant differences between the communes.

- Communes in the North Department, Milot and Plaine-du-Nord, are about 90% dependent on paid labor. Family labor fills the gaps, and Konbit is almost absent.
- In Fort-Liberté, Ouanaminthe, and Ferrier, family labor is the most important category, followed by paid labor. There is a minor contribution from Konbit labor, most importantly in Fort-Liberté, where it can account for up to 35% of labor.

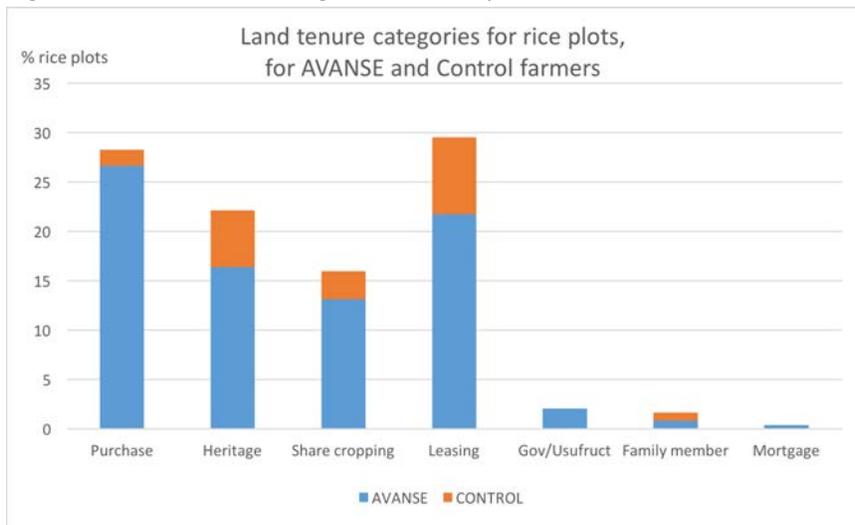
- In St. Raphael, the study control zone, farmers depend mostly on family labor, complemented by up to 30% with paid labor. Konbit seems little used there.
- Detailed data for the three labor categories used in each of the 6 communes is presented in Appendix 3.

**Gender roles in rice farming:** Rice production is predominantly a male activity in the Northern Corridor of Haiti. Men are in charge of all the operations in the rice fields, from soil preparation to harvest. Women collect, process and sell the harvest. They might assist their husbands in the fields, but only a few women cultivate their own fields.

***Land tenure regimes for rice fields***

About 50% of rice plots are held under the more stable forms of land tenure, such as outright purchase or through inheritance. The remaining 50% are in use under less stable arrangements, most importantly share cropping and leasing (Figure 6)

Figure 6: Land tenure categories for rice plots of AVANSE and Control farmers



68% of all farmers had planted their plots for 1-10 years, 17% between 11-20 years, 9% between 21-30 years and 6% between 31-40 years. The four most important land tenure regimes – purchase, inheritance, sharecropping, and leasing – are associated with all four length of use categories. A slightly higher percentage of plots used over the longer terms were associated with stable land tenure regimes. (See Appendix 4 for details).

## 4. FARMERS ADJUSTING TO WEATHER VARIABILITY AND DROUGHT IN 2018 AND 2019

### 4.1. Rice production seasons, irrigation water availability and rainfall

For many localities in the Northern corridor, the two rice growing seasons are i) the winter season from January/February to May, also called Season 1 (S1), and ii) the summer season from August/September to December, or Season 2 (S2).

The winter rice growing season of 2019 was a failure due to the absence of rainfall from November 2018 to May 2019. Only a few farmers were able to plant rice between January and March, as permitted by highly specific local conditions.

One such example occurred in the locality of Rivière Sable, Commune of Ouanaminthe, where a trickle of water from the irrigation canals reached a few of the lowest-lying fields at the far end of the irrigation perimeter, bypassing other fields that were positioned slightly higher. Some farmers in these higher locations had also started planting, but had eventually to abandon their fields when the water no longer flowed in the canals.



A few low-lying fields received enough water for rice to be grown; In the back: abandoned rice fields; Locality of Rivière Sable, commune of Ouanaminthe May 20, 2019 (Photo E. Styger)



Abandoned rice fields in front; In the back: recently abandoned rice fields and fields left to fallow, grazed by cattle; Locality of Rivière Sable, commune of Ouanaminthe, May 20, 2019 (Photo E. Styger)

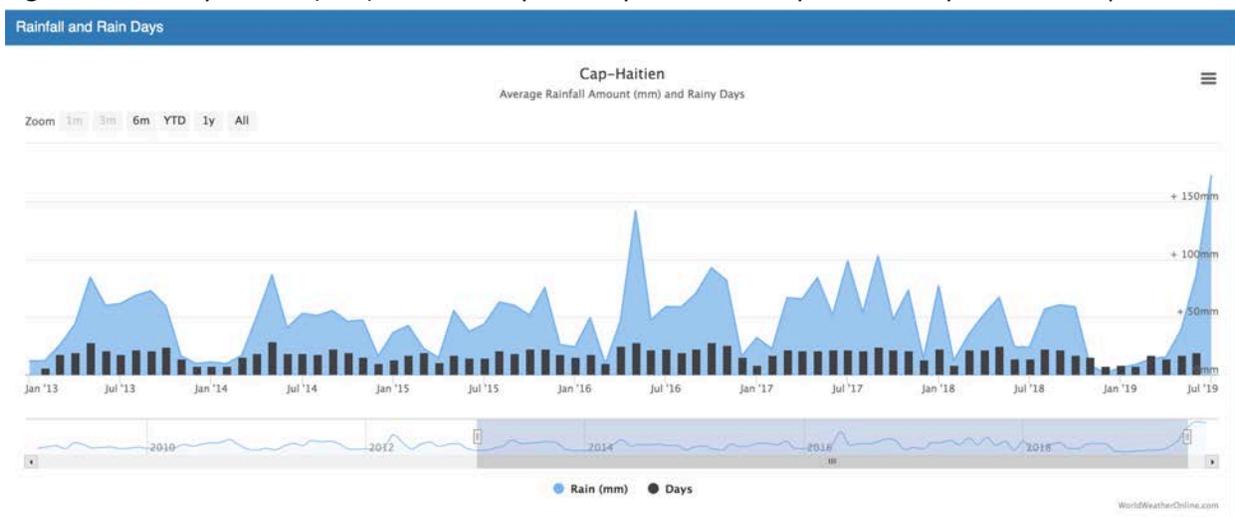
Both growing seasons in 2018 were also subject to inadequate and highly erratic rainfall, leading to drought conditions in many localities. Many farmers were not able to plant rice during either the first or second season.

Ideally, an irrigation scheme should provide irrigation water independent of rainfall. During a drought, stored water can be used to irrigate the fields. If there is flooding, farmers can evacuate the excess water through a drainage system. But this is seldom the case in the study zone. In many of the localities, the

irrigation schemes were built by farmers, tapping water directly from nearby rivers. These systems have neither any storage capacity such as a basin or a dam at their intake, nor is there any system to drain excess water. Even some of the professionally-built schemes in the area are vulnerable to varying rainfall. In the locality of La Suisse, commune of Plaine-du-Nord, the water intake from the source was placed very high up. During dryer months the level of water at the intake is lower than the primary canal, and hence the irrigation is interrupted. The irrigation capabilities of most schemes in the Northern Corridor are dependent on the amount of rain received. There is little or no storage to buffer shortfalls. Rainfall influences both the water directly received at the plot level and the water levels of the rivers that deliver water to the irrigation schemes.

During recent years, the rainy seasons have been erratic: rains begin late, rainfall is interrupted in mid-season, there are extended dry periods, or excessive rainfall causes flooding. In addition, hurricanes, possibly bringing serious flooding or crop loss, are always a threat during the second cropping season. During the AVANSE project period, each year experienced different rainfall patterns. These irregular rainfall distributions are illustrated in the following figure (7), showing monthly rainfall (in mm) and number of rain days for Cap Haitian back to January 2013.

Figure 7: Monthly rainfall (mm) and monthly rain days from January 2013 to July 2019, for Cap Haitian

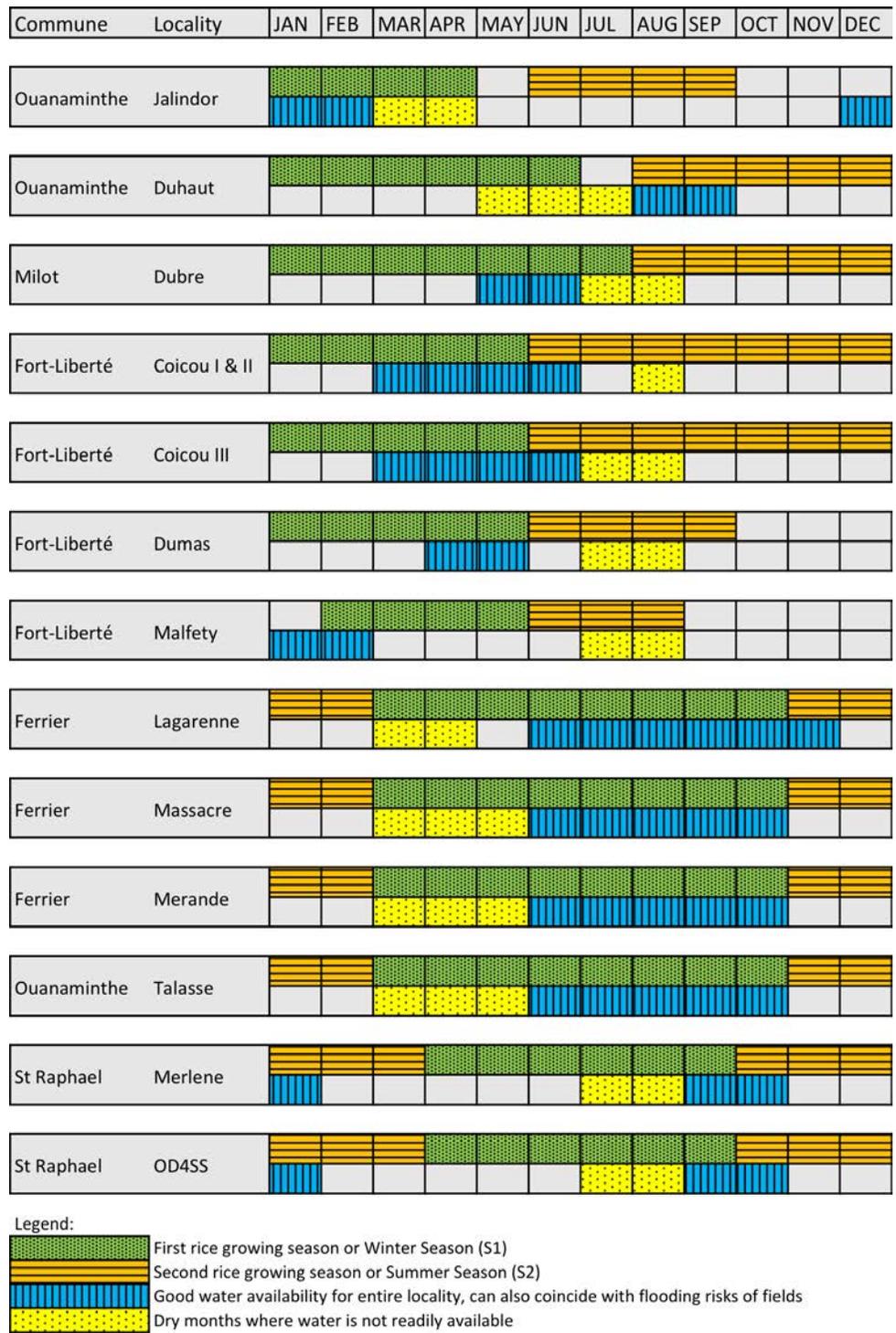


<https://www.worldweatheronline.com/cap-haitien-weather-averages/nord/ht.aspx>

### ***Rice growing calendars***

Depending on irrigation water availability, the calendar of the two rice growing seasons – under normal conditions - varies greatly for different localities. The information in the following figure (8) was provided by farmers for a few of the localities during the focus group interviews. With irregular rainfall as in figure 7 above, these rice season calendars will be affected as well.

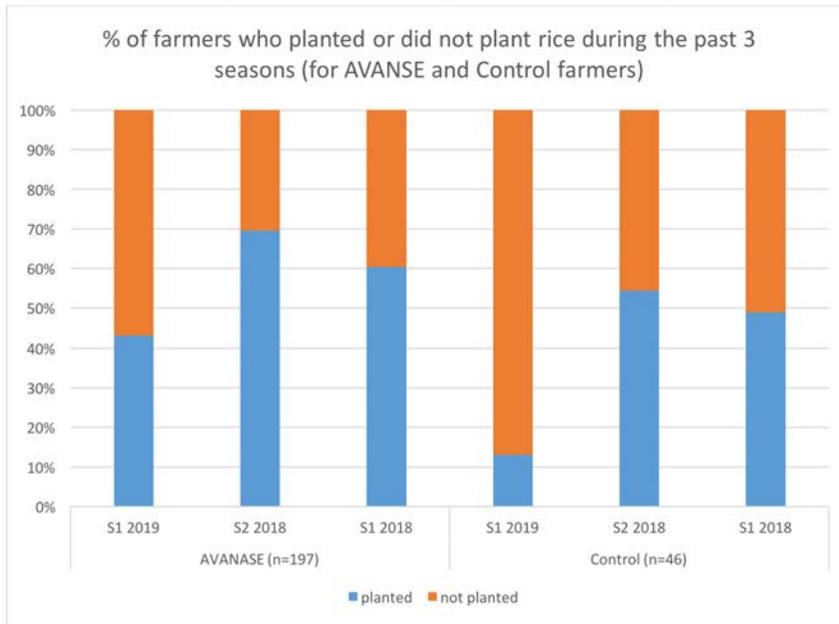
Figure 8: Rice growing calendar for the two rice season, good water availability and dry months for 13 localities in the N and NE of Haiti



#### 4.2. Rice planting activities for the past three seasons

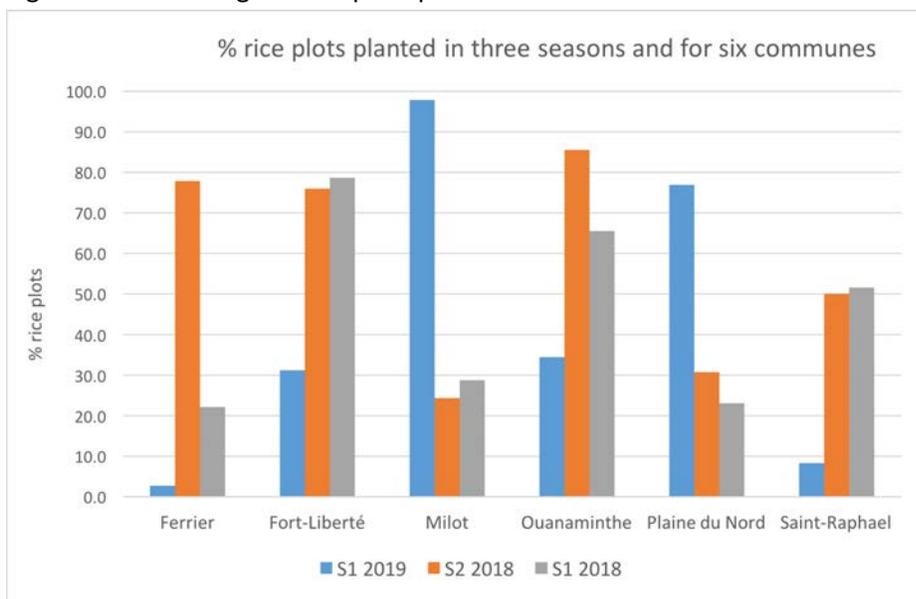
Rice farmers in both the AVANSE project zone and in St Raphael control zone were greatly affected by the drought in 2019. The following figure (9) shows the percentage of farmers who planted or did not plant rice during the past three seasons. For the AVANSE farmers, only 60% planted rice in the first season of 2018, which increased to 70% in the second season, and dropped to 43% for the first season in 2019 (the number of farmers in first season of 2019 includes all farmers that planted into June). For the control farmers, the percentage was slightly lower compared to the AVANSE farmers for all three seasons, and much lower for S1 2019.

Figure 9: Percentage of farmers who planted or did not plant rice during past three seasons



Although the winter (S1) is the primary rice growing season, highest numbers of plots were planted in the summer (S2) in 2018. The summer season is known to be less productive than the winter season. For many farmers, the inability to plant rice in the winter season 2018 prompted them to plant rice as soon as water became available. The percentages of plots planted in different communes varied greatly over the three seasons, as shown in figure 10. The details of the number of plots planted for the six communes and the 53 localities is presented in Appendix 5 a and b, respectively.

Figure 10: Percentage of rice plots planted in three seasons and for six communes



In both North Department communes, Milot and Plaine du Nord, farmers experienced difficult seasons in 2018 (only 20-30% of their plots planted), but they had almost 100 % of their plots under cultivation by the month of June in 2019. In Fort-Liberté and Ouanaminthe, farmers planted between 60-85% of their plots during the two 2018 seasons, but only about 30% of their plots in 2019. In Ferrier, which is highly dependent on rainfall, farmers struggled in the first 2018 season with only 20% of their plots planted. They tried to catch up in the second season, when they cropped almost 80% of their plots, only to be followed by the drought of 2019, which caused a complete crop failure.

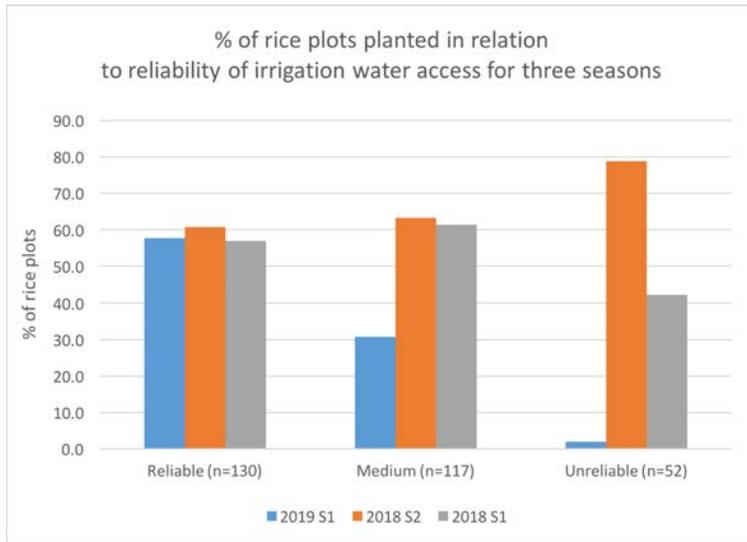
The situation in each different locality varied greatly, as presented in Appendix 5b.

- In only 11 localities (or 21%), farmers were able to plant rice during all three seasons.
- In 24 localities (45%), farmers planted rice for two seasons.
- In 16 localities (30%), farmers planted only in one out of three seasons,
- And in 2 localities (4%), farmers didn't plant rice at all during the past three seasons.

### ***Reliability of access to irrigation water***

With help from the AVANSE rice team, the 53 localities were ranked as having either i) fairly reliable irrigation water access, ii) medium access, or iii) unreliable access. The findings (Figure 11) show clearly that when irrigation water is more reliably available, farmers planted a similar percentage of plots during all three seasons, including the 2019 drought season. This was therefore independent of rainfall. On the other hand, where irrigation water access was unreliable, farmers were fully exposed to the erratic rainfall patterns.

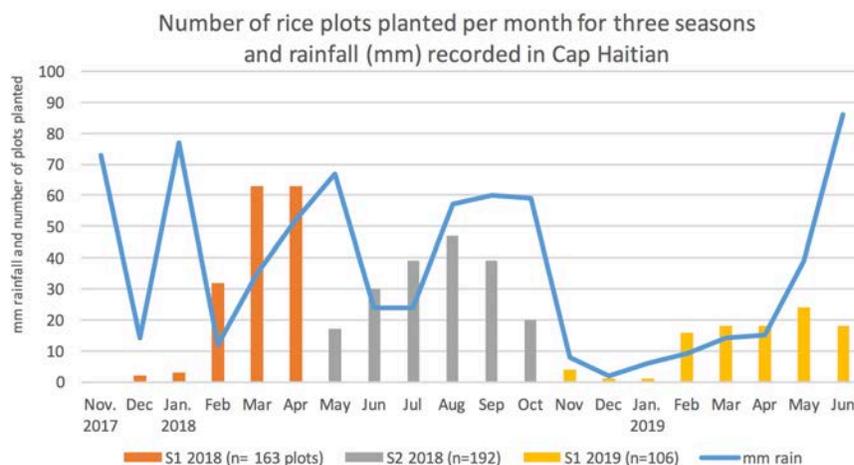
Figure 11: Percentage of rice plots planted in relation to reliability of irrigation water access for three seasons



### Timing of planting

Most plots are expected to be planted from January to March for the winter, or first season (S1) and from July to September for the summer, or second season (S2). This was confirmed for the first season in 2018, and to a lesser extent for the second season in 2018 where the planting stretched from May to October, with greatest numbers of plots planted in August (Figure 12). Due to the drought in 2019, only those few farmers with access to irrigation water were able to plant, starting in February and continuing to increase the number of plots in modest numbers until May. The regular cropping calendar could not be followed, especially when rainfall patterns changed. Farmers needed to adjust their activities according to weather patterns in addition to other constraints (more on this in Section 6).

Figure 12: Number of rice plots planted per month for three seasons and rainfall recorded in Cap Haitian

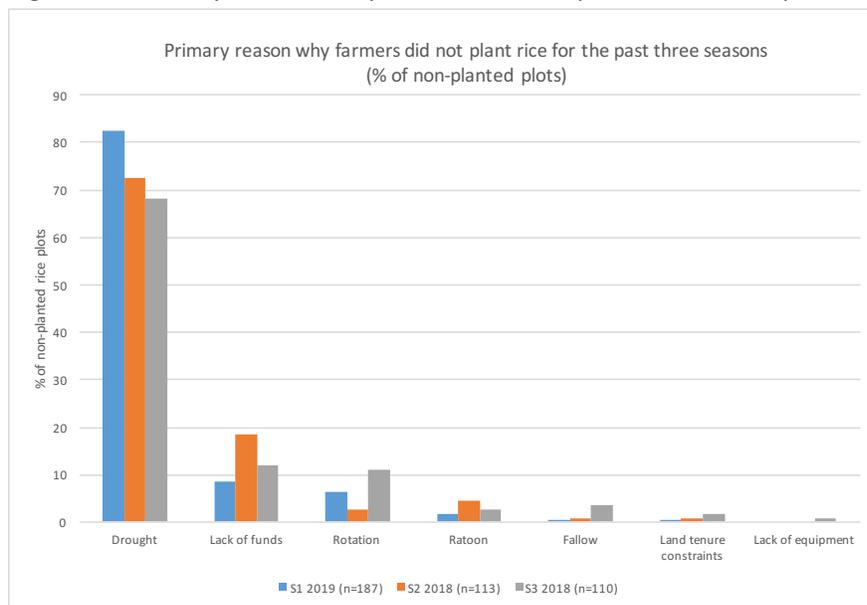


Rainfall information from <https://www.worldweatheronline.com/cap-haitien-weather-averages/nord/ht.aspx>

### Reasons for not planting

The main reason why farmers did not plant was overwhelmingly attributed to drought for all three seasons (68-82% of all non-planted plots), followed by the lack of funds (8-18%), and to a much lesser extent, reasons such as rotation with other crops, left fallow, land tenure constraints, or lack of equipment (Figure 13).

Figure 13: Primary reasons why farmers did not plant rice for the past three seasons



### 4.3. Impact of drought on rice farming households

During the focus group interviews, farmers were asked how the 2019 drought had impacted their life. Their responses (not quantified) were as follows:

Consequences on rice production, agriculture and livestock:

- Loss of rice nurseries in late 2018
- Loss and destruction of the rice crop
- Loss and destruction of other crops
- Entire cropping season failed
- Fodder shortage for livestock
- Death of livestock
- Selling of livestock
- Livestock becomes aggressive as they are hungry
- Lack of seeds as they were consumed
- Price of seeds went up
- Cutting down trees to make charcoal

Consequences on daily life and household economy:

- Had to buy rice to eat
- Living conditions became much harder
- Selling of livestock to pay for school fees
- Selling of livestock to pay for daily life expenditures
- Loss of savings
- Unable to pay the school fees for children

These substantial impacts, especially the loss of capital and savings, combined with stresses already suffered during previous seasons, makes it very difficult for farmers' economic situations not to weaken further unless future cropping seasons show significant improvement.

#### **4.4. Conclusions**

- Given that rice is the primary crop and the most important economic activity, it is surprising to note the percentage of plots planted over the past three seasons reached only 65%, 56% and 37% of all rice plots in S2, S1 2018 and S1 2019, respectively. This represents a substantial missed economic opportunity for these communities. The assumption that farmers plant all their plots twice a year was certainly not true for 2018 and 2019. It would be important to confirm the percentage of plots planted during previous years.
- The quality of the irrigation schemes determines whether farmers can produce rice on a secure and regular schedule (reliable irrigation water access), or if they are fully exposed to the impact of weather variability (unreliable irrigation water access).
- Most of the irrigation schemes in the Northern corridor depend on rainfall and are unreliable, unable to either bridge water deficits or evacuate excess water when necessary. The uncertainty makes rice production very risky.
- To increase resilience from current and future climate shocks, and to improve food security, assistance for construction of well-built irrigation perimeters can be a highly efficient first step.

## 5. CHANGES IN RICE PRODUCTION PRACTICES IN THE NORTHERN CORRIDOR

### 5.1. Introduction

AVANSE has disseminated the System of Rice Intensification (SRI) methodology in the North and Northeast Department, working for five years with farmers to implement practices associated with the SRI system. This chapter will look at following questions:

- What rice growing practices have farmers used during the past three seasons?
- How have rice production practices changed over time?
- Which SRI practices have been adopted or not adopted? What could be the reasons?

The four major rice production systems of the region were defined in Chapter 2, but for ease of reference, they are presented again in tables 14 and 15:

Table 14: Acronyms, French and English names of four production systems distinguished by AVANSE

Acronyms	French	English
<b>SRI</b>	Système de Riziculture Intensive	System of Rice Intensification
<b>SRA</b>	Système de Riziculture Améliorée	System of Improved Rice Production
<b>SRT</b>	Système de Riziculture Traditionnelle	System of Traditional Rice Production
<b>SD or DS</b>	Semis Direct	Direct Seeding

Table 15: Characteristics of the different rice production systems found in the north and northeast of Haiti, as used by AVANSE and in this study.

PRACTICES	SRI	SRA : between SRT et SRI	SRT	Direct Seeding
Direct Seeding	-	-	-	yes
Age of seedlings (days)	8-12 (to 14)	15-30	31-45 (to 60)	-
Number of plants/hill	1	2-5	6-15	-
Planted in Line or Random (L/R)	L	R or L	R	-
Spacing in cm x cm	25x25	20x20	15x15	-
Permanent Flooding (PF) or Alternate Wetting and Drying (AWD)	AWD	PF or AWD	PF	PF

**Structure of the query for this study:** To understand how rice production practices have changed since the AVANSE project became active, we divided the query into two distinct topics, discussed during individual interviews with 253 farmers during two separate visits:

- First visit: ask farmers what practices they used in each of the past three seasons on the plots they planted.

- Second visit: ask farmers what practices they used at the time they first started growing rice compared to the present.
- We purposefully did not ask about the difference in practices before the AVANSE project and the present for three reasons: i) to avoid any confusion about when the project started for the AVANSE farmers, and for control farmers to think about a fairly short timeline of 5 years, which represents AVANSE’s implementation period ii) to avoid bias from the possibility that AVANSE farmers would respond favorably towards what they might perceive to be the project’s goals, and iii) to make it easier for farmers to remember and allow for clearer details.
- Interviewed AVANSE farmers have been planting rice on average for 19.5 years, while this was 15.5 years for the Control farmers. In the data interpretation that follows, we adopt the general assumption that the practices BEFORE are more or less similar with the practices farmers used before the AVANSE project started. This is based on the following: i) recalling information might not be as accurate as direct observation, therefore using a longer time horizon can provide clearer distinction in practices, ii) AVANSE was the main rice production project in the region, and iii) the triangulation of different data and information was overlapping well.

## 5.2. Rice production practices in the Northern Corridor

### 5.2.1. Direct seeded rice system

The two main rice production systems in the project zone are direct seeding and transplanting. Under the direct seeding system, rice seed is broadcast at high density onto plowed and leveled fields. Management of the plots is minimal: plots are permanently flooded, and fertilizers, herbicides and pesticides applied as may be needed. Yields tend to be inferior to those of transplanted rice. Under the transplanting system, seedlings are raised in nurseries and then transplanted into the paddy field. As there are more stages in crop management, it requires more labor, but productivity is significantly higher. Most irrigated rice farming systems in Haiti and elsewhere in the world are transplanting systems.

In the study zone, direct seeded rice was planted on 8-13% of all plots for the three seasons, and transplanting was done on 87-92% of the plots. This was a fairly consistent ratio over the three seasons (see Table 16).

Table 16: Number of direct seeded plots for AVANSE and Control farmers and for three seasons

Number of plots	2019 S1 (N=89plots)			2018 S2 (N=158 plots)			2018 S1 (N=146 plots)		
	Transplanted	Direct Seeded	Total	Transplanted	Direct Seeded	Total	Transplanted	Direct Seeded	Total
AVANSE	74	9	83	111	17	128	120	9	129
CONTROL	5	1	6	27	3	30	14	3	17
Total	<b>79</b>	<b>10</b>	<b>89</b>	<b>138</b>	<b>20</b>	<b>158</b>	<b>134</b>	<b>12</b>	<b>146</b>
Percentage of plots									
AVANSE	89	11	100	87	13	100	93	7	100
CONTROL	83	17	100	90	10	100	82	18	100
Average	<b>89</b>	<b>11</b>	<b>100</b>	<b>87</b>	<b>13</b>	<b>100</b>	<b>92</b>	<b>8</b>	<b>100</b>

Direct seeding was practiced only in the communes of Ferrier and Ouanaminthe, and on two plots in Fort Liberté during S2 2018, but not in the other three communes of Milot, Plaine du Nord, and St Raphael.

- In Ouanaminthe, during both 2018 seasons, 20-25% of the plots (n=40) were direct seeded, which increased to 60% in 2019 (n=15).
- In Ferrier, with the drought of 2019, only one single plot was planted in the commune, and it was planted using direct seeding, while four out of four plots were direct seeded during the first season of 2018, and 11 out of 23 plots (or 48%) during the second season of 2018.

Looking back 15 to 20 years, 10% of all interviewed farmers (N=251) reported that they practiced direct seeding. These farmers were from the communes of Ferrier and Ouanaminthe. Interestingly, 10 out of the 34 farmers in Milot said they practiced both direct seeding and transplanting in earlier times. The practice of direct seeding has since stopped there.

Soil preparation practices for direct seeded rice are the same as those described below for transplanted rice. Herbicides and pesticides were used by 60-65% of farmers in earlier times, increasing to about 75% at present. Hand weeding was practiced by 97% of farmers in earlier times, and has not changed. Use of fertilizer is also similar to that of transplanted rice, except that urea is applied at a slightly higher rate today (226 kg/ha) than in the transplanted systems (203kg/ha, St Raphael site excluded). Farmers estimated that direct seeded rice yielded about 2.35 t/ha in earlier times, increasing to 3.41 t/ha today (n=42).

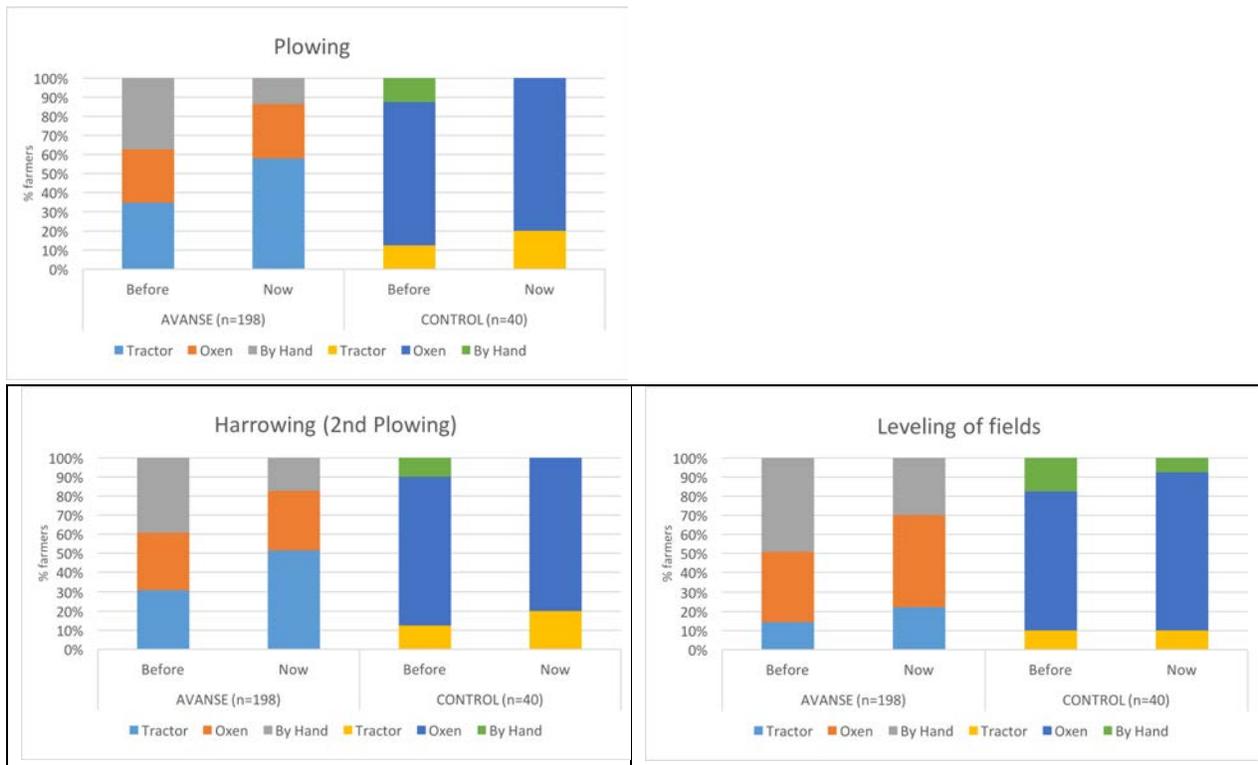
In summary, the data show a fairly consistent use of direct seeding over the past three seasons as well as over the longer time period of 15 years. Direct seeding is used in the communes that border the Dominican Republic, where this system is also a common practice.

### **5.2.2. Transplanted rice systems**

#### **F) Soil preparation**

Change in the methods of soil preparation (from 15-20 years ago to present) has been highly influenced by the increased availability tractors, which have often replaced hand tillage. Use of oxen has stayed fairly constant over time in all the communes whereas access to tractors varies considerably. For all farmers participating in the study (N=238), currently the first and second plowing is done 50% by tractors, 40% by oxen and 10% by hand. For leveling, the average is 55% by oxen, 25% by hand and 20% by tractors. (Figure 14)

Figure 14: Changes in soil preparation practices over the past 15 years for AVANSE and Control farmers



Changes in soil preparation practices over the past 15 years are explained below for the different communes, illustrated by the example of plowing operations (data for all three operations are reported in Appendix 6):

#### Northeast

- Tractor hire services from the Dominican Republic have altered the soil preparation operations in northeast Haiti.
- In Ferrier, high tractor use was already noted in earlier times at 75%, increasing to 79% at present, while hand tillage reduced from 4% to 0%. Oxen use remains constant at 21%.
- In Fort Liberté, plowing methods were evenly divided between use of tractor, oxen, and tillage by hand at about one-third each in the past. This has changed to 50% each of tractor and oxen use currently, and hand tillage has been abandoned.
- In Ouanaminthe, hand tillage and oxen were each used by 43% of farmers in earlier times, while tractor use was at 14%. Currently, tractor use has increased to 79% and oxen are used by 21% of farmers, while hand tillage has been eliminated.

#### North

- Plaine-du-Nord and Milot have no draft animals. There is an increase in the use of tractors from 10-26% earlier to 40-42% at present, with a corresponding decrease in hand tillage from 74-90%

earlier to 58-60% now. In Plaine-du-Nord, the often saturated and deep soils make it difficult to operate machinery. Hence, hand tillage still dominates in this zone at 60%.

#### Control Zone St Raphael

- In St Raphael, farmers are highly dependent on oxen, use of which has increased from 89% to 96%. Hand tillage, previously at 7%, is now reported at 0%. Tractor use remains the same at 4% for the interviewed farmers (n=28). Hand leveling is still done by 11 % of farmers, down from 14% earlier.

### G) Plant establishment

#### **Varieties**

Planted by 84-95% of farmers, the Jaragua variety has been clearly dominant in the zone during the past three seasons, followed by Odilon and TCS10, each one grown by less than 10% of farmers. A few other varieties were more rarely used. (Table 17)

Table 17: Rice varieties planted in the study zone during 3 seasons

Varieties	2019 S1	2018 S2	2018 S1
% farmers using varieties			
Jaragua	84	85	95
Odilon	7	2	1
TCS 10	6	9	3
Ti Leve	3	1	
Prosequisa		1	
Leonard		1	
Gouya		1	
Juma			1
Total %	100	100	100

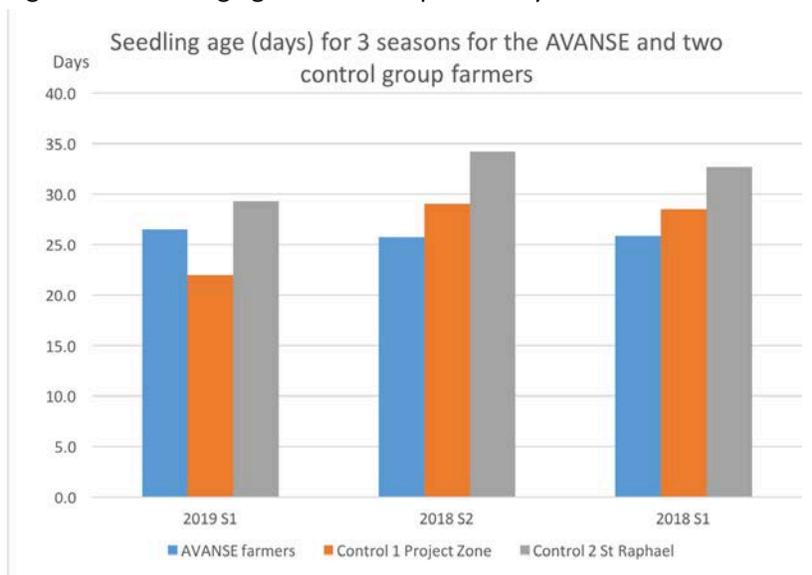
#### **Seed soaking**

Soaking seeds is a simple method to separate viable from non-viable seeds before sowing. It is a recommended practice under the SRI methodology. 88% of AVANSE farmers indicated that they were already soaking seeds before the project began. Today, 96% soak seeds before planting. For the control farmers, this practice has increased from 85% previously to 95% at present. This indicates that seed soaking is a long-standing practice used by most farmers in the zone, use of which has slightly increased over time.

### Age of seedlings when transplanted

To transplant young seedlings is a key practice under the SRI methodology. Seedlings are transplanted at the two-leaf stage, after 8-12 days in the nursery. This practice is combined with planting single seedlings/hill widely spaced. This allows the plants to tiller profusely, which contributes to the yield increases that the SRI system is known for. Traditionally, farmers in Northern Haiti transplant seedlings aged between 30-45 days, and even up to 60 days. The following figure (15) shows the average seedling age when transplanted by the AVANSE farmers, by the control farmers from the project zone, and by the control farmers from St. Raphael over all three seasons.

Figure 15: Seedling age when transplanted by the AVANSE and Control farmers



#### Number of farmers (n) interviewed

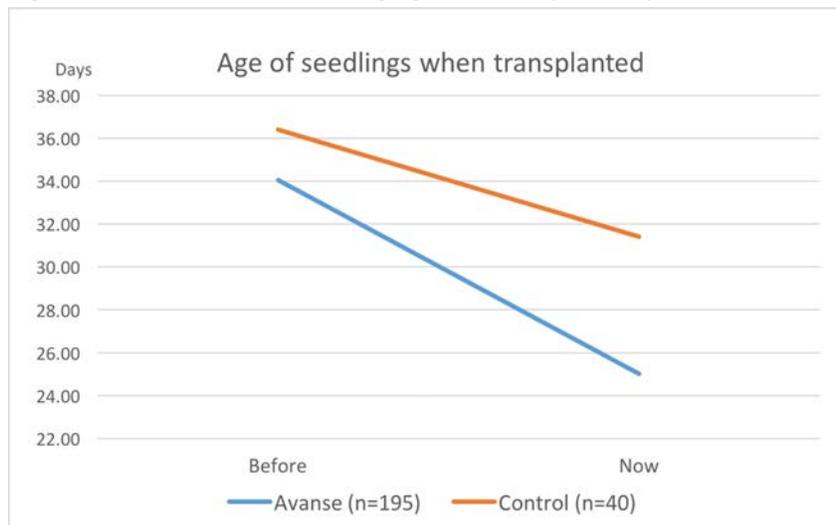
	2019 S1	2018 S2	2018 S1
<b>AVANSE farmers</b>	<b>76</b>	<b>116</b>	<b>120</b>
Control 1 Project Zone	3	6	10
Control 2 St Raphael	3	23	7

#### Observations:

- Three-season average seedling age reported by the AVANSE farmers was 26.0 days. This was lower than for the Control farmers in the project zone, at 30.1 days, and for the Control farmers from St Raphael, at 32.1 days.
- Seedlings were transplanted at a younger age in the control 1 zone than in St Raphael, which might be attributed to a spill-over effect from the AVANSE farmers.
- Over the three seasons, the average seedling age, especially for the AVANSE farmers, was very similar.
- The seedling age of 26 days as reported by the AVANSE farmers is considerably higher than the 8-12 days recommended under the SRI methodology.

For both the AVANSE and Control farmers, seedling age at transplanting was substantially lowered over time. The reduction was more pronounced for the AVANSE farmers, transitioning from 34 days to 25 days at present, while for the Control farmers, it went from 36.4 days to 31.4 days (Figure 16). These findings overlap well with the three-season results.

Figure 16: Reduction of seedling age over the past 15 years for AVANSE and Control farmers



In the environment of northern Haiti, there are several reasons why a farmer may prefer to plant 26-day old seedlings rather than 12-day old seedlings:

- The golden apple snail (*Pomacea* sp.) is an invasive and omnipresent pest in Northern Haiti. The snails eat young and emerging rice plants. The snails move in water, but become inactive and bury themselves deep into the mud in the absence of water. If transplanting younger seedlings and if unable to drain fields, farmers risk either losing all their young seedlings to apple snails (which can happen overnight after a rain shower), or have to apply highly toxic pesticides to control them. Although there is a limited time when seedlings are vulnerable -- two weeks after transplanting young SRI seedlings, the rice plants start to develop harder leaves that are not palatable to snails anymore, and they will feed on weeds instead -- the high risk of apple snail damage might be one of the main reasons why farmers prefer to plant older, less vulnerable seedlings.
- In many localities rice plots may be flooded: especially after heavy rainfall, during the hurricane season, and towards the end of the rainy season. Flood waters can rise rapidly. Given the inability to drain their plots, farmers with fields prone to flooding might be reluctant to plant young seedlings, in fear they may drown in a heavy rainstorm.
- Farmers commonly start their nurseries before they begin soil preparation. If soil preparation is delayed (which seems to happen often), the ideal SRI seedling age is quickly exceeded. The

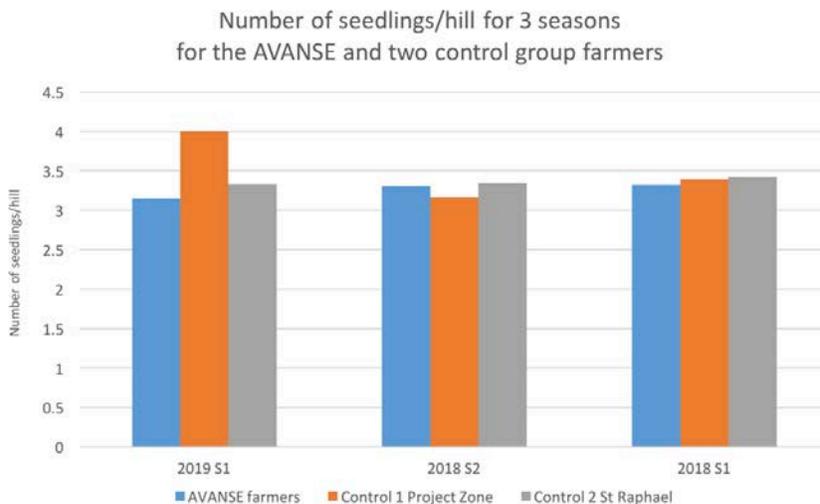
remedy would be to set up nurseries only when the last soil preparation operations are underway.

- Farmers have also indicated that they do not always have funds available to hire labor in time for transplanting, thus transplanting can be delayed.
- Farmers complain that they are not accustomed to handle small seedlings. Farmers in other countries have raised this objection as well, but experience has shown that they can quickly adapt and transplanting can go even faster. Younger people adjust more quickly. In Ghana, to cite one example, young farmers grouped together and offered a SRI transplanting service, which came to be known as the “SRI Transplanting Gang.” Could this be considered in Haiti?

### **Number of seedlings/hill**

Another important SRI practice is to plant only one single seedling per hill. This favors improved plant growth and is based on the principle of lowering the competition between plants. In combination with the practice of using young seedlings and wide spacing, the plants have ample space to tiller and to develop vigorously without being crowded by other plants. This stands in stark contrast to the traditional practice in Northern Haiti where between 7-10 or sometimes even 15 seedlings are planted in one hill. The average seedling numbers/hill planted during the past three seasons is presented in Figure 17 for the AVANSE farmers as well as for the Control farmers.

Figure 17: Number of seedlings/hill for the AVANSE and Control groups and for the three seasons

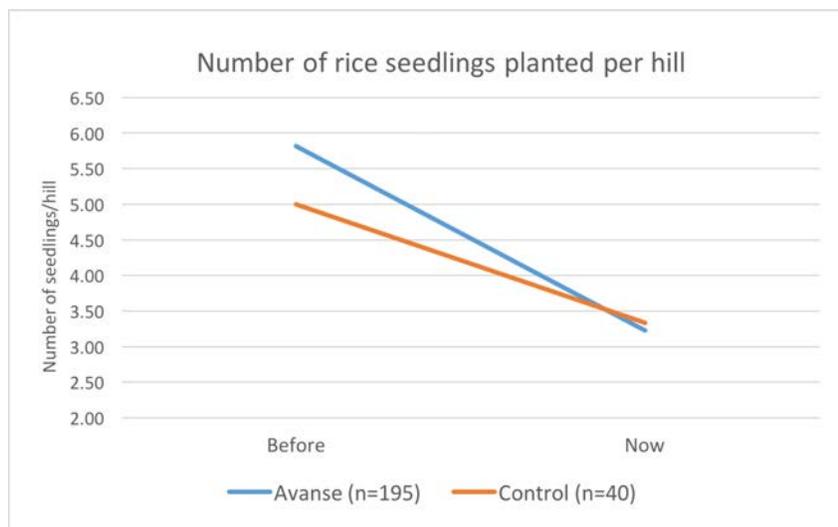


Number of farmers (n) interviewed			
	2019 S1	2018 S2	2018 S1
<b>AVANSE farmers</b>	<b>75</b>	<b>117</b>	<b>121</b>
Control 1 Project Zone	3	6	10
Control 2 St Raphael	3	23	8

Observations:

- AVANSE farmers planted on average over three seasons 3.26 seedlings/hill, which was slightly lower than for the Control 2 farmers with 3.37 seedlings/hill and the Control 1 farmers with 3.52 seedlings/hill.
- Although the number of farmers interviewed varies considerably for the different groups and seasons, the results are fairly similar for all three groups and the three seasons.
- For the longer-term comparison, farmers reported that the seedling numbers/hill were reduced by almost half: from 5-6 seedlings/hill before the project to 3.2-3.3 seedlings/hill at present. (Figure 18)
- These results coincide with the three-season results presented above (Figure 17).
- As with the parameter of transplanted seedling age, the average number of three seedlings/hill is higher than what is recommended under the SRI methodology.

Figure 18: Reduction in number rice seedlings/hill over the past 15 years for AVANSE and Control farmers



Among the reasons to not plant only one seedling/hill are:

- The golden apple snail pest: Farmers find it very risky to plant only one seedling/hill, because apple snails can destroy easily an entire field overnight. If farmers plant several seedlings per hill, the chance for at least one or two seedlings to survive in each hill is higher. If necessary, farmers can uproot seedlings from unscathed hills and fill in the missing seedlings destroyed by the apple snails in other hills. If they had planted only one seedling/hill, it would be necessary to retrieve more seedlings from the nursery to replace those lost, but by this time nursery seedlings might no longer be available.

- In case of flooding or drought, farmers believe the plants have a greater chance of survival if planted at several seedlings/hill. This should be further investigated, as it has been reported from many countries that single and young seedlings establish deeper and stronger roots and are therefore better equipped to withstand drought or flooding conditions.
- Farmers also explain that they are not accustomed to transplant single seedlings, which slows down the transplanting process and therefore increases its cost.
- Finally, it might be the case that the quality of the nursery bed is not conducive to single seedling transplanting. SRI nurseries are non-densely seeded in a well-structured soil. Plants are well separated from each other and can be easily peeled off the nursery mat during the transplanting process. In contrast, if farmers use the more traditional nursery preparation methods of dense seeding on clayey soils, the seedling roots will be entangled with each other in the clayey soil, making it difficult to separate single seedlings for transplanting. These are simple techniques, but if not followed, the transplanting process can indeed become cumbersome.

### ***Plant spacing and line planting***

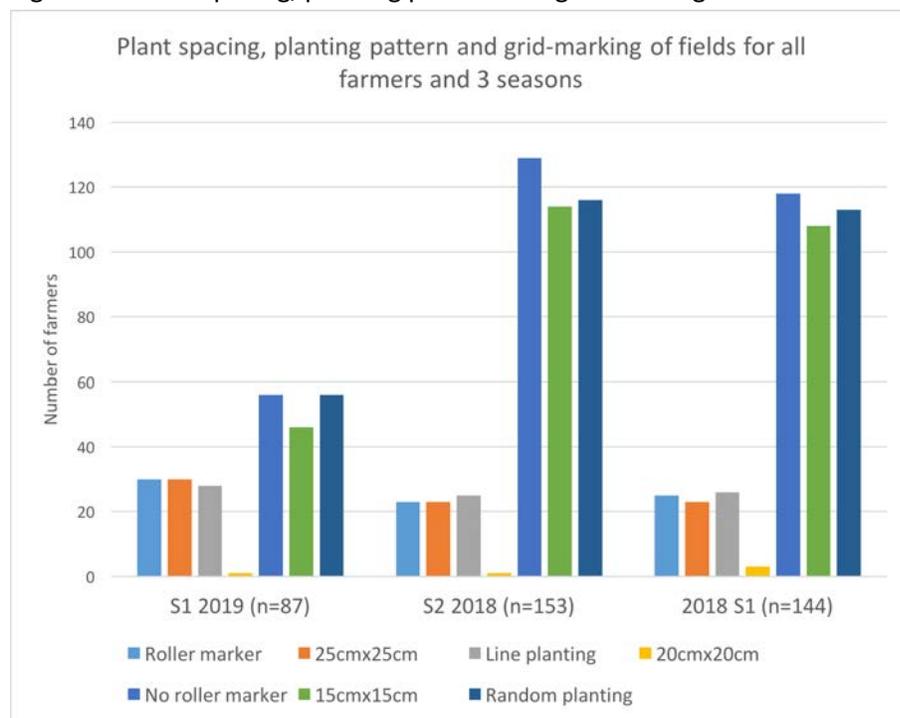
Increased spacing between plants is another SRI practice and goes hand in hand with the reduced plant density and the younger plants (discussed above), allowing the plants to tiller and grow vigorously without experiencing competition from other plants. Planting in lines allows for the use of the mechanical weeder. If planting is done in a grid pattern, the weeders can be used in horizontal and vertical directions, which can substantially reduce labor needed for hand weeding or eliminate the use of herbicides.

The AVANSE project distributed roller markers to the SRI farmer field schools to facilitate transplanting of the seedlings. The roller marker is the best marking tool available, as it marks a perfect grid of 25cmx25cm onto the mud. Transplanting is done at the intersections of the lines.

The following figure (19) integrates three parameters as reported by the farmers:

- i) Applied spacing between planting hills, at either 15cmx15cm, 20cmx20cm or 25cmx25cm,
- ii) Planting done either in line or at random (not in line)
- iii) Use or non-use of the roller marker to mark the fields before transplanting

Figure 19: Plant spacing, planting pattern and grid-marking of field for all farmers and three seasons



Observations:

- It is evident that when using the roller marker, farmers automatically planted at 25cmx25cm as well as in line.
- When the AVANSE farmers did not have access to the roller marker, they reverted back to their traditional spacing of 15cmx15cm and to random planting.
- All control farmers planted with a 15cmx15cm spacing and in random order, except for one farmer from Ouanaminthe, who was able to use a roller marker in S1 2019 and S1 2018.
- The spacing of 20cmx20cm was almost nonexistent.
- The 20-30 roller marker users were from the communes of Milot and Plaine-du-Nord, where 72% of the interviewed farmers said they used the roller marker<sup>1</sup> and from Ouanaminthe, where about 40% of the farmers used it <sup>2</sup>. Farmers in Ferrier and Ford-Liberté hardly used the roller markers at all (2 farmers in Ferrier and 1 farmer in Fort-Liberté used a roller marker for one season out of a total of 200 farmers for all three seasons).

These data show that the use of a 25cmx 25cm spacing and the line planting coincided with the use of roller marker. When AVANSE farmers did not have access to the roller marker, the spacing and planting arrangements were the same as for the control farmers. Without the roller marker, there was no adoption of line planting or a gradual increase in spacing.

<sup>1</sup> 28,10 and 8 farmers used a roller marker and 11, 3, 4 farmers did not use it in S1 2019, S2 2018, S1 2018, respectively

<sup>2</sup> 2,10 and 16 farmers used a roller marker, and 9, 15, 17 farmers did not use it in S1 2019, S2 2018, S1 2018, respectively

This raises a few questions:

- Did farmers not understand the advantages of larger spacing?
- Were the roller markers available in Ferrier and Fort Liberté? And if so, why would farmers not use them?
- Were farmers not aware of other marking strategies such as rakes, strings or bamboo markers? This would have allowed greater flexibility if a roller marker were not available. The different marking strategies are presented in the SRI manual prepared by the author for AVANSE.

Spacing is highly interconnected with age of seedlings and the number of seedlings/hill. As seedlings were transplanted at 26 days and at three seedlings/hill, contrary to single 8-12 day old seedlings as recommended with SRI, the spacing for optimal production is automatically reduced due to lower tillering capabilities of older plants and higher competition among plants. Nevertheless, it could be possible that a 20x20cm spacing would be more appropriate and ultimately lead to better productivity than a 15x15cm spacing. This could be discussed with farmers in future technical assessments and trainings. Additionally, it might be worthwhile to measure the actual spacing in the field, as the information for this study was based on recall only.

Another reason to maintain a closer spacing and random planting is weed growth (also discussed below), which is greater under intermittent irrigation and wider spacing. If efficient weeders are not available and used, farmers' concerns with the extra cost for hand weeding or herbicide might outweigh the prospect of improved production.

## **H) Crop management**

### ***Irrigation management***

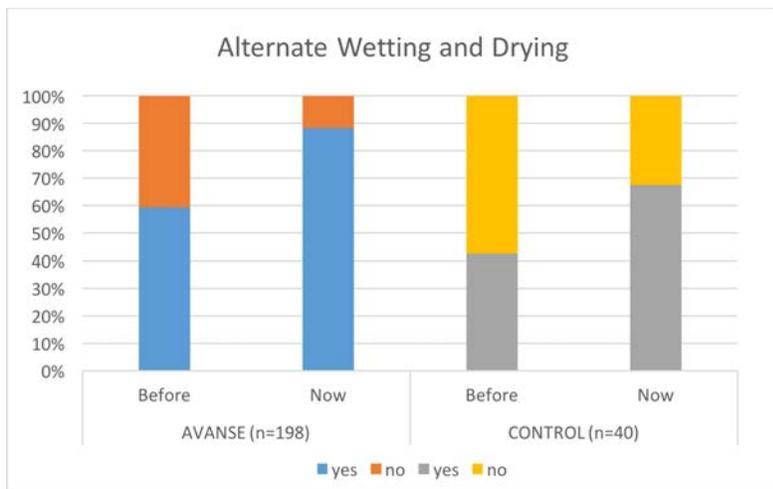
Good SRI water management provides the rice plants with just enough water needed for optimal plant development. There should be no permanent flooding and no drought stress. Using the Alternate Wetting and Drying irrigation method (AWD) during the vegetative phase of the rice crops i) creates an aerated soil environment that favors deep and abundant root growth, ii) favors tillering of the plants (which is suppressed under permanent flooding) while at the same time, iii) reduces irrigation water needs by 30-50%. AWD was one of the SRI practices included in the AVANSE FFS trainings.

The study results for this parameter were very consistent:

- 80-85% of the AVANSE farmers indicated over all three seasons that they did not permanently flood their fields, but used AWD.
- 70 to 100% of the control farmers in the project zone reported using intermittent irrigation (sample size was limited to only 3, 7, and 10 farmers for the three seasons)
- In St Raphael, 14%, 33%, and 65 % of the farmers irrigated intermittently in the three seasons.

When looking back in time, both groups increased the use of AWD, but for the AVANSE farmers the percentage using AWD is higher than for the control farmers (Figure 20).

Figure 20: The use of Alternate Wetting and Drying by AVANSE and Control farmers before the project and now



#### Observations:

- The higher percentage of AVANSE farmers using AWD compared to Control farmers is probably a result of the FFS SRI trainings, where farmers witnessed that rice grows better when not permanently flooded.
- Control farmers in the project zone seemed to have witnessed this from their fellow AVANSE farmers' plots, and use AWD more frequently now.
- In St Raphael, only a small number of the interviewed farmers have heard about SRI in the past couple years. It might be possible they witnessed the advantages of AWD and adopted it, but this is not certain.
- A decisive factor for not flooding the rice fields could be the unreliability of irrigation water availability, as discussed in Section 4. Even if farmers had planned to flood their fields permanently, their paddies might have dried out once or several times during the season due to water shortages. As this phenomenon is widespread, it could well explain the high number of farmers indicating that they follow the AWD watering regime.

It was not possible in this study to obtain a deeper understanding about farmers' opinions or decision-making about AWD. It would be interesting to study this question in more detail. But unless farmers have control over their irrigation water, the AWD practice becomes of secondary importance.

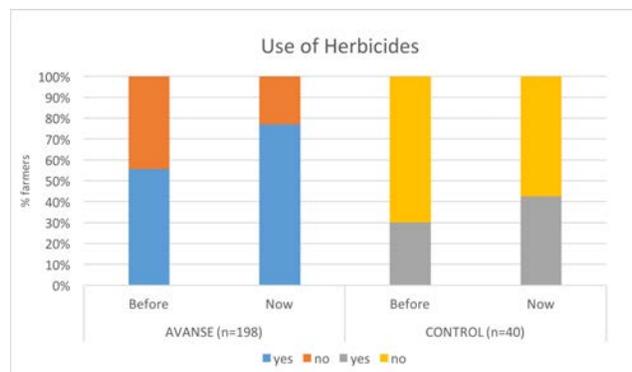
## Weed management

Weed growth becomes more prolific when farmers irrigate intermittently. The three methods for weed control are hand weeding, herbicide use, and the use of a mechanical weeder. The latter is recommended under the SRI methodology.

Hand weeding: 100% of farmers indicated they hand weeded their rice paddies before the project and still do it today.

Herbicide use: There is an increasing trend to use herbicides by both the AVANSE and the control farmers. The percentage of AVANSE farmers (n=196) and control farmers in the project zone (n=12) using herbicides is much higher at 77% and 100%, respectively, compared to the farmers in St Raphael (n=28) at 18% (Figure 21). Reasons for this recent increased herbicide use in the project zone could lie in i) higher availability of herbicides imported directly from the Dominican Republic, ii) increased number of input sellers, and iii) lack of efficient alternatives such as mechanical weeding.

Figure 21: Herbicide use by AVANSE and Control farmers



Mechanical weeder use: Only 4-6 farmers during each of the three seasons reported that they used a mechanical weeder, which represents 3% of the farmers for 2018 and 8% for 2019. The project had introduced a model of the Cono-weeder to their farmers, but the tool turned out to be a too heavy and often got stuck in the mud, which discouraged farmers from using it. A new weeder model, the Mandava weeder, is now available in Haiti. It has only one cone, is lighter, easier to use, and less expensive to make, and is also easier to use in heavy soils. It can be recommended to be widely distributed in Haiti.

Referring back to the discussion above on line planting and increased spacing, there is direct connection with the use of the mechanical weeders. Wider spacing, such as 25x25cm, in combination with AWD provokes more weed growth. Without an efficient weeder, a farmer must either hire labor for hand weeding or buy herbicides. Farmers might prefer to reduce the spacing in order to save on weed control costs. If the introduced weeder model were to be widely accepted and used by the farmers, the adoption of line planting and wider spacing would likely follow. In other words, the use of the roller

marker or any other marking method go hand in hand with the use of weeders. If efficient weeders were successfully introduced to the zone, both herbicide use and the burden of hand weeding could be reduced. Farmers would save on cost and labor, as well as benefiting from the reduced exposure of humans, animals and the environment to toxic chemicals.

### ***Pesticide use***

The percentage of AVANSE farmers using additional pesticides (as distinct from herbicides) is the same as for herbicides at 77%. For the control farmers in the project zone 92% indicate using pesticides, while for St Raphael it is 54%. In the project zone, pesticides are used mostly to control the apple snails (*Caracol* in Creole), a pest that has not yet reached St Raphael.

### ***Fertilization***

The SRI methodology supports the improved management of organic matter and its application to soil in order to improve soil structure, soil fertility and biological activity. This supports healthy and productive crop development and improves fertilizer use efficiency. Fertilizers are used as needed to complement the use of organic matter, which often allows farmers to reduce fertilizer amounts by half from the recommended dosage. In many countries, SRI projects encourage the application of animal manure and compost to soils. This was not integrated into the technical approach of the AVANSE project.

### ***Organic matter management and application***

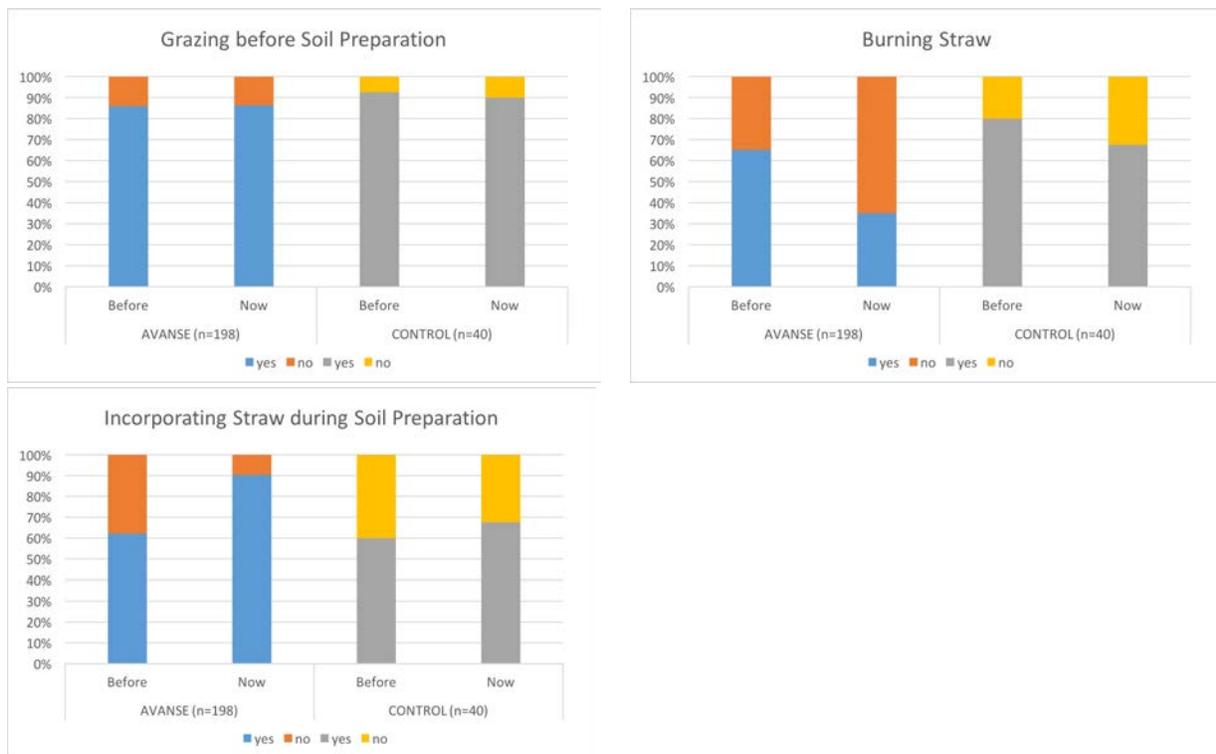
AVANSE encouraged farmers to continue with their traditional practices of organic matter management, such as i) letting cattle graze on straw stubble after harvest and deposit their manure directly on the field, ii) incorporate decomposing weeds - that were composted on the field bunds during the cropping season - into soil during the next soil preparation, iii) not to burn straw, but iv) incorporate straw into soil during plowing.

Looking into the change of practices from 15 years ago to present (Figures 22), the following can be noted:

- Cattle grazing on rice residues has long been a traditional method and has not changed in its importance, with 84% of AVANSE farmers and 90-93% of the Control farmers confirming that they practiced this method in earlier times as well as today.
- In earlier times, 65% of the AVANSE farmers burned rice straw, which has been reduced to 35% of the farmers. 80% Control farmers burned straw in earlier times, and 68% of them still do so today.
- Currently 90% of the AVANSE farmers incorporate rice straw during soil preparation, while only 68% of the Control farmers do so. In earlier times, this was 60-62% for both groups.

These findings indicate that AVANSE’s awareness raising and training reinforced the good practice of incorporating straw into soil instead of burning it. An additional plus: as combine harvesters become more common in the region, especially in the northeast, straw is cut and automatically ejected during harvest operations back onto the field, which is ideal. When harvested by hand, rice is threshed on location, but the straw needs to be spread back onto the field by hand.

Figure 22: Change in organic matter management strategies over time by AVANSE and Control farmers



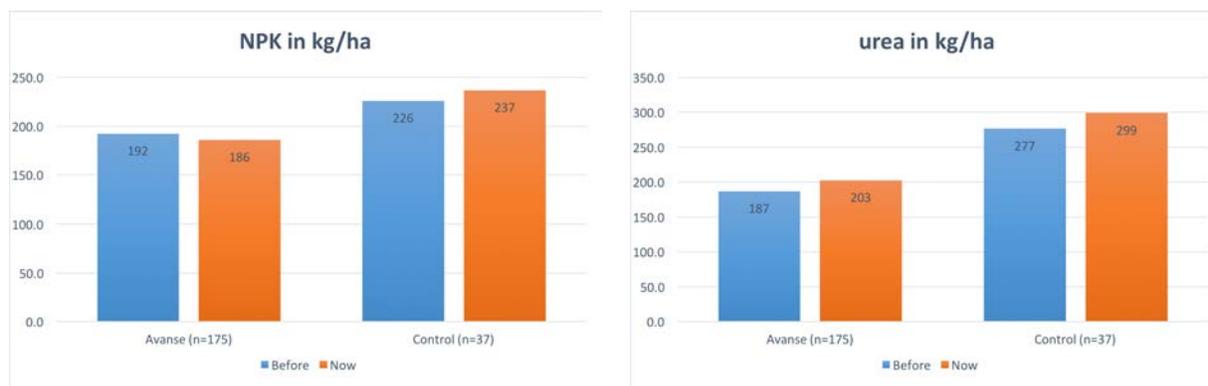
### ***Chemical fertilizer application***

Only 50% of the AVANSE farmers used fertilizer (Urea and NPK) in earlier times, which has increased to 70% at present, whereas 90% of the control farmers use chemical fertilizer today, up from 72% in earlier times. The lower percentage for the AVANSE farmers is influenced by the commune of Milot, where most farmers avoid the use of chemical inputs.

Regarding the amount of fertilizer applied, the AVANSE farmers have only slightly increased the application rate for urea and slightly reduced it for NPK over time. Today, the Control farmers use 47% more Urea and 27% more NPK compared to the AVANSE farmers. (Figure 23)

Especially in St Raphael, the production system is marked by an increase in fertilizer use. Some farmers complained during the focus group interviews about their soils becoming “hot” (which indicates a decline in soil organic matter) due to overuse of fertilizer.

Figure 23: Fertilizer application rate by AVANSE and Control farmers



Access to fertilizers increased during the AVANSE project and the results indicate that clearly more farmers use fertilizers than prior to the project. The results also show that AVANSE farmers were able to better manage their fertilizers. It is likely that improved organic matter management and better timing of fertilizer application contributed to higher fertilizer use efficiency. This means that the same results can be obtained with less fertilizer, which lessens farmers' expenditures. These results are in line with technical advice provided by the AVANSE rice team.

### 1) Ratoon crop

Ratooning is a traditional practice in Haiti that allows farmers to harvest twice from the same rice crop. After the harvest, rice plants often re-sprout from their stubbles. In Haiti, farmers take advantage of this by continuing to irrigate the plot and apply fertilizer. A second rice harvest is ready within 60 days. The advantage is that farmers can obtain a second harvest without the costs for seed, soil preparation, nursery and transplanting. As the first growing season is slightly longer in the project zone, farmers prefer to ratoon their rice after the first season. They do it less often during the second season, as it is shorter and slightly cooler, thus less conducive to ratooning.

Results from our study indicate that during the longer winter season S1 2018, 24 plots were ratooned of the 166 plots planted (or 14.5%). Harvest for the ratoon crop stretched from July to November 2018 with most harvests taking place in October 2018. Average yield was 2.52 t/ha. In the shorter summer season S2 2018, 3 farmers (or 1.5 %) chose to ratoon their crop. They harvested in December and February with an average yield of 3.18 t/ha. Farmers reported that after direct seeding, their ratoon crop yielded 1.75 t/ha to 2.46t/ha. They also indicated that it is possible to reach almost the same yield with the ratoon crop as the regular season crop, especially with SRI, because the plants re-sprout better due to the thicker and stronger stems.

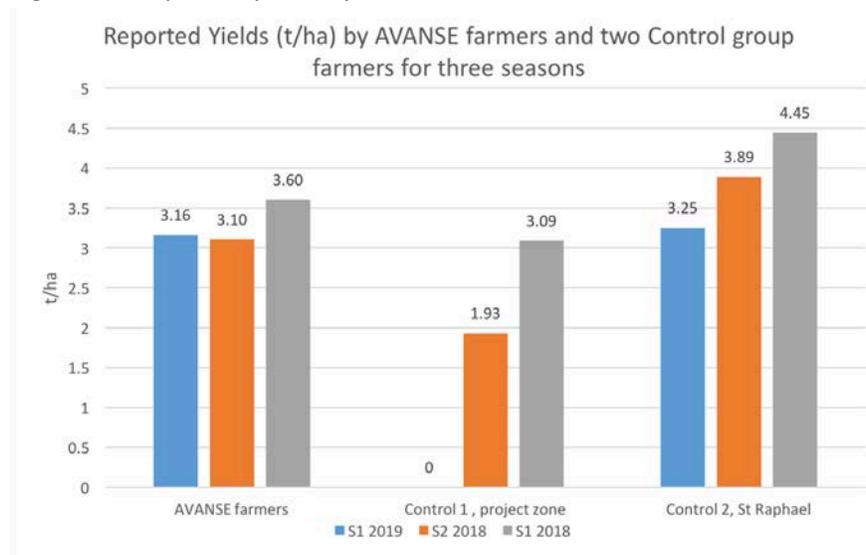
Comparing how this practice has evolved over time, 20 % of the interviewed farmers indicated that they ratooned their crops in earlier times, but this has declined to only 5-10% today. Some farmers reported that the new varieties do not regrow well, although the Jaragua variety seems to do well with ratooning.

The most important reason for decline in ratooning is the variable rainfall pattern, thus farmers can no longer adhere to the traditional cropping calendars. Farmers often plant late and there is not sufficient time between the seasons to grow a ratoon crop. This is a real drawback, as ratooning allows farmers to recoup some of the crop production costs with an additional harvest.

## J) Paddy Yields

Paddy yields could not be directly measured in the field for this study. The following numbers are estimates as they were recalled by farmers. The estimates were provided in local measurement units and converted to t/ha. The following two figures 24 and 25 depict the results:

Figure 24: Reported yields by AVANSE farmers and Control farmers for three seasons

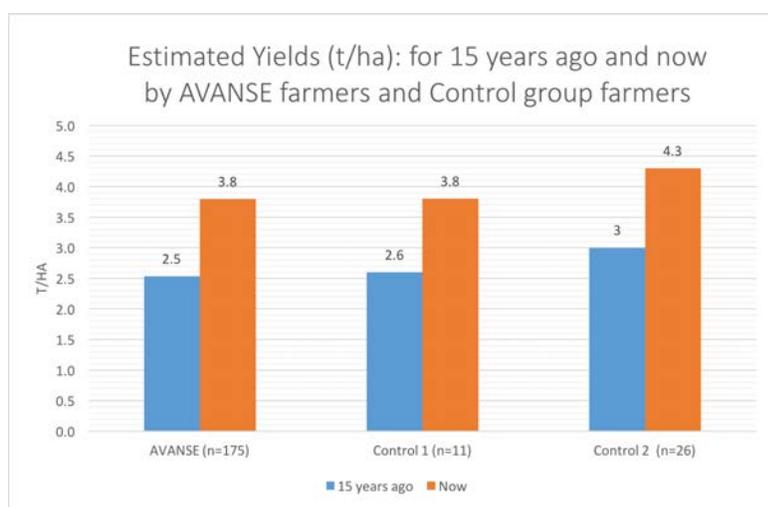


Number of farmers (n) interviewed			
	S1 2019	S2 2018	S1 2018
AVANSE farmers	74	111	120
Control 1 Project Zone	4	4	7
Control 2 St Raphael	3	23	7

Figure 24 shows that S1 2018 produced the highest yields for all three farmer groups. Yields for AVANSE farmers were slightly better than for control farmers from the project zone (although the number of farmers for the control group is very small). Farmers in St Raphael reported consistently higher yields than the farmers in the project zone.

Comparing yields from 15 years ago and today, the estimated yields for AVANSE farmers and Control farmers in the project zone were almost the same, with a yield increase of 50% from earlier to present. The farmers in St Raphael reported higher overall yields, with a yield increase of 43% from before to present. (Figure 25)

Figure 25: Estimated rice paddy yields for AVANSE and Control farmers



Some observations:

- Overall, AVANSE farmers and Control farmers from the project zone reported the same yields.
- It seems that overall productivity in St Raphael was higher than in the project zone. This could be either due to environmental factors, better water availability, higher fertilizer use, or a difference in calculating yields, which cannot be excluded.
- Yields for direct seeded rice were reported above in this section.
- It is difficult to interpret these data with high confidence without additional information and confirmation. Ideally, yields should have been measured directly in the field, which was unfortunately not possible for this study.

## 6. ADOPTION OF THE FOUR RICE PRODUCTION SYSTEMS, INCLUDING SRI

### 6.1. Farmers' knowledge of SRI

#### *What is SRI?*

This question was asked of all AVANSE farmers and the one-third of Control farmers who knew about SRI. It was an open-ended question with no guidelines how many practices should be listed. The results are shown in Table 18.

Table 18: SRI Practices as enumerated by AVANSE and Control farmers

SRI Parameter	% AVANSE Farmers (n=190)	% Control farmers who know of SRI (n=16)
Young plants	64.2	62.5
1 plant/hill	16.8	25
Spacing 25x25	9.5	12.5
Line planting	4.2	0
Alternate Wetting and Drying	3.7	6.25

For both the AVANSE and Control farmers, transplanting young plants was most often cited, by over 60% of the farmers. This was followed by transplanting only one plant/hill and maintaining an increased plant spacing. Intermittent irrigation (or AWD) was only rarely mentioned.

The same question was asked during the focus group interviews in the 11 localities where farmers knew about SRI (it included one of two localities in St Raphael). The farmer groups listed what they knew:

- In all 11 locations: planting one seedling/hill and AWD
- In 10 locations: 25cmx25xm planting
- In seven locations: transplanting young seedlings
- In six locations: line planting and raised-bed nursery
- In fewer than five locations: seed soaking, use of roller marker, good soil preparation and field leveling, and incorporating straw during plowing.

During the focus group discussions, farmers gave detailed descriptions of the SRI practices and explained how they differentiate from the traditional ones. They elaborated how the change in practices affects plant growth and grain productivity. This suggests that AVANSE farmers and a third of the Control farmers share a good understanding of the SRI practices and their implementation. In St Raphael, some farmers were trained in SRI by the IF Foundation two years ago. There are a few SRI plots in the zone. The trained farmers indicated that they are confident in their ability to implement SRI. They said it would be easy for them to use the roller marker and to do AWD, but more difficult to transplant young seedlings, and apply compost or manure to their plots.

### Can you implement all SRI practices?

In a follow-up question, farmers were asked if they were technically able to implement all five core practices as disseminated by AVANSE: i) transplanting single seedlings/hill ii) at the age of 8-12 days, iii) planting with increased spacing and iv) in line, and v) practicing intermittent irrigation (or AWD).

Of all AVANSE farmers, 90% claimed that they have the technical know-how to implement all the SRI practices while only 10% did not. For those Control farmers who knew about SRI, 53% said they could implement all the SRI practices, while 47% indicated they could not. The high confidence of the AVANSE farmers could be attributed to the Farmer Field School approach, where farmers implemented a SRI plot for themselves during at least one season, and where they could observe the SRI fields of fellow farmers within their irrigation perimeter over multiple years. The Control farmers were less confident. They might have witnessed the performance of SRI rice fields, but they might not have implemented an SRI plot themselves.

### 6.2. Farmers' assessments of the performance of the different systems

To test their understanding about SRI further, farmers were asked to rank the four rice production systems: System of Rice Intensification (SRI), Improved systems (SRA), Traditional System (SRT) and Direct Seeding (SD) (system differences are explained in Table 6 in Chapter 2) for the following parameters: yield and economic benefits, system in need of the least water, system most resilient to drought, to strong winds and to floods. The four latter parameters respond to environmental constraints of the project zone. The responses are presented in Figure 26 below, based on answers from 182 AVANSE farmers and for 15 control farmers, 7 of whom knew of SRI and practice it sometimes. Farmers were not asked to commit to an answer if they did not have an opinion.

Figure 26: Farmers' assessment of four rice production systems, for a) yields, b) economic benefits, c) needs less water, d) drought resilience, e) strong wind resilience, and f) flood resilience (all figures y-axis: % farmers' response; AVANSE farmers n=182, Control farmers n=15 of which 7 knew of SRI)

a)

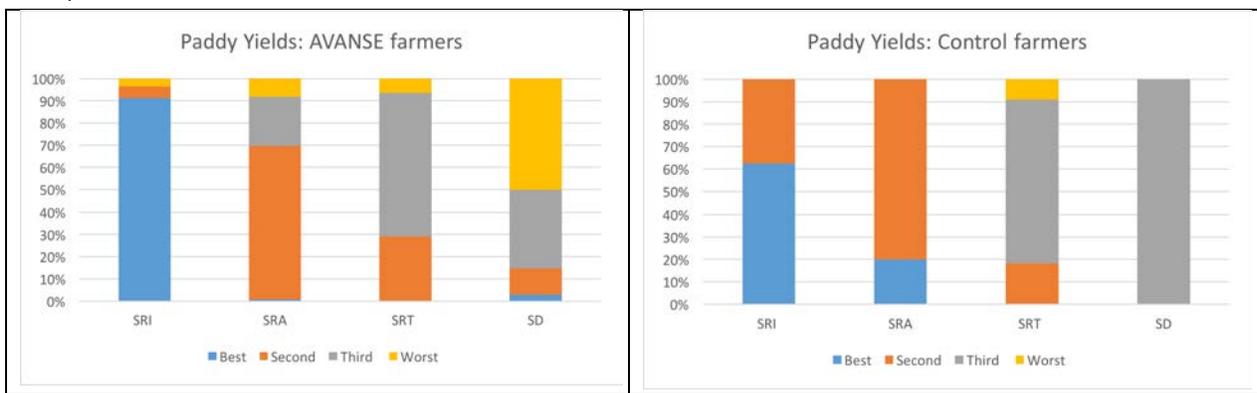
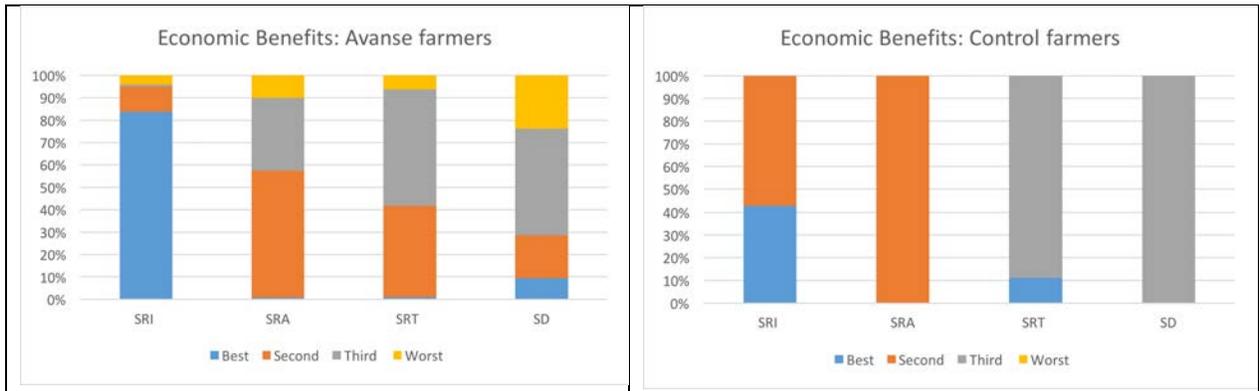
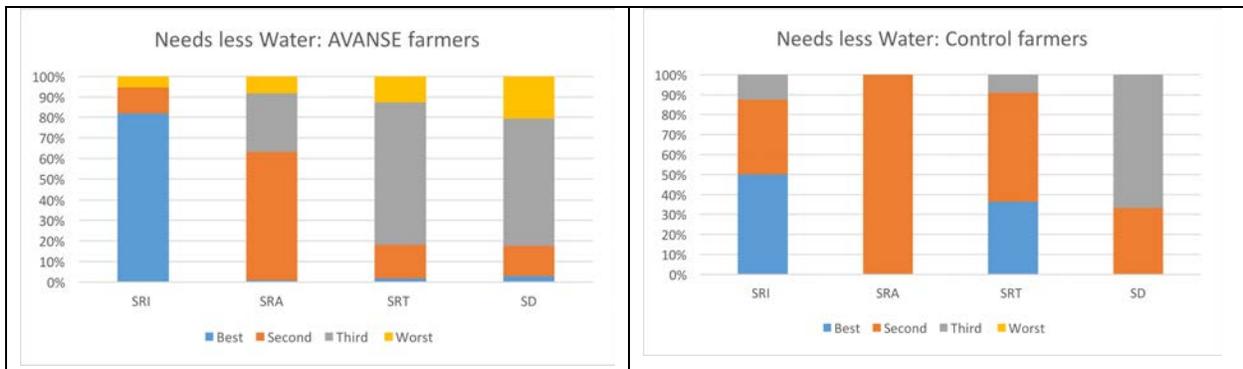


Figure 26: continued

b)



c)



d)



e)

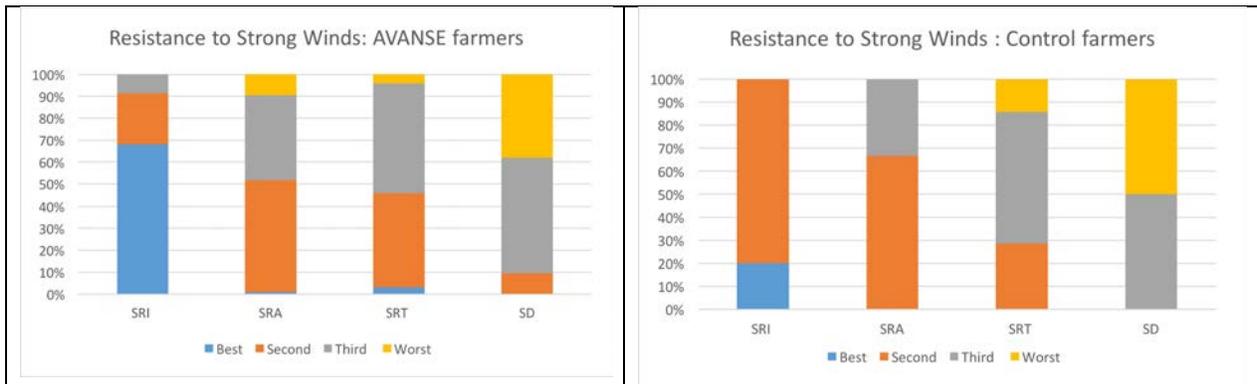
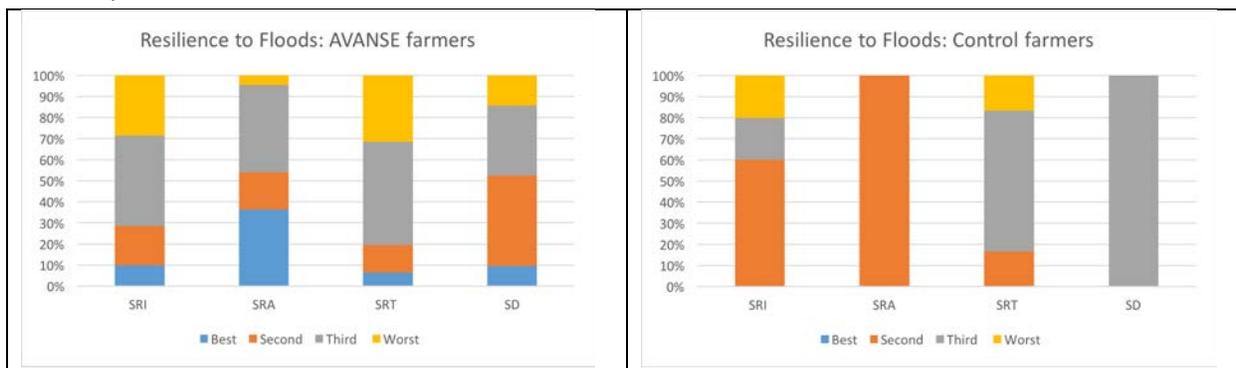


Figure 26: continued

f)



Observations:

- More than 90% of AVANSE farmers seemed convinced that the SRI system produces the best yields, and more than 80% that SRI produces the highest economic benefits. Farmers were also almost unanimously convinced that the SRI system uses the least water, and best resists drought and strong winds. In regards to flooding, the SRA system was the most resilient followed by SD, SRI, and SRT.
- Interestingly, the SD system, as being the most extensive system, was ranked by a few AVANSE farmers being most productive and reaping the best economic benefits. Some reasons are explained further below.
- For the control farmers, who knew about SRI, the SRI system also performed best for yields, economic benefits and savings on water consumption, and performing well in droughts and strong winds. For farmers not knowing about SRI, the SRT system was the preferred system in comparison to SD.

In summary: farmers in the project zone know the SRI system well. They recognize almost universally that the SRI system is associated with the best yields, economic benefits and resilience towards environmental threats. Now let’s have a look at which systems they adopt.

**6.3. Adoption of the four rice production systems**

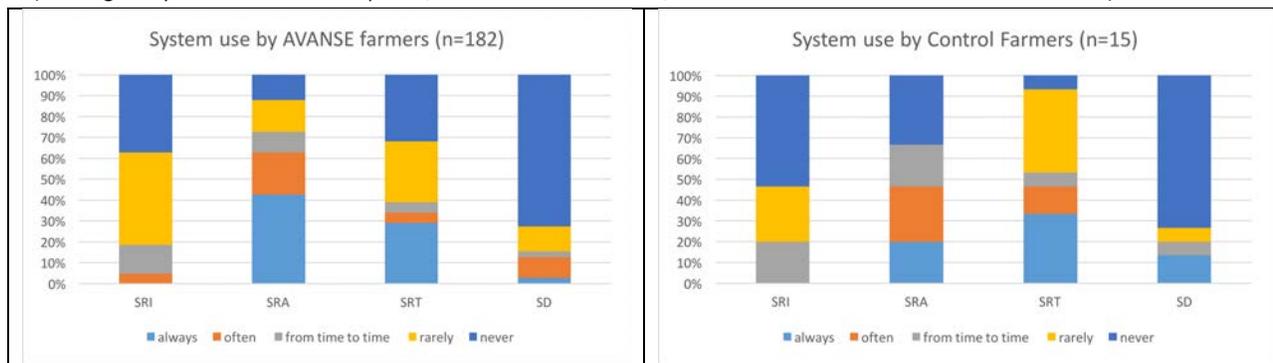
Following the inventory of practices actually used (Section 5) and the assessment of knowledge on SRI, the adoption of SRI practices was discussed in the context of the four rice production systems SRI, SRA, SRT and SD.

***Which system are you using?***

As the use of the four systems is not exclusive from each other and farmers might change the use of systems depending on circumstances in different seasons, the following figure (27) shows how often farmers use the four systems.

Figure 27: Rice production system use by AVANSE farmers and Control farmers

(both figures y-axis: % farmers' response; AVANSE farmers n=182, Control farmers n=15 of which 7 knew of SRI)



Observations:

- None of the AVANSE farmers practice SRI every season. About 20% farmers use it often or from time to time, about 45% rarely, and 35% never.
- AVANSE farmers' preferred system is SRA: 45% of them always practice it, about 20% often, and only 12% said they never use it.
- SRT is the second most used system, practiced by about 30% of AVANSE farmers all the time. More than 30% of farmer never use it anymore. Only 2% use Direct Seeding all the time and an additional 10% often.
- For the Control farmers, SRT is the most important system, followed by SRA. Almost 50% of farmers use either SRT or SRA every season or often.

These results confirm that farmers have considerable difficulty to adopt the SRI system in its entirety. The new system of SRA is a partial adoption of the SRI system. SRA practices are positioned between the recommended SRI practices and the traditionally implemented SRT practices. As such, farmers have developed an improved rice production system based on the principles of the SRI system that can respond to their constraints. Interesting to note is that SRA is often used by about 50% of the Control farmers, indicating that SRI in the Northern Corridor has disseminated beyond those who learned it directly from the project.

A summary of farmers' assessments of advantages and disadvantages of the four systems is presented in the table 19.

Table 19: Farmer assessment of advantages and disadvantages of the four rice production systems

FARMER CITED ADVANTAGES	FARMER CITED DISADVANTAGES
<p>SRI</p> <ul style="list-style-type: none"> <li>• Gives best yield</li> <li>• Very good seed savings</li> <li>• Produces most tillers (40-60/plant)</li> <li>• Produces heaviest, fullest panicles</li> <li>• Produces most viable seed</li> <li>• Ratoon crop produces very well</li> </ul>	<p>SRI</p> <ul style="list-style-type: none"> <li>• Needs to be well planned and timing of operations must be followed carefully</li> <li>• Weed control more difficult</li> <li>• Production costs are higher</li> <li>• Needs more labor and more care</li> </ul>

Table 19: continued

FARMER CITED ADVANTAGES	FARMER CITED DISADVANTAGES
SRA	SRA
<ul style="list-style-type: none"> <li>• Obtains good yields</li> <li>• Some seed saving</li> <li>• Good tillering</li> <li>• If lack of labor or funding, it is simpler and needs less maintenance than SRI (e.g. faster transplanting)</li> <li>• 2-4 plants/hill and older plants have higher chance to survive apple snail attack than a young single plant/hill</li> <li>• with slightly older plants than with SRI it gives a bit more flexibility in the transplanting and planning process</li> </ul>	<ul style="list-style-type: none"> <li>• Cost of production is somewhat higher than with SRT, but lower than with SRI (includes especially labor for crop management)</li> <li>• Has more weeds than SRT</li> </ul>
SRT	SRT
<ul style="list-style-type: none"> <li>• Production costs are lower compared to SRA, SRI,</li> <li>• Less weeding needed (fewer weeds due to permanent flooding and close spacing)</li> <li>• Less fertilizer is used</li> <li>• If plots are flooded before transplanting: older and taller plants can be planted into standing water closely spaced. They are not palatable to apple snails anymore.</li> <li>• If faced with financial constraints, if water control is not possible and if plans for the cropping season get interrupted, SRT can still produce at least something</li> </ul>	<ul style="list-style-type: none"> <li>• Uses more seeds than with SRI and SRA</li> <li>• Is difficult to weed (because of random planting and close spacing)</li> <li>• Plants tiller weakly</li> <li>• Grain filling is irregular and not satisfactory</li> <li>• Yields are low</li> </ul>
SD	SD
<ul style="list-style-type: none"> <li>• Reduced production costs</li> <li>• Does not require much maintenance nor management</li> <li>• Requires little labor</li> <li>• Saves time</li> </ul>	<ul style="list-style-type: none"> <li>• Uses much more seed than the other systems</li> <li>• Is difficult to weed</li> <li>• High risk of crop failure during crop establishment</li> <li>• Has the lowest yields</li> </ul>

#### 6.4. Favorable and unfavorable conditions for SRI adoption

Based on the difficulty of adopting the SRI system in its entirety, the farmers were asked what conditions would allow them to adopt SRI, and what conditions prevent them from adopting SRI. The answers are presented in the following figures 28 and 29.

Figure 28: Conditions that allow farmers to implement SRI

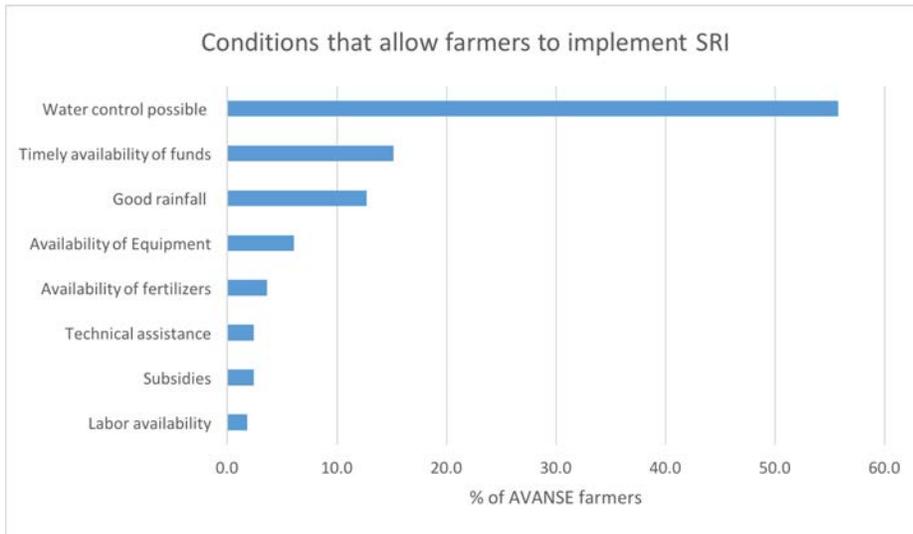
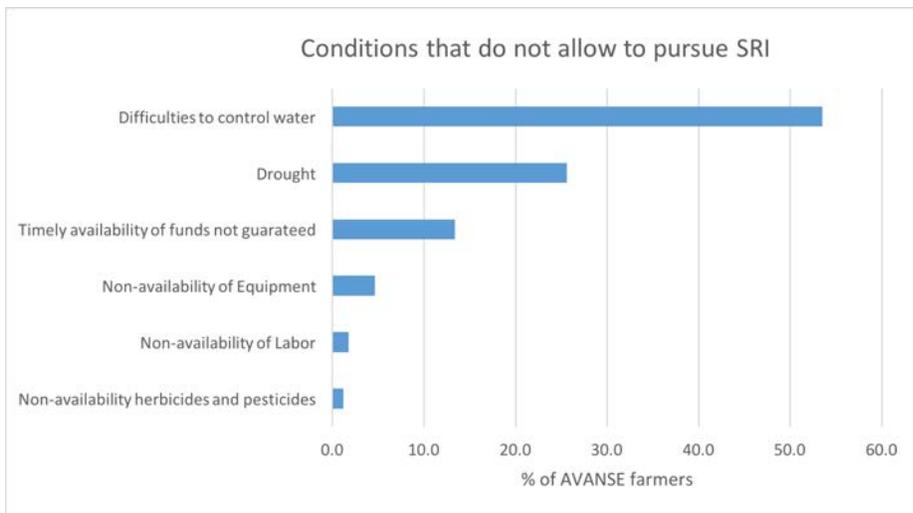


Figure 29: Conditions that do not allow farmers to adopt SRI



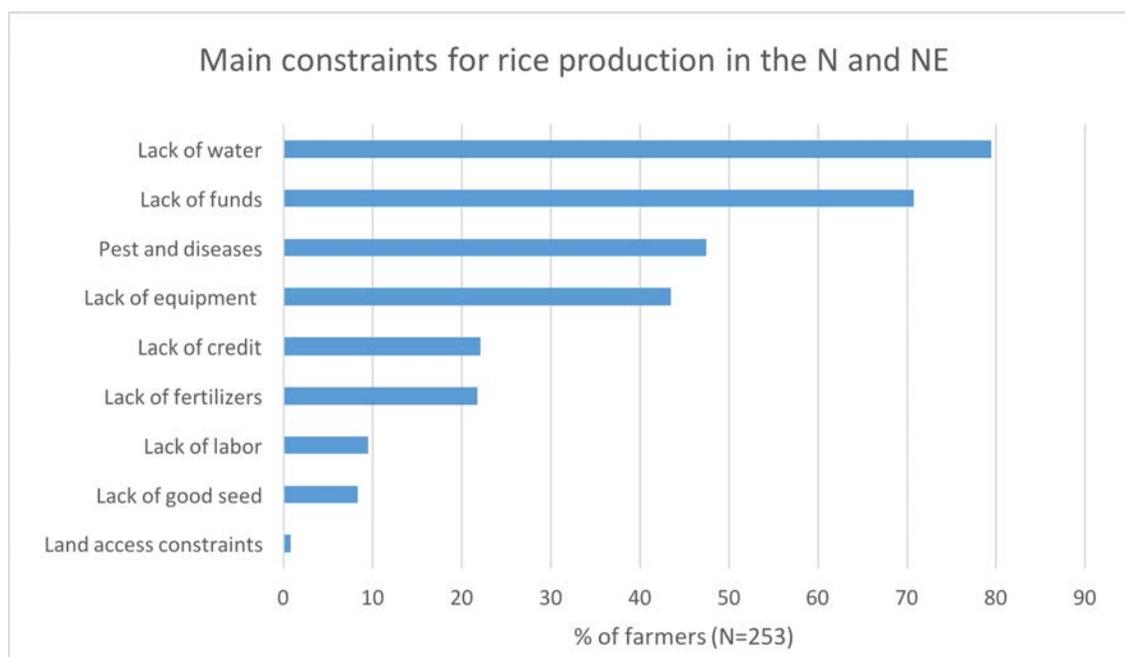
Observations:

- The two figures mirror each other fairly well, identifying the constraints that hinder farmers in adopting the SRI system and if lifted would allow them to adopt the SRI system.
- The three main constraints were clearly: i) the inability to control water, which includes the two parameters drought and rainfall, ii) the uncertain availability of funds when needed, and iii) the lack of equipment availability.

Interestingly, these constraints for SRI adoption are the same as the ones farmers identified as being the most important constraints for rice production in the Northern Corridor.

Farmers were asked about the most important constraints for rice production during the first visit of the interviews, while SRI adoption was discussed during the second visit. In the first visit, farmers were asked to identify the three most important constraints they face for rice production. The results are shown in the following figure 30.

Figure 30: Main constraints for rice production in the N and NE of Haiti as identified by farmers



Observations:

- The two main constraints identified by the farmers were problems associated with water availability and availability of funds (including access to credit), noted by more than 70% of farmers. Pest and diseases pressure and lack of equipment were also cited by almost 50% of farmers.
- Notably, neither input access nor labor access were highly ranked as a problem under either rice production constraints or under SRI implementation constraints. Inputs as well as labor can be accessed if funds are available.
- Timeliness of funding availability, timeliness of operations and following the cropping calendar are additional criteria that influence which system farmers choose to adopt and how successful their season will be.

To illustrate this in more detail, some events and decision-making pathways are outlined below to demonstrate the effects of lack of funding and water availability. It shows how farmers often have little choice as to what rice production practices they can use given the overwhelming constraints.

## **CONSTRAINT: Lack of funds**

Rice farmers need funds to:

- To hire tractor services for soil preparation
- To hire labor for transplanting and weeding
- To buy inputs, such as seeds, fertilizers and pesticides

### **If funding is not available when needed**

- **Farmers do not plant their fields**
- **Soil preparation is delayed**
  - Rainy season advances, late planting
    - Farmer might switch to direct seeding (DS) to gain time
    - Ratoon crop is no longer possible
    - As rainy season is well underway, risk of flooding is increased
      - If plots are flooded before transplanting, farmers revert to SRT
    - As rainy season is well underway, end of the cropping cycle might coincide with dry season
      - if rains stop early, rice crop might not mature well
  - Seedlings in nurseries are getting too old
    - SRI is no longer possible; farmers will do SRA or SRT
- **Hiring labor is delayed or not possible**
  - Transplanting is delayed and seedlings get older
    - SRI is no longer possible; farmers will do SRA or SRT
    - Without labor, farmer might revert to SD
  - Weeding cannot be assured properly or at all
    - Seedlings might be transplanted in close spacing to reduce weed pressure
    - Fields might be permanently flooded
    - Herbicides are used
    - Farmers might revert to DS to eliminate the need of weeding.
- **Seeds and fertilizers are not purchased in time**
  - Delay in seed purchasing
    - Delay in cropping season, with higher probability of exposure to drought and floods
  - Delayed fertilizer application
    - Fertilizer use efficiency is reduced

All of the above consequences result in yield reduction!

If the situation is serious, farmers revert to SRT and SD. If farmers can access sufficient funding and are not too much delayed, they are more likely to pursue SRA. For farmers to follow the SRI practices, the

technical itinerary and good timing needs to be followed, which means that funding needs to be available at the beginning of the cropping season so that farmers can plan properly.

Funding constraints lead to the adoption of less productive rice systems (SD, SRT), resulting in lower yields and lower incomes. Farmers will not be able to save for the following growing season, and risk becoming locked into a vicious cycle.

### **CONSTRAINT: Unreliable water availability**

In the Northern corridor, irrigation water availability is highly dependent on rainfall. Irrigation schemes have little capacity to store or to drain water. Rice fields become therefore highly vulnerable to droughts and floods.

#### **Water availability in irrigation schemes is not guaranteed**

- **Can't store water at the intake**
  - Prone to droughts (and floods)
    - Season failure: farmers plant and abandon plots, or farmers do not plant at all
      - Economic loss
    - Cropping season delay:
      - See many of the potential outcomes for **delayed operations** above under lack of funding
      - Everyone adopts a different cropping calendar
        - Pest and disease pressure increases
          - Increased use of pesticides
          - Economic loss
          - Vulnerability increases
        - The plantings are no longer in sync with the rainy season
          - Vulnerability increases
            - Farmers revert to extensive systems with reduced production costs: SRT, SD
  - **Can't drain excess water**
    - Prone to floods
      - Small SRI seedlings might drown
        - Planting of older taller seedlings, reverting to SRT
      - Apple snail pest pressure is omnipresent when fields are flooded
        - Young and single seedlings are prone to damage
          - Planting older seedlings: Reverting to SRT
  - **Potential Hurricanes in the summer cropping season**
    - Threats of severe flooding
    - Threats of crop loss

These main constraints are highly interrelated:

- Even if irrigation water is available and farmers have some control over it, - as explained by farmers from Jalindor, commune of Ouanaminthe - it is still the financial capacity that determines their decision making. They still might need to revert to SD or SRT.
- On the other hand, if farmers do have funds available and are able to plan properly the cropping season, water in their irrigation scheme might not be available and farmers are forced out of their plans. This can also be the case when looking to hire a tractor service.
  - An example from Ferrier illustrates this well: A farmer started his nursery and planned to hire a tractor to prepare his land. He waited for the tractor, but it never came. By the time he was eventually able to find an alternative, he had lost his nursery, the rainy season was advanced, when he decided to direct seed his plot, in the hope to catch up and to produce at least something.

In conclusion: timing of crop operations, water availability and funding need to be synchronized for farmers to be able to operate rationally.

## 7. CONCLUSIONS

Farmers in the project zone know the SRI system well, based on their training and a multi-year exposure through the AVANSE Farmer Field School Program. They have the skills to implement the practices properly and are confident in their ability to do so. Farmers unanimously agree that the SRI system produces the best yields and the highest economic benefits. They recognize that the SRI plants are more resilient to environmental stress, and produce the most tillers, best-filled panicles and the most viable seed. But they confess that although they would like to implement SRI, conditions hardly permit them to do so. In fact, none of the AVANSE farmers practice the SRI system every season. Only 20% of the farmers can do it often or occasionally. The remaining 80% can implement SRI only rarely, or never.

The three major constraints that prevent farmers from properly adopting the SRI system are i) the inability to control irrigation water, ii) working funds are not available when needed, and iii) necessary equipment is not available. These constraints are interrelated, and even if one is addressed, the others can hinder the good planning and decision-making necessary for the adoption of SRI. When conditions become very difficult, farmers revert to SRT or SD, but not by choice. “With SRT or SD,” they say, “we hope to at least produce something.” Rice production becomes a kind of speculation, driven by the fear to not lose another season and worsen their economic well-being. Some additional quotes from the focus group interviews:

“Because the conditions for a good production are not there, and we don’t have the funds available in time, we are not able to follow the good practices we learned from AVANSE.”

“Some farmers are motivated by higher yields, but others are discouraged, as more care and more funds are needed to achieve better yields with SRI, but with unexpected climate-related events, such as flooding and droughts, you might still not get anywhere.”

But there is no doubt that SRI has positively influenced the rice production systems in the Northern corridor, resulting in the new SRA system that is more productive, saves more seed, and manages fertilizers more efficiently and organic matter better compared to the traditional system. Most AVANSE farmers have adopted the SRA system, and it is used by almost 70% of the Control farmers, a very high adoption rate. This indicates that the dissemination of the SRA system, derived from SRI practices, is spreading beyond the project participants in the Northern Corridor.

The Northern Corridor is one of the main rice producing zones of Haiti. Rice farmers depend on rice as their main cash crop. The natural capacity to plant two rice crops per year, including the possibility to grow a third ratoon crop, represents a significant economic potential. It is therefore hoped that future investments can focus on i) improving irrigation and drainage infrastructure to allow farmers to manage water independently of rainfall and weather variability, ii) providing farmers access to better financing and credit services with reasonable conditions, and iii) assisting the rice farming communities to build up appropriate equipment ownership at the local level. This will permit farmers to plan their rice season well, to adopt the SRI system, benefit from higher yields and a better quality crop, creating a vibrant and healthy rice production sector that strengthens the local economy.

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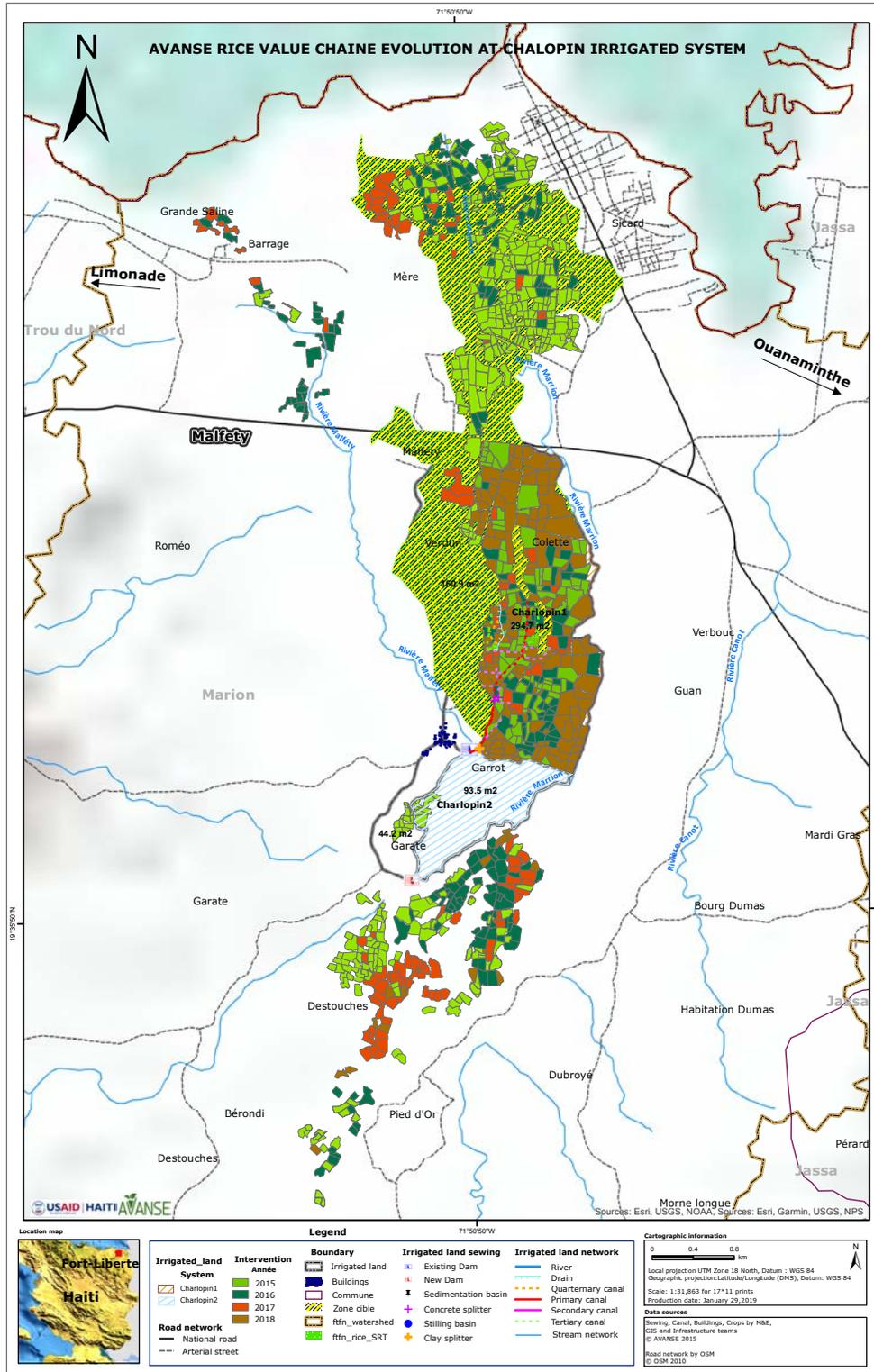
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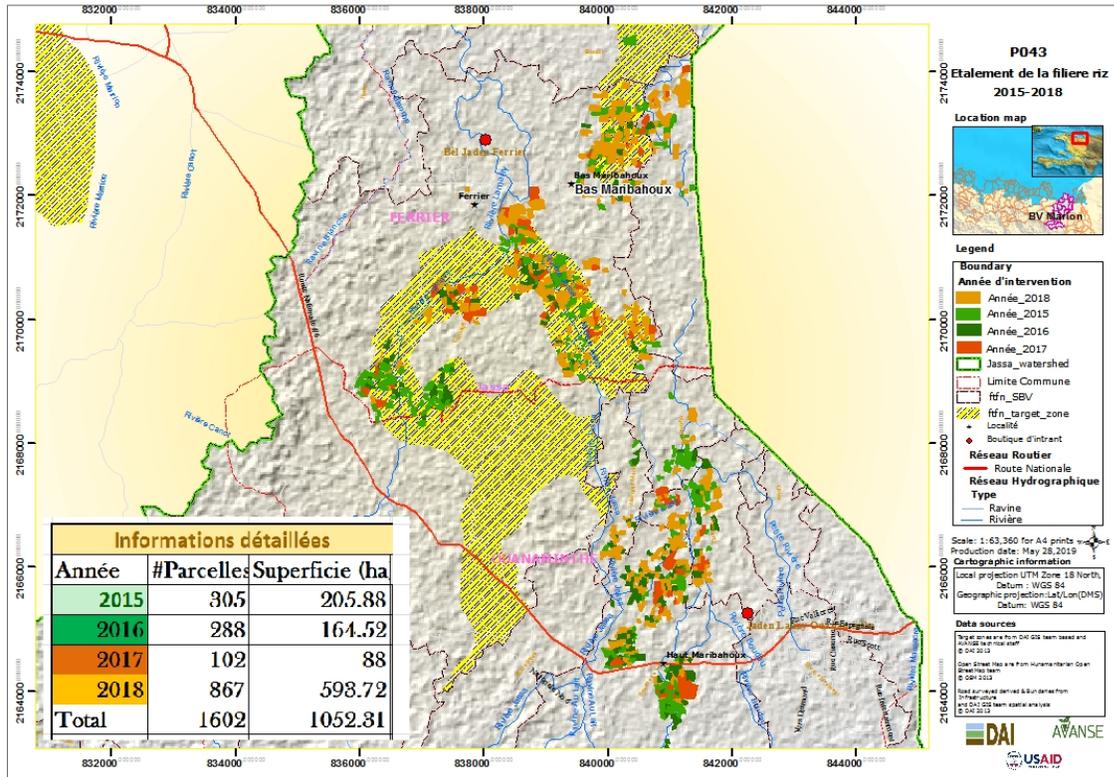
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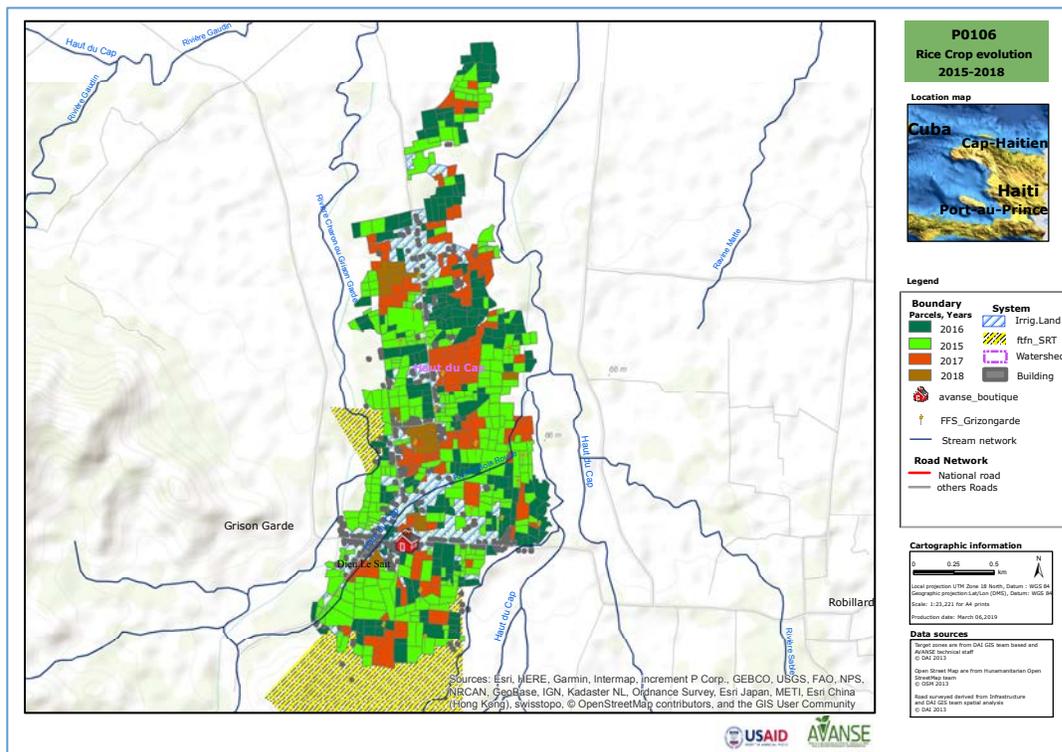
**Appendix 1:** Rice area coverage of AVANSE project interventions from 2015 to 2018 for  
a) Chalopin Irrigated System (commune of Fort-Liberté)



b) Communes of Ferrier and Ouanaminthe



c) Grison Garde (not included in this study)

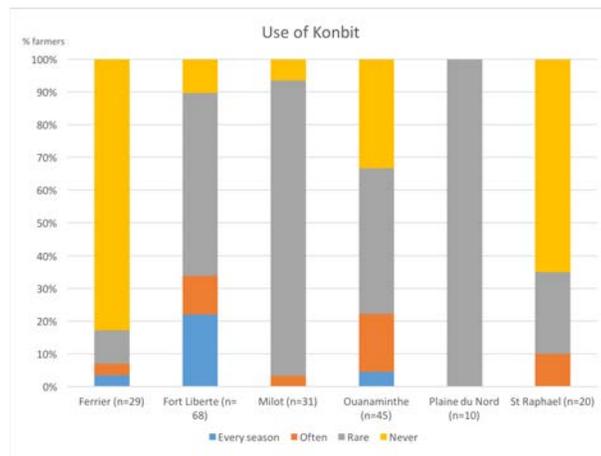
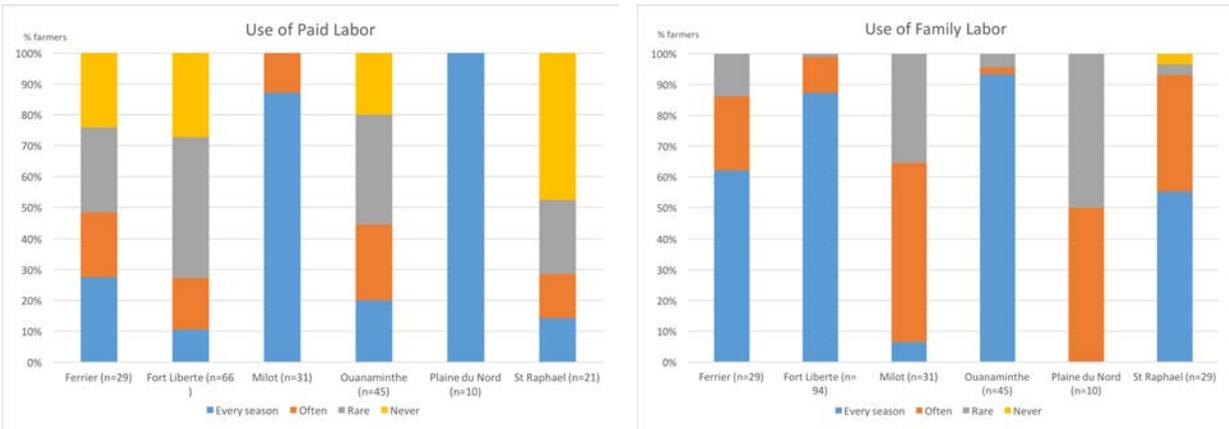


Appendix 2: Number of farmers interviewed in different localities in six communes for AVANSE farmers and control farmers.

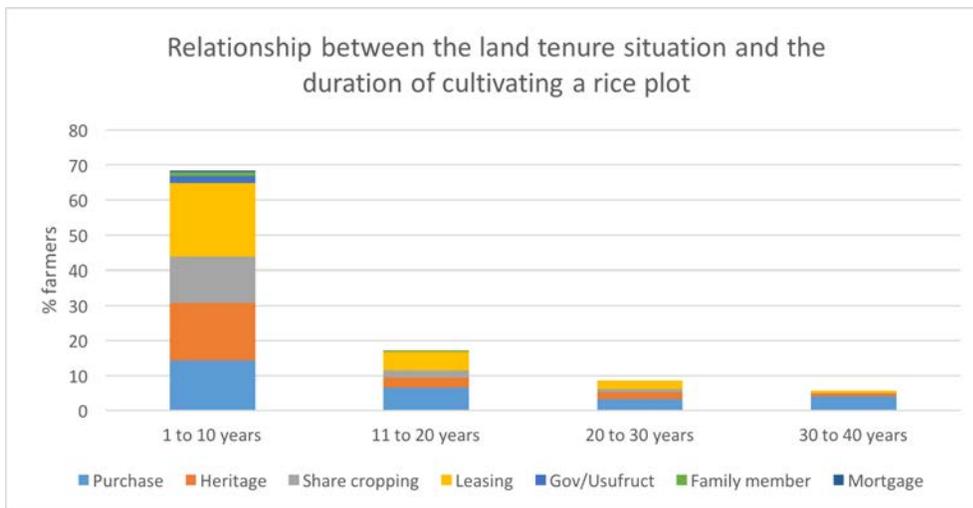
Location	AVANSE farmer numbers	CONTROL	Control: heard about SRI?		Total farmer numbers
			YES	NO	
<b>Ferrier</b>	<b>22</b>	<b>5</b>	<b>2</b>	<b>3</b>	<b>27</b>
Bas-Latasse	1				1
Bastingale	3				3
Kokoloko	1				1
Lamatrie	1				1
Latasse	3				3
Manuel	2	1	1		3
Pave	1				1
St-Jean	4				4
Tiboule	2				2
Troplen	4	4	1	3	8
<b>Fort Liberte</b>	<b>96</b>	<b>4</b>	<b>1</b>	<b>3</b>	<b>100</b>
Anba lagon	1				1
Babin	1				1
Chalopin	6				6
Coicou I	15				15
Coicou II	3				3
Coicou III	41				41
Concilia	3				3
Detouche	3				3
Dumas	1	3	1	2	4
Foreste	1				1
Grenn Plen	2				2
Lorette		1		1	1
Miniere	1				1
Nan Prefè	7				7
Nantoy	1				1
Piedor	2				2
Proprietaire	1				1
Rifin	2				2
Romeo	5				5
<b>Milot</b>	<b>31</b>				<b>31</b>
Ba Lanme	31				31
<b>Ouanaminthe</b>	<b>38</b>	<b>7</b>	<b>1</b>	<b>6</b>	<b>45</b>
Boujo	3	1		1	4
Du haut	13	1	1		14
Jalindor	11	1		1	12
Lamatri	4	1		1	5
Limina	1				1
Makimara	3	2		2	5
Riviere Sable	2				2
Robino		1		1	1
Talasse	1				1
<b>Plaine du Nord</b>	<b>10</b>				<b>10</b>
La Suisse	10				10
<b>St Raphael</b>		<b>30</b>	<b>8</b>	<b>22</b>	<b>30</b>
Melene		3		3	3
Porte 16		1	1		1
Porte 5		15	5	10	15
Porte 9		1		1	1
Sanyago		7		7	7
Walondry		3	2	1	3
<b>NA</b>	<b>9</b>	<b>1</b>		<b>1</b>	<b>10</b>
<b>Total</b>	<b>206</b>	<b>47</b>	<b>12</b>	<b>35</b>	<b>253</b>

NA: Answer not available.

### Appendix 3: Use of three labor categories for rice farming in six communes



### Appendix 4: Relationship between the land tenure situation and the duration of cultivating a rice plot



## Appendix 5: Plots planted and not planted in three rice growing seasons in 2018 and 2019

### a) For six communes

Communes	Planted in S1 2019				Planted in S2 2018				Planted in S1 2018			
	yes 1	no 2	all plots Total	planted %	yes 1	no 2	all plots Total	planted %	yes 1	no 2	all plots Total	planted %
Ferrier	1	37	38	3	29	9	38	76	9	29	38	24
Fort Liberte	35	77	112	31	85	27	112	76	88	24	112	79
Milot	44	1	45	98	11	34	45	24	13	32	45	29
Ouanam	19	36	55	35	47	8	55	85	36	19	55	65
Plaine du Nord	10	3	13	77	4	9	13	31	3	10	13	23
Saint-Raphael	3	33	36	8	18	18	36	50	17	16	33	52
<b>Total</b>	<b>112</b>	<b>187</b>	<b>299</b>		<b>194</b>	<b>105</b>	<b>299</b>		<b>166</b>	<b>130</b>	<b>296</b>	

### b) For 53 localities

Commune	Locality	Planted in S1 2019 - Winter 2019				Planted in S2 2018 - Summer 2018				Planted in S1 2018 - Winter 2018			
		YES Number plots	NO Number plots	ALL PLOTS Number plots	% % planted	YES Number plots	NO Number plots	ALL PLOTS Number plots	% % planted	YES Number plots	NO Number plots	ALL PLOTS Number plots	% % planted
Ouanaminthe	Limina	2		2	100	2		2	100	2		2	100
Fort-Liberté	Coicou I	9	8	17	53	17	17	17	100	17		17	100
Fort-Liberté	Coicou II	1	4	5	20	5	5	5	100	5	5	5	100
Ouanaminthe	Riviere Sable	2	2	2	0	2	2	2	100	2	2	2	100
Ouanaminthe	Ponigo	1	1	0	0	1	1	1	100	1	1	1	100
Ouanaminthe	Talasse	1	1	0	0	1	1	1	100	1	1	1	100
Fort-Liberté	Anba lagon	1	1	0	0	1	1	1	100	1	1	1	100
Fort-Liberté	Bedann	1	1	0	0	1	1	1	100	1	1	1	100
Fort-Liberté	Proprietaire	1	1	0	0	1	1	1	100	1	1	1	100
Fort-Liberté	Grenn Plen	2	2	0	0	1	1	2	50	2	2	2	100
Saint-Raphael	Walondry	3	3	0	0	1	2	3	33	3	3	3	100
Fort-Liberté	Lorette	1	1	0	0	1	1	1	0	1	1	1	100
Fort-Liberté	Nantoy	1	1	0	0	1	1	1	0	1	1	1	100
Saint-Raphael	Porte 16	1	1	0	0	1	1	1	0	1	1	1	100
Ouanaminthe	Du haut	7	10	17	41	14	3	17	82	16	1	17	94
Fort-Liberté	Nan Prefê	6	1	7	86	6	1	7	86	6	1	7	86
Fort-Liberté	Coicou III	19	26	45	42	33	12	45	73	37	8	45	82
Ouanaminthe	Makimara	5	5	0	0	3	2	5	60	4	1	5	80
Saint-Raphael	Sanyago	8	8	0	0	4	4	8	50	4	1	5	80
Ouanaminthe	Boujo	4	4	0	0	3	1	4	75	3	1	4	75
Fort-Liberté	Dumas	4	4	0	0	3	1	4	75	3	1	4	75
Fort-Liberté	Concilia	3	3	0	0	3	3	3	100	2	1	3	67
Fort-Liberté	Rifin	3	3	0	0	2	1	3	67	2	1	3	67
Fort-Liberté	Detouche	3	3	0	0	1	2	3	33	2	1	3	67
Fort-Liberté	Romeo	5	5	0	0	4	1	5	80	3	2	5	60
Ferrier	Tiboule	2	2	0	0	1	1	2	50	1	1	2	50
Fort-Liberté	Piedor	2	2	0	0	1	1	2	50	1	1	2	50
Ferrier	Troplen	1	10	11	9	6	5	11	55	5	6	11	45
Saint-Raphael	Porte 5	3	15	18	17	9	9	18	50	8	10	18	44
Fort-Liberté	Chalopin	7	7	0	0	2	5	7	29	3	4	7	43
Ouanaminthe	Jalindor	9	4	13	69	13		13	100	5	8	13	38
Ferrier	Latasse	3	3	0	0	2	1	3	67	1	2	3	33
Saint-Raphael	Melene	3	3	0	0	2	1	3	67	1	2	3	33
Milot	Ba Lanme	44	1	45	98	11	34	45	24	13	32	45	29
Ouanaminthe	Lamatric	8	8	0	0	7	1	8	88	2	6	8	25
Ferrier	St-Jean	4	4	0	0	3	1	4	75	1	3	4	25
Plaine du Nord	La Suisse	10	3	13	77	4	9	13	31	3	10	13	23
Ferrier	Manuel	6	6	0	0	5	1	6	83	1	5	6	17
Ouanam	Dilaire	1	1	0	0	1	1	1	100	1	1	1	0
Ferrier	Bastingale	4	4	0	0	4	4	4	100	4	4	4	0
Ferrier	Kokoloko	3	3	0	0	3	3	3	100	3	3	3	0
Ferrier	Goudanmen	2	2	0	0	2	2	2	100	2	2	2	0
Ferrier	Massacre	1	1	0	0	1	1	1	100	1	1	1	0
Ferrier	Bas-Latasse	1	1	0	0	1	1	1	100	1	1	1	0
Ferrier	Pave	1	1	0	0	1	1	1	100	1	1	1	0
Fort-Liberté	Babin	1	1	0	0	1	1	1	100	1	1	1	0
Fort-Liberté	Foreste	1	1	0	0	1	1	1	100	1	1	1	0
Fort-Liberté	Garathe	1	1	0	0	1	1	1	100	1	1	1	0
Fort-Liberté	Miniere	1	1	0	0	1	1	1	100	1	1	1	0
Saint-Raphael	Centre Bourg	1	1	0	0	1	1	1	100	1	1	1	0
Saint-Raphael	Porte 7	1	1	0	0	1	1	1	100	1	1	1	0
Ouanaminthe	Robino	1	1	0	0	1	1	1	0	1	1	1	0
Saint-Raphael	Porte 9	1	1	0	0	1	1	1	0	1	1	1	0
<b>Total number plots</b>		<b>112</b>	<b>187</b>	<b>299</b>		<b>194</b>	<b>105</b>	<b>299</b>		<b>166</b>	<b>130</b>	<b>296</b>	
<b>% plots planted/not planted</b>		<b>37</b>	<b>63</b>			<b>65</b>	<b>35</b>			<b>56</b>	<b>44</b>		

Appendix 6: Changes in soil preparation practices over the past 15 years for 6 communes

Soil Preparation Operations	BEFORE			NOW		
	Tractor	Oxen	By Hand	Tractor	Oxen	By Hand
% farmers						
<b>1st Plowing</b>						
Ferrier	0.75	0.21	0.04	0.79	0.21	0.00
Fort Liberte	0.39	0.37	0.24	0.51	0.47	0.02
Milot	0.26	0.00	0.74	0.42	0.00	0.58
Ouanaminthe	0.14	0.43	0.43	0.79	0.21	0.00
Plaine du Nord	0.10	0.00	0.90	0.40	0.00	0.60
St Raphael	0.04	0.89	0.07	0.04	0.96	0.00
<b>Average</b>	<b>0.31</b>	<b>0.36</b>	<b>0.33</b>	<b>0.51</b>	<b>0.37</b>	<b>0.11</b>
<b>2nd Plowing</b>						
Ferrier	0.78	0.22	0.00	0.79	0.21	0.00
Fort Liberte	0.37	0.39	0.24	0.47	0.51	0.02
Milot	0.07	0.00	0.93	0.22	0.00	0.78
Ouanaminthe	0.14	0.45	0.40	0.76	0.24	0.00
Plaine du Nord	0.00	0.00	1.00	0.30	0.00	0.70
St Raphael	0.04	0.89	0.07	0.04	0.96	0.00
<b>Average</b>	<b>0.28</b>	<b>0.38</b>	<b>0.34</b>	<b>0.46</b>	<b>0.39</b>	<b>0.14</b>
<b>Leveling</b>						
Ferrier	0.00	0.96	0.04	0.04	0.92	0.04
Fort Liberte	0.25	0.31	0.44	0.30	0.49	0.21
Milot	0.08	0.00	0.92	0.18	0.00	0.82
Ouanaminthe	0.07	0.52	0.40	0.17	0.79	0.05
Plaine du Nord	0.00	0.00	1.00	0.30	0.00	0.70
St Raphael	0.04	0.82	0.14	0.04	0.86	0.11
<b>Average</b>	<b>0.14</b>	<b>0.43</b>	<b>0.44</b>	<b>0.20</b>	<b>0.54</b>	<b>0.26</b>

**Questionnaire Enquête Individuelle des Producteurs Rizicoles, Project AVANSE, May 2019**  
**Questionnaire A**

<b>Producteur, Nom :</b>		<b>Prénom :</b>		<b>Sexe :</b>	
<b>Localité</b>			<b>Commune :</b>		<b>Age estimé:</b>
<b>1</b>	Section Communale :	<b>5</b>	Enumérateur:		
<b>2</b>	PHONE :	<b>6</b>	Date:		
<b>3</b>	CIN :	<b>7</b>	Temps début :		
<b>4</b>	NIF :	<b>8</b>	Temps fin:		

**SECTION A : IDENTIFICATION PRODUCTEUR**

**SECTION B : LA RIZICULTURE**

**1. Parcelles rizicoles cultivées**

Listez le nombre de parcelles dans le tableau.

***Pour les parcelles emblavées, prenez les coordonnées GPS (pour la taille de la parcelle : demandez au producteur, ce n'est pas nécessaire de mesurer). Pour les parcelles non-emblavées, demandez le nom le plus précis de la localité (pour permettre à retrouver la localité sur la carte)***

Plot #	Taille	Localité	Planté Hiver 2019	Abandonné Hiver 2019	Plantée Saison 2 2018	Plantée Saison 1 2018	Depuis quand cultivez-vous cette parcelle	Foncier* / Mode de tenure
	Mesure locale	1. GPS (planté) 2. Nom (non planté)	1. Oui 2. Non	1. Oui 2. Non	1. Oui 2. Non	1. Oui 2. Non	Nb années	*
Plot 1**								
Plot 2								
Plot 3								
Plot 4								
Plot 5								
Plot 6								

\* **Foncier** : 1. Achat ; 2. Héritage 3. Métayage 4. Affermage 5. Etat/Usufruit 6. Membre de Famille/Usufruit 7. Hypothèque

\*\* **Plot ou Parcelle** : Une fois un numéro est attribué à une parcelle, maintenez le pour la suite du questionnaire.

**2. Si la parcelle n'était pas plantée, donnez des explications pourquoi :**

- Saison 1 Hiver 2019 \_\_\_\_\_
- Saison 2 Été 2018 \_\_\_\_\_
- Saison 1 Hiver 2018 \_\_\_\_\_

**3. En cas de disponibilité en eaux pour les trois prochains mois, cultiverez-vous toutes vos parcelles ?**

1. Oui
2. Non, lesquelles alors : \_\_\_\_\_ ; pourquoi ? \_\_\_\_\_

**4. Si le producteur qui vient de commencer la saison :**

1. Date de début préparation sol : \_\_\_\_\_
2. Date de semi de pépinière : \_\_\_\_\_

**5. Si le producteur a des parcelles plantées et ensuite abandonnées une parcelle en 2019, remplissez le tableau, si non passez à la question 6.**

	Préparation sol, 1.Oui, 2.Non	1 Repiquage 2 Semi Direct 3. Non plante	Date plantation champ	Application engrais 1.Oui, 2. Non	Nombre d'irrigation	Date abandon	Raison d'abandon
P1							
P2							
P3							
P4							

**6. Inventaires des pratiques pour 2019, et les deux saisons en 2018**

*POUR CHAQUE PARCELLE, UTILISER UNE FICHE A PART POUR LES QUESTIONS 6 ET 7. PROCEDER UNE PARCELLE A L'AUTRE*

**Objective :** nous voulons connaître si le producteur a changé les pratiques durant les 2 à 3 dernières saisons.

*Simple procédure :* 1. établir d'abord les dates de plantation et récolte. 2. Demander comment le producteur a planté le riz la dernière fois. Laisser lui s'exprimer librement, compléter là ou il y a des manquants. Pour la saison antérieure, demandez par groupe des travaux : préparation du sol, plantation, irrigation, gestion des cultures, récoltes, retourne. (le retourne se fait normalement à la fin de la S1), compléter là ou s'est pas clair en demandant les précision un à un.

**6. A) Parcelle Numéro 1**

Nom Producteur :		Parcelle Numéro 1			Localité :	
PRATIQUES	Unités	2019 S1	2018 S2	2018 S1	Cocher là où il y a des	Observations *

					changements	
<b>Date de Plantation :</b>	Mois				NA	
<b>Date de Récolte :</b>	Mois				NA	
1. Avant la préparation du sol : Pâturages animaux au champ	1. Oui 2. Non					
2. Paille brûlée	1. Oui 2. Non					
3. Paille incorporée pendant le labour	1. Oui 2. Non					
<b>Nom Producteur :</b>		<b>Parcelle Numéro 1</b>			<b>Localité :</b>	
PRATIQUES	Unités	2019 S1	2018 S2	2018 S1	Cocher là où il y a des changements	Observations *
<b>4. Labour (équipement)</b>	1. Oui 2. Non					
<b>5. Hersage ou 2ieme Labour (équipement)</b>	1. Oui 2. Non					
<b>6. Nivelage (équipement)</b>	1. Oui 2. Non					
7. Repiquage/ Semi Direct	1. Repiquage 2. Semi Direct					
8. Trempage graines	1. Oui 2. Non					
9. Pépinière sèche/inondée	1. Sèche 2. Inondée					
10. Variété	Nom					
11. Age des plants transplantés	Nombre de Jours					
12. Nombre plants/poquet	Nombre					
13. Plante en ligne ou quinconce	1. Ligne 2. Quinconce					
14 Utilisation Roller Marker	1. Oui 2. Non					
15. Écartement	cm x cm					
16. Irrigation en phase de tallage : (IP/AIA)*	1. IP 2. AIA					

17. Irrigation en phase de reproduction (IP/AIA)	1. IP 2. AIA					
18. Application Urée, dosage Kg/ha	1. oui/quantité 2. Non					
19. Application Complet (NPK), dosage Kg/ha	1. oui/quantité 2. Non					
<b>20. Utilisation pesticides (peste)</b>	1. Oui 2. Non					
21. Utilisation herbicide	1. Oui 2. Non					
22. Sarclage à main	1. Oui 2. Non					
23. Utilisation de sarcluse	1. Oui 2. Non					
<b>Nom Producteur :</b>		<b>Parcelle Numéro 1</b>			<b>Localité :</b>	
<b>PRATIQUES</b>	<b>Unités</b>	<b>2019 S1</b>	<b>2018 S2</b>	<b>2018 S1</b>	<b>Cocher là où il y a des changements</b>	<b>Observations *</b>
<b>24. Rendement obtenu : Production et superficies</b>	<b>Unités locales</b>					
<b>25. Pourcentage du riz vendu</b>	%					
<b>26. Revenu tiré</b>	1. Satisfait 2. Non Satisfait					
27. Retourne / Ratoon	1. Oui 2. Non					
28. Application engrais	1. oui/quantité 2. Non					Type :
29. Date de récolte						
<b>30. Production Retourne</b>	<b>Unités locales</b>					
<b>31. Pourcentage du riz du retourne vendu</b>	%					
<b>32. Revenu tiré du retourne</b>	1. Satisfait 2. Non Satisfait					

Sous Observation : **Equipment préparation sol** : Tracteur, Motoculteur, traction animale, à la main, autre : **Pesticides** : pour quel ravageur ou maladie ; **Ajoutez autres observations** ; **IP** : Inondation Permanente, **AIA** : Alternance Inondation Assèchement

### 7. A) Raisons de changement des pratiques Parcelle Numéro 1

Lister des pratiques qui ont changé (rapporter de la question antérieure) Numéro                  Pratique		Expliquez pourquoi ces changements ont eu lieu en détail en tenant compte de changements de saison en saison

Continuez au verso de ce page si nécessaire

### 6. B) Parcelle Numéro 2 :

Nom Producteur :		Parcelle Numéro 2			Localité :	
PRATIQUES	Unités	2019 S1	2018 S2	2018 S1	Cocher là où il y a des changements	Observations *
<b>Date de Plantation :</b>	Mois				NA	
<b>Date de Récolte :</b>	Mois				NA	
1. Avant labour Pâturages animaux au champ	1. Oui 2. Non					
2. Paille brûlée	1. Oui 2. Non					
3. Paille incorporée pendant le labour	1. Oui 2. Non					
<b>4. Labour (équipement)</b>	1. Oui 2. Non					
<b>5. Hersage ou 2ieme Labour (équipement)</b>	1. Oui 2. Non					
<b>6. Nivelage (équipement)</b>	1. Oui 2. Non					
7. Repiquage/ Semi Direct	1. Repiquage 2. Semi Direct					

8. Trempage graines	1. Oui 2. Non					
9. Pépinière sèche/inondée	1. Sèche 2. Inondée					
10. Variété	Nom					
11. Age des plants transplantés	Nombre de Jours					
12. Nombre plants/poquet	Nombre					
13. Plante en ligne ou quinconce	1. Ligne 2. Quinconce					
14 Utilisation Roller Marker	1. Oui 2. Non					
15. Écartement	cm x cm					
16. Irrigation en phase de tallage : (IP/AIA)*	1. IP 2. AIA					
17. Irrigation en phase de reproduction (IP/AIA)	1. IP 2. AIA					
18. Application Urée, dosage Kg/ha	1. oui/quantité 2. Non					
<b>Nom Producteur :</b>		<b>Parcelle Numéro 2</b>			<b>Localité :</b>	
<b>PRATIQUES</b>	<b>Unités</b>	<b>2019 S1</b>	<b>2018 S2</b>	<b>2018 S1</b>	<b>Cocher là où il y a des changements</b>	<b>Observations *</b>
19. Application Complet (NPK), dosage Kg/ha	1. oui/quantité 2. Non					
<b>20. Utilisation pesticides (peste)</b>	1. Oui 2. Non					
21. Utilisation herbicide	1. Oui 2. Non					
22. Sarclage à main	1. Oui 2. Non					
23. Utilisation de sarcluse	1. Oui 2. Non					
<b>24. Rendement obtenu : Production et superficies</b>	<b>Unités locales</b>					
<b>25. Pourcentage du riz vendu</b>	<b>%</b>					

<b>26. Revenu tiré</b>	1. Satisfait 2. Non Satisfait					
27. Retourne / Ratoon	1. Oui 2. Non					
28. Application engrais	1. oui/quantité 2. Non					Type :
29. Date de récolte						
<b>30. Production Retourne</b>	<b>Unités locales</b>					
<b>31. Pourcentage du riz du retourne vendu</b>	%					
<b>32. Revenu tiré du retourne</b>	1. Satisfait 2. Non Satisfait					

### 7 B) Raisons de changement des pratiques Parcelle Numéro 2

Lister des pratiques qui ont changé (rapporter de la question antérieure) Numéro                      Pratique		Expliquez pourquoi ces changements ont eu lieu en détail en tenant compte de changements de saison en saison

### 6. C) Parcelle Numéro 3 :

Nom Producteur :		Parcelle Numéro 3			Localité :	
PRATIQUES	Unités	2019 S1	2018 S2	2018 S1	Cocher là où il y a des changements	Observations *
Date de Plantation :	Mois				NA	
Date de Récolte :	Mois				NA	
1. Avant labour Pâturages animaux au champ	1. Oui 2. Non					
2. Paille brûlée	1. Oui 2. Non					
3. Paille incorporée pendant le labour	1. Oui 2. Non					
4. Labour (équipement)	1. Oui 2. Non					
5. Hersage ou 2ieme Labour (équipement)	1. Oui 2. Non					
6. Nivelage (équipement)	1. Oui 2. Non					
7. Repiquage/ Semi Direct	1. Repiquage 2. Semi Direct					
8. Trempage graines	1. Oui 2. Non					
9. Pépinière sèche/inondée	1. Sèche 2. Inondée					
10. Variété	Nom					
Nom Producteur :		Parcelle Numéro 3			Localité :	
PRATIQUES	Unités	2019 S1	2018 S2	2018 S1	Cocher là où il y a des changements	Observations *
11. Age des plants transplantés	Nombre de Jours					
12. Nombre plants/poquet	Nombre					
13. Plante en ligne ou quinconce	1. Ligne 2. Quinconce					
14 Utilisation Roller Marker	1. Oui 2. Non					
15. Écartement	cm x cm					

16. Irrigation en phase de tallage : (IP/AIA)*	1. IP 2. AIA					
17. Irrigation en phase de reproduction (IP/AIA)	1. IP 2. AIA					
18. Application Urée, dosage Kg/ha	1. oui/quantité 2. Non					
19. Application Complet (NPK), dosage Kg/ha	1. oui/quantité 2. Non					
<b>20. Utilisation pesticides (peste)</b>	1. Oui 2. Non					
21. Utilisation herbicide	1. Oui 2. Non					
22. Sarclage à main	1. Oui 2. Non					
23. Utilisation de sarcluse	1. Oui 2. Non					
<b>24. Rendement obtenu : Production et superficies</b>	<b>Unités locales</b>					
<b>25. Pourcentage du riz vendu</b>	%					
<b>26. Revenu tiré</b>	1. Satisfait 2. Non Satisfait					
27. Retourne / Ratoon	1. Oui 2. Non					
28. Application engrais	1. oui/quantité 2. Non					Type :
29. Date de récolte						
<b>Nom Producteur :</b>		<b>Parcelle Numéro 3</b>			<b>Localité :</b>	
<b>PRATIQUES</b>	<b>Unités</b>	<b>2019 S1</b>	<b>2018 S2</b>	<b>2018 S1</b>	<b>Cocher là où il y a des changements</b>	<b>Observations *</b>
<b>30. Production Retourne</b>	<b>Unités locales</b>					
<b>31. Pourcentage du riz du retourne vendu</b>	%					
<b>32. Revenu tiré du retourne</b>	1. Satisfait					

	2. Non Satisfait					
--	------------------	--	--	--	--	--

### 7 C) Raisons de changement des pratiques Parcelle Numéro 3

Lister des pratiques qui ont changé (rapporter de la question antérieure)		Expliquez pourquoi ces changements ont eu lieu en détail en tenant compte de changements de saison en saison
Numéro	Pratique	

**AU CAS OU LE PRODUCTEUR CULTIVE PLUS DE 3 PARCELLES, AJOUTEZ LES FICHES ET COMPLETEZ L'ENQUETE POUR CHAQU'UNE DES PARCELLES**

#### 8. Quel sont les contraintes les plus importantes pour la riziculture ?

**Question ouverte : laissez le l'agriculteur s'exprimer librement, mais voilà une liste de référence pour l'enquêteur** (Pluviométrie, Disponibilité de main d'œuvre, si oui : pour quelles opérations, disponibilité d'équipement, si oui : lequel, Semences, Engrais chimiques, Maladies, Ravageurs, Accès aux terres, Manque de crédit, Disponibilité des fonds : si oui, pour faire quoi)

**Contrainte 1 :**

Contrainte 2 :

Contrainte 3 :

Contrainte 4 :

## SECTION C : ACTIVITES ECONOMIQUES ET AGRICOLES

### Activités économiques

#### 9. Dans quelles activités économiques participez-vous ? (Cocher avec un X premier colonne)

Citer 3 activités qui apportent le plus d'argent ? (Marquer et prioriser 1,2,3 deuxième colonne)

1.    Agriculture ; Culture 1 : \_\_\_\_\_ (préciser les cultures de rente les plus importantes à part le riz)
2.    Agriculture ; Culture 2 : \_\_\_\_\_
3.    Agriculture ; Culture 3 : \_\_\_\_\_
4.    **Riziculture**
5.    Élevage ; préciser l'animal : \_\_\_\_\_
6.    Ressources naturelles : préciser \_\_\_\_\_
7.    Ouvrier agricole, salarié saisonnier
8.    Métier/Profession : \_\_\_\_\_
9.    Commerce formel : \_\_\_\_\_
10.    Commerce informel : \_\_\_\_\_
11.    Enseignement
12.    Agent de gouvernement
13.    Autre : \_\_\_\_\_
14.    Autre : \_\_\_\_\_

#### 10. Mouvements saisonniers

Est-ce que vous faites un mouvement saisonnier/Quittez-vous votre ménage entre les saisons ?

1. Oui
2. Non
3. Si oui, destination : \_\_\_\_\_
4. Si oui, Période : \_\_\_\_\_
5. Si oui, Activités économiques : \_\_\_\_\_

6. Influence sur la riziculture ? Oui      Non

7. Raisons : \_\_\_\_\_

### Agriculture

**11. Faites la liste de toutes les cultures pratiquées (y inclus arbres, arbres fruitiers et arbustes)  
(Cocher avec un X)**

Cultures	Oui	En rizière	Bordure de rizière	AC, V*
Riz	X	X	----	
Mais				
Haricot				
Pois inconnu				
Pois congo				
Manioc				
Taro				
Patate douce				
Canne à sucre				
Gombo				
Banane				
Plantain				
Papaye				
Pistache				
Piment				

AC : Autoconsommation, V : Vente (trois réponses possibles : AC ; V ; ou AC et V)

**12. Animaux Élevés (coché avec un X)**

Animaux	Possession Oui	AC, V*
Vaches/Bovin		
Caprin		
Ovin		
Porcin		
Cheval		
Ânes		
Bœuf de travail		
Volaille		
Poisson = Aquaculture		

**13. Ressources naturelles exploités ?**

1. Oui
2. Non

Si Oui

3. Sel
4. Charbon de bois
5. Bois
6. Pêche (Océan, Eau douce, Rivière)
7. Mine
8. Autre : \_\_\_\_\_

9. Autre : \_\_\_\_\_

**14. Apportez-vous de matières/fumures organiques ?**

1. Oui 2. Non

3. Si oui, pour quelles cultures ?

4. Si oui, quel type ?

1. Déjection Animale      2. Déchets Végétaux      3. Déjection Animale et Déchets Végétaux

**15. Prenez-vous du crédit ?**

1. Oui 2. Non

3. Si oui, en 1) Cash, ou 2) Service : \_\_\_\_\_

4. Si oui, pour quelle activité et culture ? \_\_\_\_\_

**16. Main d'œuvre utilisée pour la riziculture (répondre à toutes les questions)**

1. Familiale :

Chaque saison - souvent – rarement - jamais

2. Salarié :

Chaque saison - souvent – rarement - jamais

3. Konbit :

Chaque saison - souvent – rarement – jamais

**17. Faites-vous partie de CEP d'AVANSE? 1. Oui 2. Non**

Si oui, au cours de quelle année : (listez toutes les années y inclut 2019) \_\_\_\_\_

○ Combien de saisons avez-vous bénéficié directement du projet : \_\_\_\_\_

Qu'est-ce que vous avez bénéficié : 1. Formation, 2. Semences, 3. Fertilisants, 4. Autres : \_\_\_\_\_

Si non, avez-vous entendu du SRI ? 1. Oui, 2. Non

*(Pour la deuxième visite, nous allons faire la distinction dans le questionnaire pour les personnes qui connaissent le SRI et les personnes qui n'ont pas entendu du SRI)*

Producteur, Nom :		Prénom :	
Localité :		Département 1. NORD      2. NORD'EST	
Enquêteur	Date	Début	Fin

**DEUXIEME VISITE :**  
**QUESTIONNAIRE B) Discussion SUR LES SYSTEMES RIZICOLES (SRI INCLUS)**

*On commence avec la Partie 1 pour tous les producteurs, ceux qui connaissent et ceux qui ne connaissent pas le SRI*

**PARTIE 1 : PRATIQUES TRADITIONELLES**

**18. Depuis quand cultivez-vous le riz ? \_\_\_\_\_**

- A ce moment, avez-vous pratiqué le semis direct ? 1. Oui, 2. Non
- A ce moment, avez-vous pratiqué le repiquage ? 1. Oui, 2. Non

*Remplissez le(s) tableau(x) en bas, selon réponse*

**19. A ce moment, quelles étaient les pratiques que vous avez suivies (Pratiques traditionnelles)**

*Simple procédure : Demander comment le producteur a planté le riz dans le temps. Laisser lui s'exprimer librement, compléter là où il y a des manquants. Pour l'actuel/maintenant, demandez par groupe des travaux : préparation du sol, plantation, irrigation, gestion des cultures, récoltes, retourne. (le retourne se fait normalement à la fin de la S1), compléter là où s'est pas clair en demandant les précision un à un. Ajoutez des observations dans le casier.*

**A) Système de Repiquage**

PRATIQUES		Pratiqué avant	Pratiqué maintenant ? 1. Oui 2. Non 3. Parfois
-----------	--	----------------	---

			/ ajoutez Observations
1. Avant la préparation du sol : Pâturages animaux au champ ?	1. Oui 2. Non		
2. Paille brulée ?	1. Oui 2. Non		
3. Paille incorporée pendant le labour	1. Oui 2. Non		
<b>4. Labour (équipement)</b>	1. Oui 2. Non		
<b>5. Hersage (équipement)</b>	1. Oui 2. Non		
<b>6. Nivelage (équipement)</b>	1. Oui 2. Non		
<b>PRATIQUES</b>		<b>Pratiqué avant</b>	<b>Pratiqué maintenant ? 1. Oui 2. Non 3. Parfois / ajoutez Observations</b>
7. Repiquage/ Semi Direct	1. Repiquage 2. Semi Direct	1	
8. Trempage graines	1. Oui 2. Non		
9. Age des plants transplantés	Nombre de Jours		
10. Nombre plants/poquet	Nombre		
11. Plante en ligne ou quinconce	1. Ligne 2. Quinconce		
12. Écartement	cm x cm		
13. Irrigation en phase de tallage : (IP/AIA)*	1. IP 2. AIA		
14. Irrigation en phase de reproduction (IP/AIA)	1. IP 2. AIA		
15. Application Urée, dosage Kg/ha	1. oui/quantité 2. Non		
16. Application Complet (NPK), dosage Kg/ha	1. oui/quantité 2. Non		
<b>17. Utilisation pesticides (peste)</b>	1. Oui 2. Non		
18. Utilisation herbicide	1. Oui 2. Non		
19. Sarclage à main	1. Oui 2. Non		
20. Utilisation de sarcleuse	1. Oui 2. Non		
<b>21. Rendement obtenu : Production et superficies</b>	<b>Unités locales</b>		

22. Retourne / Ratoon	1. Oui 2. Non		
23. Application engrais	1. oui/quantité 2. Non		
<b>24. Production Retourne</b>	<b>Unités locales</b>		

## B) Système de Semi Direct

PRATIQUES		Pratiqué avant	Pratiqué maintenant ? 2. Oui 2. Non 3. Parfois / ajoutez Observations
1. Avant la préparation du sol : Pâturages animaux au champ ?	1. Oui 2. Non		
2. Paille brulée ?	1. Oui 2. Non		
3. Paille incorporée pendant le labour	1. Oui 2. Non		
PRATIQUES		Pratiqué avant	Pratiqué maintenant ? 1. Oui 2. Non 3. Parfois / ajoutez Observations
<b>4. Labour (équipement)</b>	1. Oui 2. Non		
<b>5. Hersage (équipement)</b>	1. Oui 2. Non		
<b>6. Nivelage (équipement)</b>	1. Oui 2. Non		
7. Repiquage/ Semi Direct	1. Repiquage 2. Semi Direct	2	
8. Trempage graines	1. Oui 2. Non		
9. Age des plants transplantés	Nombre de Jours		
10. Nombre plants/poquet	Nombre		
11. Plante en ligne ou quinconce	1. Ligne 2. Quinconce		
12. Écartement	cm x cm		
13. Irrigation en phase de tallage : (IP/AIA)*	1. IP 2. AIA		
14. Irrigation en phase de reproduction (IP/AIA)	1. IP 2. AIA		
15. Application Urée, dosage Kg/ha	1. oui/quantité 2. Non		

16. Application Complet (NPK), dosage Kg/ha	1. oui/quantité 2. Non		
<b>17. Utilisation pesticides (peste)</b>	1. Oui 2. Non		
18. Utilisation herbicide	1. Oui 2. Non		
19. Sarclage à main	1. Oui 2. Non		
20. Utilisation de sarcleuse	1. Oui 2. Non		
<b>21. Rendement obtenu : Production et superficies</b>	<b>Unités locales</b>		
22. Retourne / Ratoon	1. Oui 2. Non		
23. Application engrais	1. oui/quantité 2. Non		
<b>24. Production Retourne</b>	<b>Unités locales</b>		

***Pour les producteurs qui connaissent SRI – Continuez avec section D***

***Pour les producteurs qui ne connaissant pas le SRI - Continuez avec section E***

## **SECTION D : LE SRI ET LES PRATIQUES AMELIOREES**

### **PARTIE 2 : LE SRI**

**20. Avez-vous entendu du SRI ? 1. Oui, 2. Non**

Si oui, de qui ? \_\_\_\_\_

Depuis quand (Année) : \_\_\_\_\_

**Vous faites parties des bénéficiaires AVANSE ? 1. Oui, 2. Non**

*(Ici c'est une simple vérification ce qu'on avait établi en Questionnaire A, mais il est bien de vérifier)*

**Si non, changer à la Section E**

**21. Explication du producteur ce que c'est le SRI**

(Ici, nous testons les connaissances des producteurs sur le SRI : On note les réponses sans fournir des éléments, même si c'est non complet ou pas correcte)

**Lesquelles des pratiques sont typiques pour le SRI (ou différentes pour ce que vous avez fait avant) ?**

1. \_\_\_\_\_,                      2. \_\_\_\_\_,
3. \_\_\_\_\_,                      4. \_\_\_\_\_
5. \_\_\_\_\_,

**22. Pouvez-vous réaliser toutes les pratiques de SRI ?      1. Oui   2. Non**

*Enquêteur va citer la liste des pratiques SR : **Repiquage des très jeunes plants de 8-12 jours ; 1 plant/poquet ; écartement élargi, planté en ligne ; Alternance irrigation et assèchement.***

- a. Pendant combien de saisons avez-vous pratiqué le SRI complet depuis sa connaissance ? -  
\_\_\_\_\_

*La question 23 peut être répondu en A seul, en B seul ou en A et B (préférable). Cela dépendra comment la discussion évolue avec le producteur.*

**23    A ) Quelles sont les conditions qui vous permettent de pratiquer le SRI?**

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_
3. \_\_\_\_\_  
\_\_\_\_\_
4. \_\_\_\_\_  
\_\_\_\_\_

**B ) Quelles sont les conditions qui NE vous permettent PAS de pratiquer le SRI?**

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_
3. \_\_\_\_\_  
\_\_\_\_\_

4. \_\_\_\_\_  
 \_\_\_\_\_

24. Avez-vous accès à un roller marker ? 1. Oui 2. Non

25. Avez-vous accès à une sarleuse mécanique ? 1.Oui 2. Non

**PARTIE 3 : COMPARAISON DES SYSTEMES**

26. Les 4 grands systèmes de production sont : SRT, SD, SRI, SRA

*L'enquêteur a déjà établi jusque-là quels systèmes le producteur utilise. Ce n'est pas nécessaire de les appeler SRT, SRA, mais l'enquêteur trouvera le langage qui est convenable avec le producteur et ne le confus pas.*

- Système (s) utilisé(s) ?
- 1. Chaque saison (toujours), 2. Souvent, 3. De temps en temps, 4. Rarement, 5. Jamais
  - SRT : \_\_\_\_\_
  - SD : \_\_\_\_\_
  - SRI : \_\_\_\_\_
  - SRA : \_\_\_\_\_

**Référence pour l'enquêteur : Différences des 4 systèmes rizicoles**

PRATIQUES	SRT	SRI	SRA : Entre SRT et SRI (moyenne)	Semi Direct /SD
Semi Direct	-	-	-	oui
Age des plants (jours)	30-45	8-12	15-25	-
Nombre plants/poquet	7-10	1	2-4	-
Plante en ligne ou quinconce (L/Q)	Q	L	Q/L	-
Écartement cm x cm	15x15	25x25	20x20	-
Inondation permanente (IP) ou alternance irrigation et assèchement (AIA)	IP	AIA	IP/AIA	IP

27. Pour les 4 grands systèmes de production (mentionnez les avantages et désavantages pour chaque système. Si un système n'est pas utilisé, cocher avec un X

SRT : Avantages

<b>SRT</b> : Désavantages
<b>Semi Direct</b> : Avantages
<b>Semi Direct</b> : Désavantages
<b>SRA</b> : Avantages
<b>SRA</b> : Désavantages
<b>SRI</b> : Avantages
<b>SRI</b> : Désavantages

**28. Selon votre opinion quel système se comporte le mieux ?**

En termes de Perception, Indiquez 1-4 (1 c'est le mieux) ;

*Si le producteur ne semble pas avoir une opinion, ne forcez pas la réponse, et cocher avec un X.*

	<b>SRT</b>	<b>SRA</b>	<b>SD</b>	<b>SRI</b>
Rendements				
Bénéfices Économiques				
Utilisation moins d'Eau				
Résistance à la sécheresse				
Résistance aux vents				
Résistance aux inondations				

**SECTION E : PRODUCTEUR N' A PAS ENTENDU PARLER DU SRI**

Après avoir rempli le tableau sur les pratiques traditionnelles (question 19) et avec les discussions menées jusqu'à la, l'enquêteur a déjà établi quels systèmes le producteur utilise. Il se peut que le producteur ne suit pas le SRT ou le SD, mais un troisième système qui a évolué ? on peut l'appeler S3. Ajouté ce système pour les prochaines questions.

**29. Les grands systèmes de production sont : SRT, SD, et peut-être S3**

- 1. Chaque saison, 2. Souvent, 3. De temps en temps, 4. Rarement, 5. Jamais,
  - SRT : \_\_\_\_\_
  - SD : \_\_\_\_\_
  - S3 (Système qui a évolué de SRT ou SD) : \_\_\_\_\_

**30. Si des changements sont constatés (dans le tableau 19) dans les pratiques AVANT et maintenant: Listez ces pratiques et demander le producteur pourquoi ils ont changé ces pratiques ? Avantages et désavantages : Expliquez en phrases complet/en détail, pas seulement des mots-clés**

- Pratique 1 : \_\_\_\_\_
  - Avantages
  - Désavantages
  
- Pratique 2 : \_\_\_\_\_
  - Avantages
  - Désavantages
  
- Pratique 3 : \_\_\_\_\_
  - Avantages
  - Désavantages
  
- Pratique 4 : \_\_\_\_\_
  - Avantages
  - Désavantages

- Pratique 5 : \_\_\_\_\_

- Avantages
- Désavantages

- *Ajoutez d'autres pratiques au verso de ce page si nécessaire) -*

**31. D'où sont venus les changements ? Expliquer un à un**

\*

\*

\*

\*

**32. Selon votre opinion quel système se comporte le mieux ?**

En termes de Perception, Indiquez 1-4 (1 c'est le mieux) ;  
*Si le producteur ne semble pas avoir une opinion, ne forcez pas la réponse, et cocher avec un X.*

	SRT	SD	S3
Rendements			
Bénéfices Économiques			
Utilisation moins d'Eau			
Résistance à la sécheresse			
Résistance aux vents			
Résistance aux inondations			

----- F I N -----

## APPENDIX B2

### Focus group SRI : Adoption et adaptation du SRI, Projet AVANSE, Juin 2019

#### Préparation pour le focus group

- Contacter l'agent de l'équipe riz pour contacter les producteurs
- Composition du groupe :
  - 6- 10 Producteurs avec différentes opinions, situations rizicoles et adoption des techniques, pas seulement les meilleures paysans SRI ( ! )
  - Respecter le genre
- Prenez le nom et numéro de téléphone de personne de contacte
- Demander s'il y a un endroit un peu privé pour bien s'échanger
- Demander s'il y a des chaises, si non amener-les
- Organiser les boissons et goutés bien en avance avec l'administration
- Appelez la personne de contact à l'heure de départ pour confirmer votre arrivée.
- Respectez l'heure du rendez-vous, arrivez un peu en avance.
- Éviter si possible la présence des personnes extérieures pour mettre les producteurs à l'aise

#### A noter :

- Localité de rencontre :
- Date :
- Début de la rencontre (heure) :
- Fin de la rencontre (heure) :
- Noms (et fonctions) des participants (indiquez le genre):
- Noms des enquêteurs :

#### Introduction :

- Bonjour tout le monde, merci d'être venu à notre rencontre etc.
- Nous sommes de l'AVANSE,
- Nous faisons partie de l'équipe suivi/évaluation,
- Comme vous le savez, le projet AVANSE se termine bientôt
- Nous aimerions échanger avec vous pour mieux comprendre la situation de la riziculture
- Nous aimerions comprendre ce qui marche bien/mieux et ce qui ne marche pas si bien.
- Et tirer des leçons sur l'avancement des techniques rizicoles, surtout en référence avec le SRI.
- Chaque opinion compte, et nous voulons vous tous écouter et apprendre de vous.

#### A la fin de l'entretien :

- Remerciement et demander si les participants ont quelque chose à ajouter ou partager. Échanger avec eux, jusque tout le monde est à l'aise, remerciement encore une fois.

- Apporter les boissons et goutés

## QUESTIONS

### Général : SRI et son adoption

1. Depuis quand connaissez-vous le SRI ? Tout le monde connaît le SRI ? (confirmez)
2. Qu'est-ce que le SRI ? Bref : (pratiques essentielles)
  - a. *Repiquage des jeunes plants (8-12 jours)*
  - b. *1 plant/poquet ;*
  - c. *Écartement élargi, planté en ligne ;*
  - d. *Alternance irrigation et assèchement*
3. Pouvez-vous pratiquer le SRI ?

### Adoption des pratiques

4. **Quelles pratiques SRI adoptez-vous, lesquelles n'adoptez-vous pas ?**
  - Les quelles sont faciles ou difficiles à adopter ?
5. Quelles sont les **raisons (adoption/non adoption) ?**
  - Entrer en détail de chaque pratique particulièrement mentionnée par les producteurs.
  - Essayer de comprendre en détail, demander l'opinion des autres dessus, approfondissez
6. Quelles sont les **contraintes majeures** qui influences les pratiques rizicoles ?
7. Quelles sont les **pratiques qui marchent le mieux pour vos conditions ?**
  - Pourquoi
  - Collecter les différences des opinions

### Contexte

8. Qu'est-ce qui a **changé pour le mieux ou pour le pire au cours des 10 à 20 dernières années** dans la production de riz ?
9. ***Si approprié*** : quel est **l'impact économique du SRI** ? Si non, une autre question selon situation.
10. Comment la **sécheresse de 2019** a affecté vos conditions de vie ?

## APPENDIX B3

### Focus group 2 : Caractérisation du Périmètre Irrigué (Consulter les cartes et autres infos de l'infrastructure)

#### Discussion avec un petit groupe des personnes de ressources

- Localité de rencontre :
  - Date :
  - Début de la rencontre (heure) :
  - Fin de la rencontre (heure) :
  - Noms et fonctions des participants (indiquez m, f) :
  - Noms des enquêteurs :
- 

#### Questions :

- Nom du IP :
- Historique (année de construction et bailleur)
- Superficie totale ; Nombre d'ha.
- Connections avec autres IP ou isolé
- Nombre total de paysans
- Superficie moyenne de parcelles de riz par producteur
- Superficie minimum et maximum pour 1 producteur :
- Quel est le calendrier cultural normal pour ce PI ?
  - Saison 1, (hiver)
  - Saison 2 (été)
  - Rendement moyen S1 (même que S2 ?)
  - Rendement moyen S2
  - Si approprié - Rendement SRI ? pour les deux saisons ?
- **Gestion de l'eau :**
  - Dans quels mois l'eau est disponible dans tout le PI ?
  - Est-ce qu'il y a des sections qui sont typiquement inondés dans certaines périodes ?  
Oui/Non
    - Si oui, dans quels mois
    - Taille de cette section par rapport à la totalité du PI
    - Hauteur moyenne de l'inondation ?
  - Est-ce qu'il y a des sections qui s'assèchent régulièrement ? Oui/Non
    - Si oui, dans quels mois
    - Taille de cette section par rapport à la totalité du PI
    - Hauteur moyenne de l'inondation ?
- **Association des usagers :**
  - Comment cela fonctionne ?
  - Fonctionne bien ou non ?
  - Est-ce que les producteurs paient pour l'eau ? si oui combien ?
- **Sols :**
  - Quelle est la qualité du sol ?

- Très fertile, moyennement fertile, non fertile
  - Lourdes (argileux), moyenne (limoneuse), léger (sableuse)
  - Est-ce que la fertilité du sol diminue ?
  - Il y des contraintes du Sol?
- **Stress biologiques** : (Spécifiez)
  - Maladies :
  - Peste :
  - Mauvaises herbes :
- **Accès aux intrants** : Où approvisionnez-vous
  - En semences ? Qualité/Disponibilité
  - En fertilisants ? Qualité/ Disponibilité
  - En pesticides ? Qualité/ Disponibilité
- Est-il possible **d'accéder au crédit** pour la production de riz ? Combien d'agriculteurs y ont-ils accès ? (En pourcentage)
  - Conditions du Crédit ?
- **Accédez-vous aux équipements agricoles**
  - Liste des équipements et autres outils existant sur le périmètre irrigué ;

	Disponibles sur PI (oui/non)	% de Producteurs utilisent
Tracteur		
Motoculteur		
Traction animale		
Roller Marker		
Sarclouses		
Combine-récolte		
Batteuse		

- **Main d'Œuvre**
  - Travaux essentiellement fait par
    - Par les hommes
    - Par les femmes
  - Quels travaux sont partagé ?
  - Fréquence de MO familiale, Salarie, Konbit sur ce PI ?
- **Tenure foncière**, caractéristiques générales : quelles situations rencontre-t-on sur ce périmètre ? (circle)
  - 1.. Achat ; 2. Héritage 3. Métayage 4. Affermage 5. Etat/Usufruit 6. Membre de Famille 7. Prêt de terrain 8. Hypothèque
  - Quels sont les trois plus importants : (écrire le numéro)
  - Est-ce que les parcelles changent souvent entre cultivateurs ? Quelle est la fréquence et quelle est la raison.
- **Contraintes sur le périmètre irrigué ?**
- Comment la **sécheresse de 2019** a influencé le PI ?