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50,000 FARMERS IN 13 COUNTRIES

RESULTS FROM SCALING UP THE SYSTEM OF RICE INTENSIFICATION IN WEST AFRICA

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Author Information:

Dr. Erika Styger, Associate Director, Climate-Resilient Farming Systems, International Programs, College of Agriculture and Life Sciences, Cornell University, Ithaca, USA, and Technical Lead of the Regional Coordination of the SRI-WAAPP project (2014 to 2016).

Dr. Gaoussou Traoré, Coordinator of the National Center of Specialization on Rice (NCoS-Rice) based in Mali, and Regional Coordinator of the SRI-WAAPP project (2014 to 2016). Currently retired.

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50,000 FARMERS IN 13 COUNTRIES

RESULTS FROM SCALING UP THE SYSTEM OF RICE INTENSIFICATION IN WEST AFRICA

Achievements and Regional Perspectives for SRI

SRI-WAAPP, 2014-2016

PROJECT SUMMARY REPORT

Erika Styger and Gaoussou Traoré

The West and Central Africa Council for Agricultural Research
and Development (CORAF/WECARD)

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ACRONYMS

ADRA	Adventist Relief Agency
ACDI/VOCA	Agricultural Cooperative Development International/ Volunteers Cooperative Assistance (USA)
AEL	Association of Evangelicals of Liberia
AIMS Inc	Associates for International Management Services
AMAPAD	Association Mawouro-bi pour la Promotion de l'Agriculture Durable (Burkina Faso)
AMSIG	Amsig Resources Ltd, Ghana
ANADER	Agence Nationale d'Appui au Développement Rural (Côte d'Ivoire)
ANARIZ-CI	Association Nationale des Riziculteurs de Côte d'Ivoire
ANCAR	Agence Nationale de Conseil Agricole et Rural (Senegal)
ARPASO	Association des riziculteurs des plaines aménagées de San ouest
CCR-B	Conseil de Concertation des Riziculteurs du Benin
CDA	Centro de Adoración (Liberia)
CHAP	Community of Hope Agriculture Project (Liberia)
CNRA	Centre National de Recherche Agronomique (Côte d'Ivoire)
CNS-Riz / NCS-Rice	Centre National de Spécialisation sur le Riz/ National Center of Specialization in Rice
CODEGAZ	Une Association Humanitaire Internationale
CORAF/ WECARD	Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricoles/West and Central African Council for Agricultural Research
CRCOPR	Cadre Régional de Concertation des Organisations des Producteurs de Riz
CRS	Catholic Relief Services
CSIR	Council for Scientific and Industrial Research (Ghana)
CSIR-SARI	Council for Scientific and Industrial Research – Savanna Agricultural Research Institute (Ghana)
DeDESC	Développement Durable, Economic et Socio-Culturel (Benin)
DNA	Direction Nationale de l'Agriculture (Mali)
DRARHASA	Direction régionale de l'agriculture, des ressources hydrauliques, de l'assainissement et de la sécurité alimentaire (Burkina Faso)
E-ATP	Expanded Agribusiness and Trade Promotion project (Burkina Faso)
ECOWAS	Economic Community of West African States
ENAE	Ecole Nationale de l'Agriculture et de l'Elevage (Guinea)
ESOP	Entreprises et services d'organisation des producteurs (Togo)
ESRI	Environmental Systems Research Institute, USA
ETD	Entreprises Territoires et Développement (Togo)
FAO	Food and Agriculture Organization of the United Nations
FBO	Farmer-based Organizations
FIRCA	Fonds Interprofessionnel pour la Recherche et le Conseil Agricole (Côte d'Ivoire)
GRAPHE	Groupe Chrétien de Recherche-Actions pour la Promotion Humaine (Togo)
GRIB	Ghana Rice Interprofessional Body
IBT	Institut Biblique de Telekoro (Guinea)
ICAT	Institut de Conseil d'Appui Technique (Togo)

(additional acronyms for institutions active with SRI in the region can be found at the end of each country chapter)

IER	Institut d'Economie Rurale (Mali)
IFAD	International Fund for Agricultural Development
IFDC	International Fertilizer Development Centre
IICEM	Integrated Initiatives for Economic Growth project (Mali)
INERA	Institut de l'Environnement et de Recherches Agricoles (Burkina Faso)
INRAB	Institut National des Recherches Agricoles du Benin
INRAN	Institut National de la Recherche Agronomique du Niger
IP	Innovation Platform
IRAG	Institut de Recherche Agronomique de Guinée
ISAV	Institut Supérieur Agronomique et Vétérinaire de Faranah (Guinea)
ITRA	Institut Togolais de Recherche Agronomique (ITRA) (Togo)
IVS	Inland Valley Swamps
JICA	Japan International Cooperation Agency, Project
LRC	Law Reform Commission (Liberia)
M&E	Monitoring and evaluation
NARI	National Agricultural Research Institute - The Gambia
NAWFA	Gambia National Women Farmers Association
NCRI	National Cereals Research Institute (Nigeria)
NGO	Non-governmental organization
PADAER	Programme d'Appui au Développement Agricole et à L'Entreprenariat Rural, Senegal
ProCAD	Programm Cadre d'Appui à la Diversification Agricole (Benin)
PRODAM	Projet de Developpment Agricole de MATAM (Senegal)
RCU	Regional Coordination Unit of SRI-WAAPP
ROPPA	Réseau des Organisations Paysannes et des Producteurs de l'Afrique de l'Ouest
SAED	Société Nationale d'Aménagement et d'Exploitation des Terres du Delta, du Fleuve Sénégal et des Vallées du Fleuve Sénégal et de la Falémé (Senegal)
SAPEC	Smallholder Agricultural Productivity Enhancement and Commercialization Project (Liberia)
SARI	Savanna Agricultural Research Institute (Ghana)
SLARI	Sierra Leone Agricultural Research Institute
SRI	System of Rice Intensificaiton
SRI-Rice	SRI International Network and Resources Center, Cornell University
SRI-WAAPP	Improving and Scaling Up the System of Rice Intensification in West Africa Project
UNMIL	United Nations Mission in Liberia
USAID	United States Agency for International Development
WAAPP/ PPAAO	West Africa Agricultural Productivity Program/ Programme de Productivité Agricole en Afrique de l'Ouest
WARC	West African Rice Company (Sierra Leone)

PREFACE

For an organization that has been around for more than 30 years, we are not unaware of the challenges associated with successfully scaling up best practices. But in our recent experience implementing the System of Rice Intensification (SRI) method across fields in West Africa, we have found many relevant lessons and perhaps a fitting opportunity to considerably increase rice productivity in the region.

The 'Improving and Scaling Up the System of Rice Intensification (SRI) in West Africa' (SRI-WAAPP) project was implemented from January 2014 to December 2016 as part of the West Africa Agricultural Productivity Program (WAAPP). It was funded under the WAAPP regional competitive grant scheme managed by the West and Central Africa Council for Agricultural Research and Development (CORAF).

Its impressive results and significant impacts made this project one of the most successful in the CORAF portfolio.

The project benefited more than 50,000 farmers directly and reached more than 750,000 people in total -- of whom 31.6% were women -- across the 13 participating countries in West Africa. Yields for farmers increased overall by 56% for irrigated rice and 86% for lowland rain fed rice by merely planting rice differently and in keeping with the SRI method. An independent socio-economic impact assessment by the US consulting firm Associates for International Management Services confirmed these findings. The study shows that in the areas covered by the surveys, SRI practice produced results much superior to conventional rice production practices, showing increased yields of 54% under irrigated systems, 65% in the rainfed lowlands, and 153% in the rainfed upland systems. Similarly, the average income for farmers using SRI was 41% higher than for those using conventional practice. The study concluded that the project "has proven that SRI can contribute successfully to improving agricultural productivity in West Africa." I refrain from giving away more details so as not to spoil the readers' pleasure in discovering the facts for themselves.

The SRI-WAAPP project has been groundbreaking from its conception. The project is the outcome of both a participatory design and a collective request for funding from the many organizations, institutions, and development partners in the thirteen countries implementing the WAAPP. Because of this broad support and extensive geographic coverage – a world-first for SRI – the executives at CORAF did not hesitate to approve the request. Furthermore, the project integrated very well with ECOWAS agricultural policy (ECOWAP) and its regional 'Rice Offensive,' as well as CAADP. Unusually, all field dissemination activities were designed, planned, executed, and evaluated by the national teams, which also included pilot rice farmers or "SRI champions". Regional coordination of the project was assured by the National Center of Specialization on Rice (CNS-Riz) at the Institute of Rural Economy (IER) in Mali, in partnership with the renowned Cornell University in the USA.

All this made it possible to move beyond the outdated, dogmatic vision of SRI as a rigid technology. Farmers – trained in the guiding principles of SRI – adapted their rice production practices, developed innovations and achieved substantive improvements compared to their previous methods of growing rice.

This book summarizes achievements in all 13 countries along with consolidated analysis for the region as a whole, compiled by team members from each of the nations and the regional coordination unit. It is therefore quite logical that this deliberately concise book will meet the expectations of its target audiences: rice farmers, extensionists, researchers, financial and technical partners, and policymakers, both in Africa and elsewhere. It is easy to read, with captivating illustrations, success stories, relevant analyses, and lessons learned. If the recommendations made herein are implemented, no doubt continued scaling-up SRI can significantly contribute to the goal of rice self-sufficiency by 2025, as targeted under the ECOWAS 'Rice Offensive.'

As this excellent document is based on the results obtained in rice farmers' fields across West Africa, those who practice SRI and are committed to using it, I strongly recommend reading it closely, to share it widely, and especially to work to carry out its recommendations.

I wish everyone an excellent read.

Dr. Abdou TENKOUANO
EXECUTIVE DIRECTOR OF CORAF

ACKNOWLEDGMENTS

The authors would like to express their gratitude to all those who collaborated on the SRI-WAAPP project – managers, researchers, extension staff and farmers – far too many to be able to list individually. Special thanks go to Dr. Abdoulaye Touré, World Bank regional task team leader for the WAAPP, without whom this project would not have been possible. We would also like to convey our sincere thanks to the directors and managers of CORAF/WECARD and the WAAPP, especially Dr. Niéyidouba Lamien and Dr. Ousmane Ndoye, and the national WAAPP coordination teams, whose leadership and support have been critical to the project's success.

It has been a remarkable journey and adventure, characterized by commitment, hard work and genuine teamwork; the largest regional SRI project ever undertaken in the world, spanning 13 countries across West Africa.

This document is an attempt to summarize the many accomplishments of the country teams, to report on the achievements of the regional project coordination unit, and to provide some context for the scaling-up process of SRI in West Africa. We have done our best to provide a full and accurate account, but there are many stories to be told from such a large project, and we apologize in advance for any errors and omissions, which are certainly not intentional. This report presents a snapshot in time and many new activities have sprung up in the region since 2016. The story continues!

It has been a privilege to work on this project and we remain deeply indebted to everyone who has been a part of its success. The results speak for themselves: SRI has the potential to significantly contribute to the goal of rice-self-sufficiency in West Africa. The time is right to fully scale-up SRI.

Erika Styger and Gaoussou Traoré

EXECUTIVE SUMMARY

In 2010, West Africa produced 7.9 million tons of milled rice and imported an additional 5.7 million tons to satisfy demand. The ECOWAS Rice Commission estimates that by 2025 yearly rice consumption in West Africa will increase to 24 million tons (value of 12 billion USD), triple the 2010 production. The ECOWAS States – through their "Rice Offensive," supported by the National Rice Development Strategies – target self-sufficiency in rice production by 2025.

The System of Rice Intensification (SRI), an agro-ecological, climate-smart and low-input methodology for increasing rice productivity, can play a crucial role in closing the rice production gap in West Africa. Developed in Madagascar and practiced today in more than 55 countries, the SRI methodology allows increased yields, often by 50% or more, while using 90% less seed, 30-50% less water and less agro-chemicals. Based on the principles of early plant establishment, reduced competition among plants, soils rich in organic matter, and reduced water use, rice plants can better express their genetic potential compared to conventional approaches.

SRI trials in West Africa, beginning in 2000, have confirmed these advantages. Larger-scale expansion of SRI began in Mali in 2007, and by 2010, Malian SRI practitioners started to train farmers and agricultural technicians in other West African countries. Given the growing interest in SRI across the region, the first phase of the regional project ***"Improving and Scaling up the System of Rice Intensification in West Africa" (SRI-WAAPP)*** was commissioned and supervised by CORAF/WECARD , as part of the West Africa Agriculture Productivity Program (WAAPP), supported by the World Bank under the institutional umbrella of ECOWAS.

WHERE AND HOW WAS THE SRI-WAAPP PROJECT IMPLEMENTED?

The SRI-WAAPP project ran from January 2014 to June 2016, covering two main rice-growing seasons in 13 ECOWAS countries: Benin, Burkina Faso, Côte d'Ivoire, The Gambia, Ghana, Guinea, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo. Country-specific activities were funded through the national WAAPP programs and implemented with assistance from a national SRI facilitator and SRI champions. The project was coordinated by the National Center of Specialization on Rice, Institute of Rural Economy (CNS-RIZ/IER), Mali, and the SRI-Rice Center, Cornell University, USA. The regional coordination team provided training, technical assistance, monitoring and evaluation support, a communication platform, supported institutional set-up, and organized regional workshops to plan activities and share results. Field activities were largely defined at the country level, but used similar research and development approaches that integrated technical training, on-farm exchange visits, monitoring of field performance and economic outcomes, and applied field research.

SUCCESSES AND BENEFITS OF THE PROJECT

By June 2016, 50,048 farmers – of whom 33% were women – grew rice using SRI at 1,088 sites on 13,944 hectares across the 13 countries. The project trained 33,514 people, mostly farmers, but including 1032 technicians. The number of institutions working with SRI (including government services, NGOs, farmer organizations, and bi-lateral projects) increased from 49 to 215. The project reached more than an estimated 750,000 people in West Africa, through field visits, word-of-mouth, the press, radio and television.

SRI was implemented in both irrigated and rainfed lowland systems, at 40% and 60% of the sites respectively. Adaptations to upland and mangrove systems are underway. Yields from 733 SRI and adjacent conventional rice plots were evaluated across all countries and agro-ecological zones during the life of the project. The average SRI yield for irrigated rice was 6.6 t/ha compared to 4.23 t/ha for conventionally grown rice (N=292 sites), a 56% increase. For rainfed lowland systems, SRI yields averaged 4.71 t/ha, compared to 2.53 t/ha for conventional rice (N=441), an 86% increase. The estimated total additional quantity of rice produced with SRI at the SRI-WAAPP sites compared to conventional rice during the 2015/2016 growing season alone was 31,458 tons of paddy, or 20,113 tons of milled rice, representing a value of 10.07 million USD dollars.

OUTLOOK AND RECOMMENDATIONS

Slightly more than 50,000 SRI farmers achieved these results. But these farmers represent only 1.1% of the total number of rice farmers in West Africa. If 100% of rice farmers in West Africa had used SRI in 2017, rice self-sufficiency would already have been achieved with a 5% surplus (29.88 million tons of paddy produced compared to 28.48 million tons consumed), rather than the 54% it was in reality. Replacing rice imports with rice grown in the region would have saved 4.16 billion USD in foreign exchange for 2017 alone.

If SRI is to make a real contribution to rice self-sufficiency in West Africa, many more farmers must adopt it. How many farmers must be reached before we reach the "tipping point" where SRI becomes the standard for rice cultivation in West Africa? A possible target -- the second phase of SRI-WAAPP could consider -- might be a farmer adoption rate of 33%, reaching 1.5 million rice farmers and 2.43 million hectares. The base has been established with the first phase of SRI-WAAPP; the second phase can now focus on scaling up. For this we recommend reinforcing national and regional coordination, working directly with farmers and farmer organizations, improving and refining technical training and the monitoring system, emphasizing adaptations and innovations, and expanding the communication and advocacy platform.

[1] ECOWAS Commission (2012) Accelerating the ECOWAP/CAADP Implementation, Strategic policy paper on regional offensive for sustainable rice production in West Africa

[2] at 500 USD/ton of milled rice

[3] West and Central Africa Council of Agricultural Research and Development (http://www.coraf.org/en/)

I. INTRODUCTION

WEST AFRICA'S RICE CHALLENGE

West Africa is the rice basket of Sub-Saharan Africa, producing over two-thirds of its rice. It is a main staple crop, dating from more than 3500 years ago with the domestication of *Oryza glaberrima*, which is still found in a wide variety of rice production systems in the region. In the early 21st century, rice consumption in Africa has grown faster (6.3% per year from 2000-2007) than its production (3.7% per year from 1996-2006). The resulting gap was made up from imports from Asia, which accounted for more than 40% of the rice consumed in Africa. This exposed African nations to the volatility of world market prices, and placed a heavy burden on government budgets. This became apparent in 2008, when world prices for rice tripled in less than four months. Riots erupted over the unavailability of basic food staples in Burkina Faso, Cameroon, Côte d'Ivoire, Mauritania and Senegal. Given the importance of rice as a staple food in West Africa, African governments and donors have recognized the need to increase rice production and develop and disseminate improved rice production technologies, based on intensification rather than area expansion. Between 2009 and 2014, West African countries developed **National Rice Development Strategies** (NRDS), detailing plans to increase rice production. The Economic Community of West African States (ECOWAS) has been actively supporting the National Strategies under the ***Regional Rice Offensive*** to boost rice production with the goal of regional self-sufficiency by 2025 (ECOWAS, 2012).

Because the population in West Africa is predicted to grow from 300 million in 2010 to 450 million in 2025 (FAOSTAT, accessed October 2017), combined with an estimated increase in per capita consumption from 44 to 53 kilograms during the same time period (Fofana et al, 2014), overall regional rice consumption is projected to increase from 13.44 million tons of milled rice in 2010 to 24.1 million tons by 2025 (a 79% increase) – equivalent to 37.6 million tons of paddy (Fofana et al, 2014). This implies that rice production must triple from 2010 to 2025, based on milled rice production of 7.95 million tons in 2010. For West African countries to reach self-sufficiency in rice by 2025, production would need to increase by 8.3% per year from 2010 (Fofana et al, 2014). Table 1 shows the rice production, consumption, imports, population, per capita rice consumption, and self-sufficiency rate for the 13 ECOWAS countries for 2010, 2016/2017 and as estimated for 2025, based on the target for each country to reach 100% self-sufficiency in 2025 (any cross-border rice trade within the region is not considered, only imports from outside Africa).

Table 1: Rice production, consumption, imports, population, yearly per capita consumption, and self-sufficiency rate for 13 ECOWAS countries in 2010, 2016/2017 and as estimated for 2025*

2010	Production Paddy (t)	Production Milled (t)	Consumed Milled (t)	Imported Milled (t)	Population (million)	Per Capita Cons (kg/y)	% Self Sufficiency
Benin	124,975	78,734	414,583	335,849	9.51	44	19
Burkina Faso	270,658	173,221	410,726	237,504	15.63	26.3	42
Côte d'Ivoire	1,206,153	759,876	1,619,785	859,909	20.13	80	47
The Gambia	99,890	62,931	202,275	139,344	1.69	119	31
Ghana	491,603	309,710	629,853	320,143	24.32	26	49
Guinea	1,498,962	944,346	1,182,356	238,010	11.01	107	80
Liberia	296,090	186,537	481,040	294,503	3.96	122	39
Mali	2,305,612	1,452,536	1,510,130	57,594	15.17	100	96
Niger	103,125	66,000	311,000	245,000	16.29	19	21
Nigeria	4,472,520	2,817,688	4,700,447	1,882,759	159.42	29	60
Senegal	604,043	380,547	1,087,245	706,698	12.96	84	35
Sierra Leone	1,026,671	646,803	750,301	103,498	5.78	130	86
Togo	110,109	69,369	140,164	70,795	6.39	22	49
Total/Average	**12,610,411**	**7,948,296**	**13,439,903**	**5,491,606**	**302.26**	**44**	**59**
2016/2017							
Benin	235,001	151,000	626,000	475,000	11.46	55	24
Burkina Faso	381,000	244,000	619,000	375,000	19.17	32	39
Côte d'Ivoire	2,234,375	1,430,000	2,930,000	1,500,000	23.82	122	49
The Gambia	56,250	36,000	201,000	165,000	2.12	94	18
Ghana	609,375	390,000	1,065,000	675,000	28.66	37	37
Guinea	2,165,625	1,386,000	2,086,000	700,000	13.29	150	66
Liberia	261,538	170,000	430,000	260,000	4.73	91	40
Mali	2,710,938	1,735,000	1,835,000	100,000	18.69	102	95
Niger	117,188	75,000	395,000	320,000	21.56	18	19
Nigeria	4,331,000	2,772,000	4,972,000	2,200,000	191.84	26	56
Senegal	1,062,001	680,000	1,730,000	1,050,000	16.05	108	39
Sierra Leone	1,181,000	756,000	1,106,000	350,000	6.73	164	68
Togo	125,000	80,000	230,000	150,000	7.69	30	35
Total/Average	**15,470,291**	**9,905,000**	**18,225,000**	**8,320,000**	**365.81**	**50**	**54**

* Data compiled by authors from FAOSTAT database for 2010 (at 63% milling rate), Index Mundi database for 2016/2017 (at 64% milling rate) and Fofana et al (2014), estimated for 2025 (at 64% milling rate)

Table 1: continued

2025 estimated	Production Paddy (t)	Production Milled (t)	Consumed Milled (t)	Imported Milled (t)	Population (million)	Per Capita Cons (kg/y)	% Self Sufficiency
Benin	1,166,626	746,641	746,641	0	13.94	54	100
Burkina Faso	1,155,771	739,693	739,693	0	23.90	31	100
Côte d'Ivoire	4,558,034	2,917,142	2,917,142	0	28.72	102	100
The Gambia	518,854	332,067	332,067	0	2.70	123	100
Ghana	1,772,390	1,134,329	1,134,329	0	33.68	34	100
Guinea	3,327,119	2,129,356	2,129,356	0	16.25	131	100
Liberia	1,073,998	687,359	687,359	0	5.73	120	100
Mali	4,249,466	2,719,658	2,719,658	0	23.70	115	100
Niger	926,393	592,892	592,892	0	29.64	20	100
Nigeria	13,226,936	8,465,239	8,465,239	0	233.56	36	100
Senegal	3,059,480	1,958,067	1,958,067	0	20.04	98	100
Sierra Leone	2,111,327	1,351,249	1,351,249	0	7.87	172	100
Togo	438,370	280,557	280,557	0	9.35	30	100
Total/Average	**37,584,763**	**24,054,249**	**24,054,249**	**0**	**449.07**	**54**	**100**

* Data compiled by authors from FAOSTAT database for 2010 (63% milling rate), Index Mundi database for 2016/2017 (64% milling rate) and Fofana et al (2014), estimated for 2025 (64% milling rate)

In conclusion, although West Africa as a whole has shown good progress with 24% increased rice production since 2010, rice production for 2016/2017 (at 9.9 million tons of milled rice) is only 41% of the amount that will be needed by 2025 to achieve 100% self-sufficiency. Figure 3 summarizes rice production, consumption and imports for the 13 WAAPP countries in 2010, 2016/2017, and as predicted for 2025. The charts for each of the countries can be found in the country chapters of this publication.

In addition to rapidly growing consumption, challenges to reach self-sufficiency are exacerbated by the impacts of climate change on agriculture. Weather-related crop failures are predicted to intensify in

WHERE DO WE STAND IN 2017?

From 2010 to 2016/2017, production increases of 79-92% were achieved in Benin, Côte d'Ivoire and Senegal, followed by Guinea and Burkina Faso at 47% and 41% respectively. In Ghana, Mali, Sierra Leone, Niger and Togo production increases were more moderate, between 14% and 24%, and in Nigeria, Liberia, and The Gambia, rice production decreased in 2016/2017 from 2010 (Figure 1). The largest rice producers in West Africa are Nigeria, Mali, Guinea and Côte d'Ivoire, which combined account for almost 75% of the total regional rice production (Index Mundi database, 2017).

Although overall regional rice production increased by 24% from 2010 to 2016/2017, rice consumption was up by 35%, faster than expected. Thus, during this period regional self-sufficiency declined from 59% to 54%. Only four countries exhibited increased rice self-sufficiency between 2010 and 2016/2017, with Benin and Senegal leading at 5% and 4%, followed by Côte d'Ivoire (2%) and Liberia (1%). Self-sufficiency rates declined in all the other countries compared to 2010. The countries with the highest self-sufficiency rates in 2016/2017 were Mali (95%), Sierra Leone (68%), Guinea (66%), and Nigeria (56%), while the rates were between 35-49% for Côte d'Ivoire, Liberia, Burkina, Senegal, Ghana and Togo. The lowest rates were found in Benin, Niger, and The Gambia at 18-24% (Figure 2).

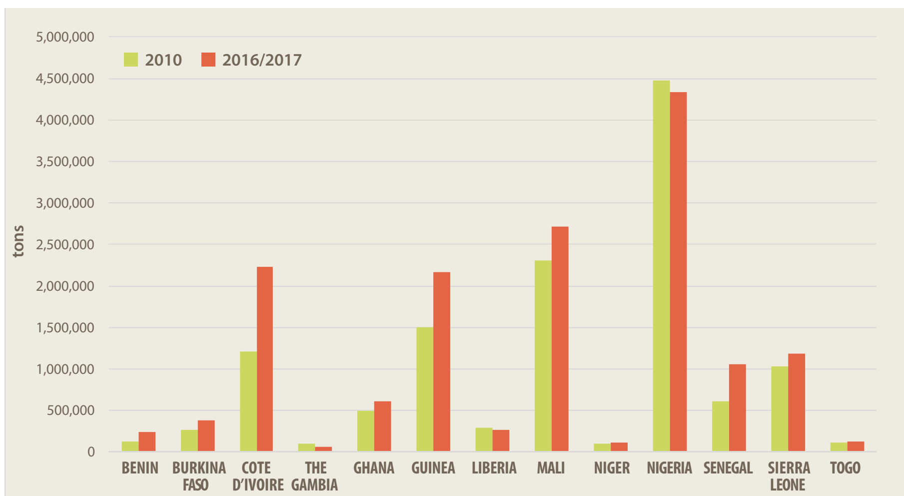


Figure 1: Paddy rice production (t) for 13 West African countries in 2010 and 2016/2017 (Data compiled by authors from FAOSTAT database, Index Mundi database)

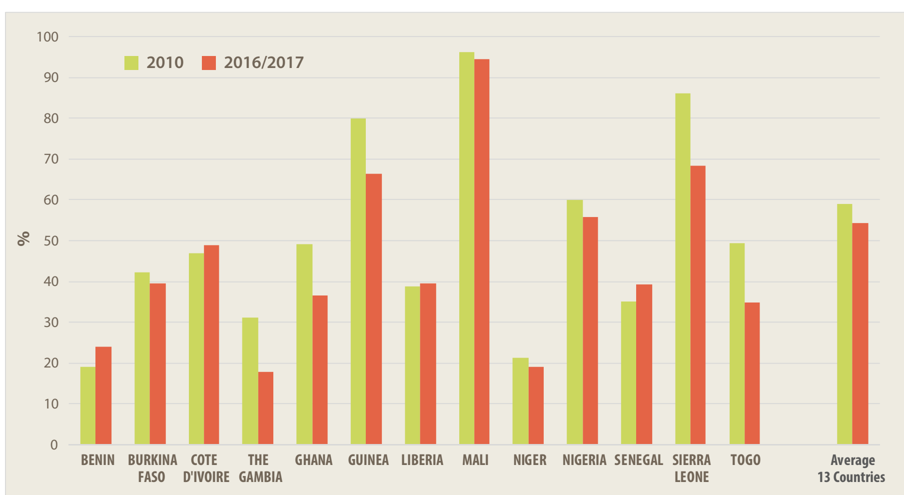


Figure 2: Rice self-sufficiency rate (%) for 13 West African countries in 2010 and 2016/2017 (Data compiled by authors from FAOSTAT database, Index Mundi database)

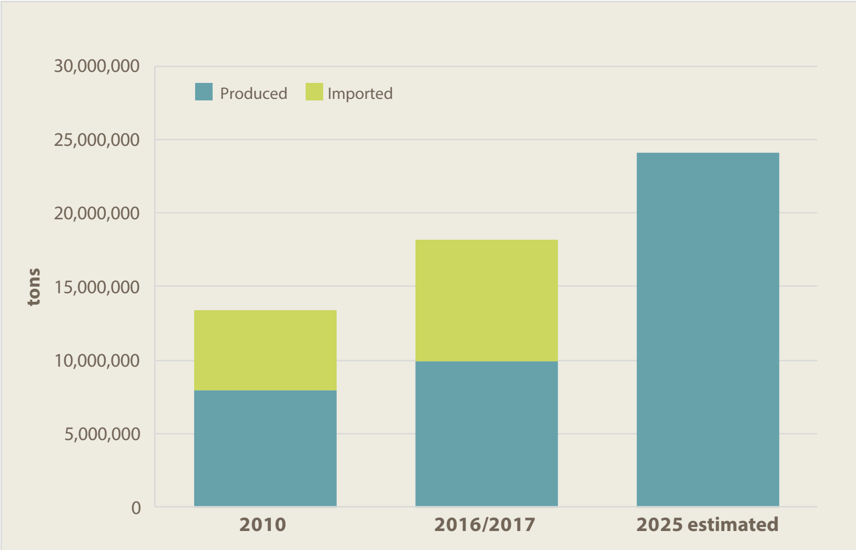


Figure 3: Rice consumption, as a composite of production and import (milled rice in t), for 13 West African countries in 2010, 2016/2017 and estimated for 2025

West Africa, with resulting economic losses and undermined food security. Rainfed rice yields are predicted to decrease by 5-25% between 2000 and 2050 due to climate change in most countries along the West African coast if no adaptation measures are undertaken (IFPRI, 2013).

On the other hand, as laid out in the *Regional Rice Offensive*, West African governments are well aware of the substantial untapped potential for developing rice production in the region: most importantly considering the low overall yields – 2.1 t/ha in 2010 -- and large unused land areas suitable for irrigated or rainfed lowland rice. Climate-smart rice production methods show promise to help meet the targets for regional self-sufficiency, delivering needed productivity increases while improving resilience towards climate change. The **System of Rice Intensification (SRI)**, which is especially suitable for smallholder rice farmers in West Africa, has proven to be such a method.

The West Africa Agriculture Productivity Program (WAAPP) -- executed in 13 West African countries, led by the West and Central African Council for Agricultural Research (CORAF/WECARD), and funded by the World Bank -- recognizing the potential of using SRI in the region, initiated and supported the **"Improving and Scaling-up the System of Rice Intensification (SRI) in West Africa"** project (or the SRI-WAAPP project) from 2014 to 2016.

THE SYSTEM OF RICE INTENSIFICATION (SRI) AND CONCEPTUAL FRAMEWORK FOR WEST AFRICA

The System of Rice Intensification, commonly known as SRI, is an agro-ecological and climate-smart rice production methodology that allows farmers to increase rice productivity while using less seed and water, and fewer purchased agro-chemical inputs. At the same time, SRI rice fields adapt better to climate change and give off fewer greenhouse gas emissions. Unlike other agriculture strategies, SRI does not rely on new varieties, fertilizers, pesticides, or infrastructure to raise yields. Instead, SRI is a knowledge-based crop management approach that allows plants to better express their genetic potential, which leads to improved plant growth and productivity. The combination of simple changes in agronomic practices, which became known as SRI, was developed during the 1980s by a Jesuit priest in close collaboration with farmers in Madagascar. Since 2000, SRI has spread to many other countries, and today we estimate that 10-15 million farmers benefit from the application of this methodology in more than 55 countries of Asia, Africa and Latin America (see Figure 4).

Rice production systems in West Africa are highly diverse, ranging from rainfed upland and rainfed lowland systems to irrigated systems, and also include the lesser-known mangrove, deep-water and recession rice systems. Rice is planted in all climate zones in West Africa, from arid desert climates in northern Senegal, northern Mali and Niger to rainforest regions in Liberia, Guinea and Sierra Leone.

For the 13 WAAPP countries, according to Diagne et al (2013, reporting data from 2009), upland rice systems occupy 43% of West Africa's rice-growing area and account for 37% of total production. Rainfed lowland systems cover 40% of the total area and account for 42% of total production. Yields for these two systems average 1.38 t/ha and 1.65 t/ha respectively. Irrigated production occupies only 11.6% of land area, accounting for about 17% of total production with average yields of 2.32 t/ha. A fourth category, including smaller systems such as mangrove and recessional, cover about 5% of the area and account for 4% of total production.

For this regional SRI-WAAPP project to be successful, it was important to share the same understanding of SRI from the start. The regional coordination team proposed a simple, operational conceptual framework (Styger and Jenkins, 2014), which was unanimously adopted by the SRI-WAAPP country teams (Figure 5). The conceptual framework identifies four SRI ***principles*** that define the SRI methodology and remain the same for all rice systems and climate zones. The crop production ***practices*** used to implement the four principles, on the other hand, can vary and need to be adapted to local conditions.

The four SRI principles are:

- Encourage early and healthy plant establishment;
- Minimize competition among plants;
- Build up fertile soils rich in organic matter and soil biota; and
- Manage water to avoid both flooding and water stress.

These four SRI principles interact synergistically and induce a response in the plants, causing them to grow deeper and fuller roots, develop more tillers, and produce healthier, fuller and larger panicles with higher quality grain.

Common SRI **practices** for growing irrigated rice, for which SRI was initially developed, include:

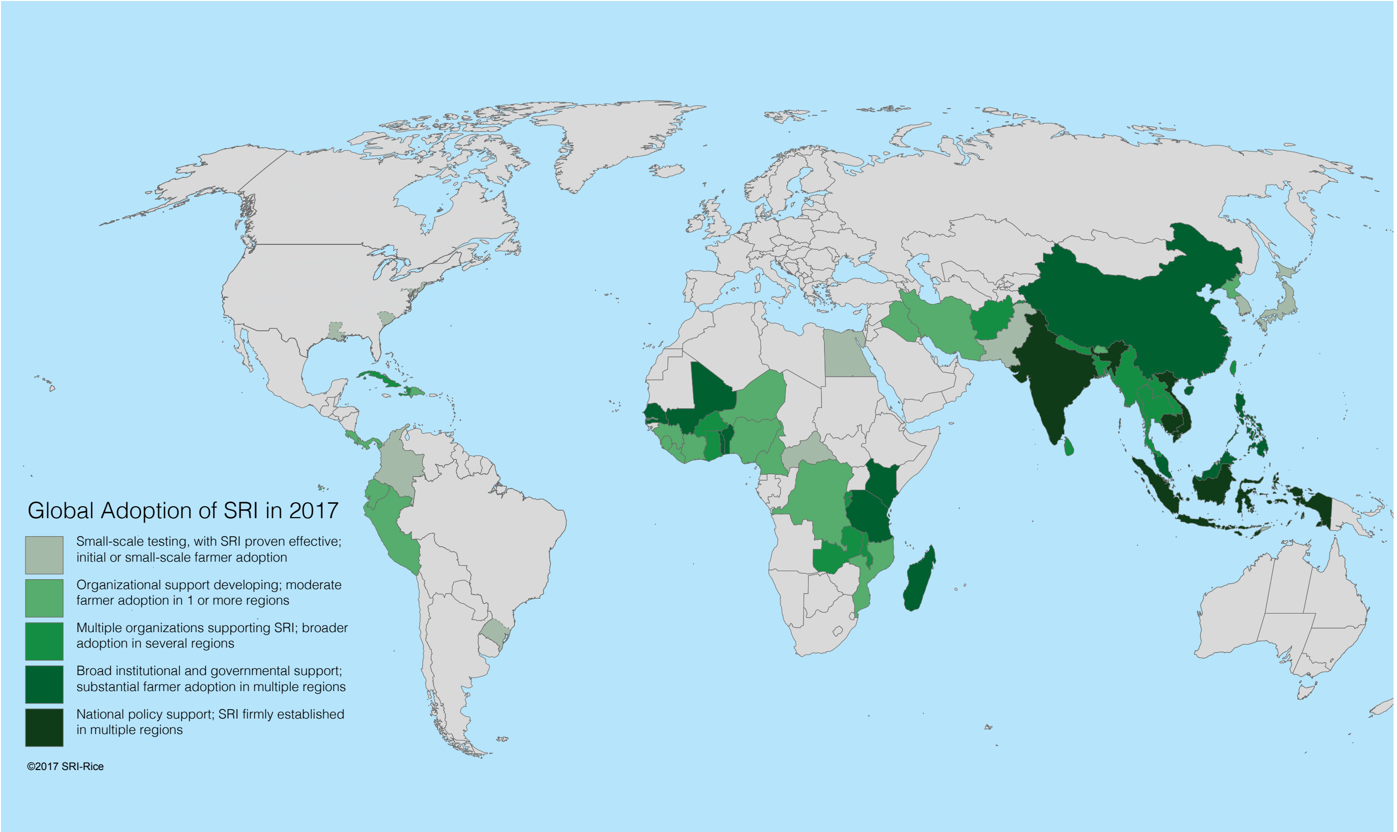


Figure 4: Global spread of SRI in 2017

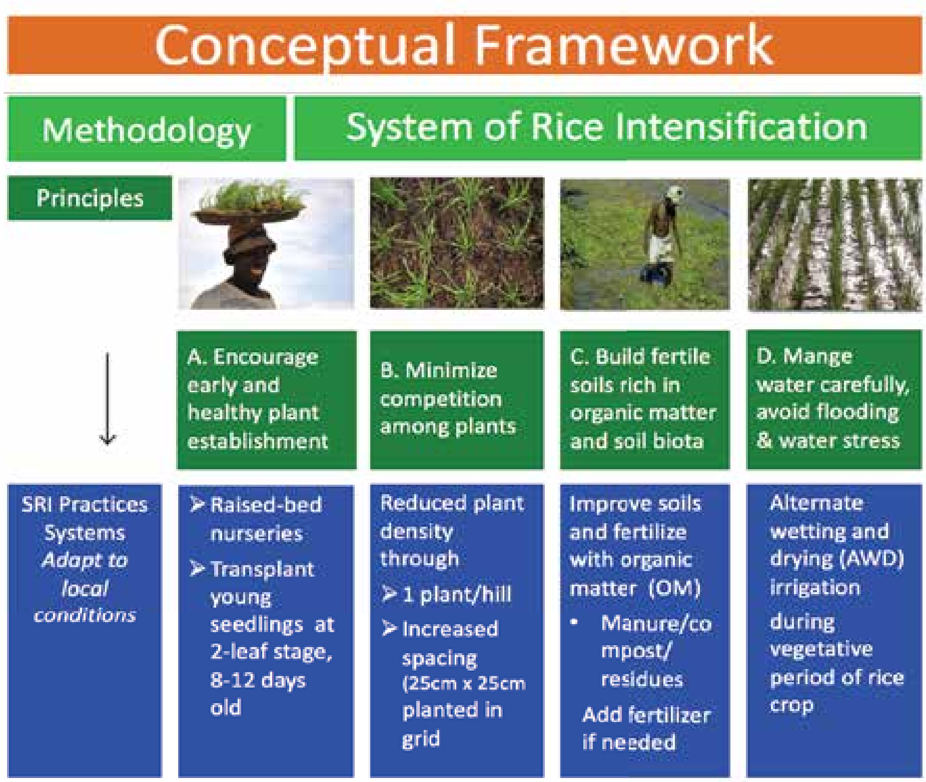


Figure 5: SRI conceptual framework as adopted by SRI-WAAPP

- Separate viable from non-viable seeds by soaking them in salt water or plain water; this also speeds up germination process (principle 1).
- Sow seeds non-densely on a raised-bed, unflooded nursery with well-structured, well-drained and fertile soil (principles 1, 2, 3, 4).
- Transplant single young seedlings at the 2-leaf stage, usually between 8-12 days old, in a grid pattern with wide spacing between hills; 25 cm x 25 cm is usually a good distance to start with (principles 1, 2).
- Follow alternate wetting and drying irrigation methods during the period of vegetative growth, and avoid deep flooding thereafter (principle 4).
- Apply composted organic matter as base fertilization, and complement with mineral fertilizer as needed (principle 3).
- Control weeds with a mechanical weeder that incorporates them into the soil and also enhances soil aeration (principles 2, 3, 4).

Although SRI was originally developed for irrigated rice, for which full water control is possible, SRI practices have been successfully adapted to rainfed rice production. This has been especially true in West Africa, where most rice is grown in rainfed systems. Although conditions across West Africa may not always allow perfect implementation of the four principles, applying these principles, combined with an understanding of the synergies created, can go far to optimize crop management.

Examples of successful variations in practice under rainfed conditions -- often characterized by broadcasting seeds or by seeding multiple seeds/hill -- are i) direct-seed only 2 seeds/hill or ii) transplant seedlings after rains have set in. Location-specific water management practices for rainfed SRI include i) bunding of plot boundaries, ii) mulching of the field to conserve soil moisture, and iii) adjust the cropping calendar to avoid heavy rains and deep flooding during the vegetative growth period of lowland rice. Other SRI practices developed for irrigated rice can be adapted to rainfed rice: e.g., organic fertilization of soil, wider spacing, and use of a soil-aerating weeder.

Refinements and adjustments of practices are greatly encouraged. Farmers constantly seek to optimize their practices, especially to adapt to climate change, and SRI lends itself very well to local innovation development. Farmers are encouraged to experiment and adapt freely, while striving to maximize the "SRI effect."

The regional nature of this project made it possible to connect researchers, extension staff, and farmers working under similar conditions across West Africa and help them to identify and share innovations. This enabled faster dissemination, adaptation, and adoption of SRI to different rice production systems, ultimately leading to better results.

SRI IN WEST AFRICA AND SRI-WAAPP PROJECT BACKGROUND

The first SRI trials in West Africa were undertaken in six countries from 2001 through 2007. Evaluations indicated substantial increases in yields, reaching 5.5t/ha-9t/ha for SRI plots compared to 2.5t/ha-5.5 t/ha in control plots under conventional practice. These first initiatives were either research efforts (The Gambia, Guinea, Senegal) or focused on testing SRI practices in farmer fields (Benin, Burkina Faso, Sierra Leone), but all were small-scale and largely unknown to each other. A more programmatic approach was developed in Mali since 2007, when the international NGO Africare started to evaluate SRI practice with farmers in the Timbuktu region, reaching average yields of 8-9t/ha. Attracted by these promising results, other programs and organizations, such as the USAID-funded Integrated Initiatives for Economic Growth in Mali (IICEM) project, the Syngenta Foundation, and the World Bank-funded project Fostering Agricultural Productivity Project (PAPAM) began working with SRI. SRI practices were introduced to farming communities in the Timbuktu, Gao, Mopti, Segou, and Sikasso regions of Mali. News about increased crop productivity and the economic benefits from using SRI spread quickly across the sub-region. From 2010 to 2012, the technical expertise gained in Mali helped train research and development professionals and farmers from Benin, Burkina Faso, Ghana, Nigeria, Senegal, and Togo, most importantly through the regional USAID-funded Expanded Agribusiness and Trade Promotion (E-ATP) project.

Participants of the Ouagadougou workshop in 2012

Demand for further expansion of SRI in the region accelerated as a result of a regional exchange visit to Mali organized by the National Center of Specialization in Rice (CNS-Riz/WAAPP) in 2011. Representatives from farmer organizations, extension and research services, and agribusinesses from Burkina-Faso, Côte d'Ivoire, Mali, Niger, and Senegal visited rice growers in the San region, who had adopted SRI on a large scale. The participants, impressed by the yield increases from using SRI, recommended that CNS-Riz/WAAPP work to promote SRI in West Africa. During the same period, the international SRI-Rice Center at Cornell University received frequent requests from West Africa for training and technical assistance.

In response to this increased interest across West Africa, representatives from the World Bank, CORAF/WECARD, CNS-Riz/WAAPP, and SRI-Rice from Cornell University met in February 2012 to discuss opportunities for a regional initiative to support the scaling-up of SRI across West Africa. CNS-Riz/WAAPP and SRI-Rice were delegated to organize a regional workshop to further explore possibilities. The workshop, held in Ouagadougou, Burkina Faso in July 2012 and co-sponsored by CORAF/WECARD, WAAPP-Burkina, Cornell University, and Oxfam America, brought together representatives from the 13 WAAPP countries to discuss the potential for SRI. They unanimously recommended that a proposal for a project to improve and scale up SRI in each of the 13 WAAPP countries be drafted and submitted to CORAF/WECARD. CNS-Riz together with SRI-Rice and with inputs from many partners in the region successfully developed this commissioned project, and in August 2013 representatives from the 13 countries met again at Saly, Senegal to review and approve the project document, and launch the project.

INTRODUCTION TO SRI-WAAPP

"Improving and Scaling up the System of Rice Intensification (SRI) in West Africa" (or the SRI-WAAPP project) ran from January 2014 to December 2016. Its objective was to increase rice productivity and competitiveness throughout the 13-country Economic Community of West African States (ECOWAS) project area: Benin, Burkina Faso, Côte d'Ivoire, The Gambia, Ghana, Guinea, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo. The project aimed to increase rice yields by 30% in targeted areas in each of the participating countries through the achievement of four results:

1. Human and institutional capacities of stakeholders in the SRI value chain in West Africa strengthened;
2. Appropriate innovations (equipment and/or best practices) for SRI developed, adopted and scaled up, in West Africa;
3. SRI stakeholders' demand for knowledge and decision-making options facilitated and met;
4. Efficient mechanisms and tools of coordination, management, and M&E of the project established.

The project was part of the larger **West Africa Agricultural Productivity Program (WAAPP)**. Funded by the World Bank, the WAAPP is a multi-year, 13-country regional effort to boost agricultural productivity across a series of key commodities -- dryland cereals, rice, roots and tubers, fruits and vegetables, fisheries, plantains, maize, and livestock -- through the development, dissemination, and use of improved agricultural technologies. As it supports the African Union's Comprehensive Africa Agricultural Development Program (CAADP) and the Africa Action Plan (AAP), the WAAPP platform is also meant to foster regional integration and strengthen linkages between research systems, extension and advisory services, farmers and agribusiness.

The **national WAAPP coordination offices** in each of the 13 countries administered the WAAPP interventions for that country. Each office coordinated, monitored and funded national SRI-WAAPP activities, and was responsible for monitoring and evaluation. The national coordination office in each country designated a **National SRI Focal Point Institution** and a **National SRI Facilitator**, responsible for technical coordination of all SRI activities in the country funded by WAAPP or others. A unique feature of project was the role of SRI Champions. These were either rice farmers or agricultural technicians who were committed to lead the promotion of SRI in their communities or as part of their professional activities. **SRI champions** received SRI technical training and worked closely with farmers on SRI extension (see Figure 6 for the institutional arrangements of the project).

The West and Central African Council for Agricultural Research and Development (CORAF/WECARD) managed the WAAPP on a regional level. For the SRI-WAAPP project, CORAF designated the **National Center of Specialization in Rice (CNS-Riz)**, housed at the Government of Mali *Institut d'Économie Rurale* (IER), to coordinate the regional, cross-border aspects of the project. CNS-Riz is the institution mandated under the WAAPP to develop and disseminate promising rice production technologies to the 13 countries in the region. For the SRI-WAAPP project, CNS-Riz teamed up with **System of Rice Intensification International Network and Resources Center (SRI-Rice)** from **Cornell University** based in Ithaca, New York (USA), to form the **regional coordination unit (RCU)**.

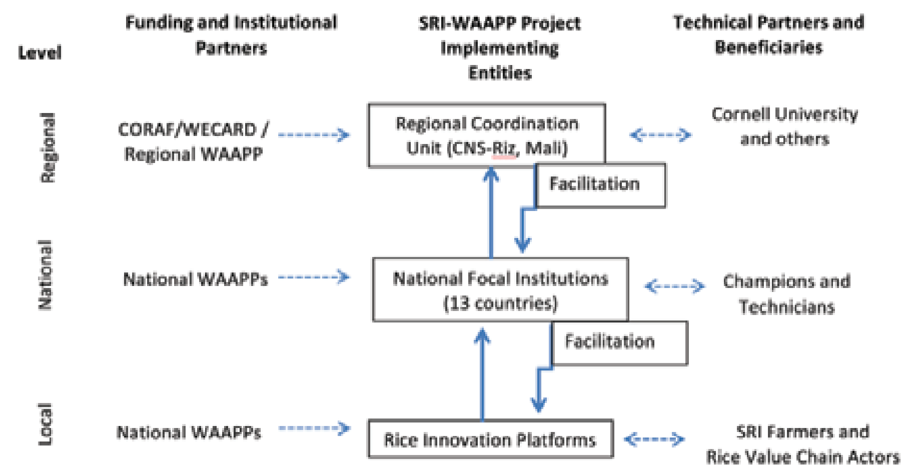


Figure 6: Institutional arrangement of SRI-WAAPP

The project operated at three levels: regional, national and local. The **national teams** developed the country plans, selected the project zones, set the national targets, and created coalitions of institutions to help with project implementation. They worked directly with farmers at **local level**, training them and providing technical field assistance; monitored field progress, and communicated results at the national level. Each national WAAPP office directly funded these in-country activities (see chapter 2 for details). The **regional coordination**, on the other hand, assured a harmonized technical and operational approach to SRI implementation across the entire region, assisted national offices with planning, budgeting, and reporting, provided monitoring tools, led in-depth technical training on SRI, created training materials, and maintained a regional communication platform, made available to countries to participate in. Funding for these regional activities were provided through CORAF/WECARD (see chapter 3 for details).

To date, the SRI-WAAPP project is the largest project for the dissemination of SRI ever undertaken in the world, and is considered unique for its integrated regional approach, the large number of countries involved, and its multi-institutional complexity.

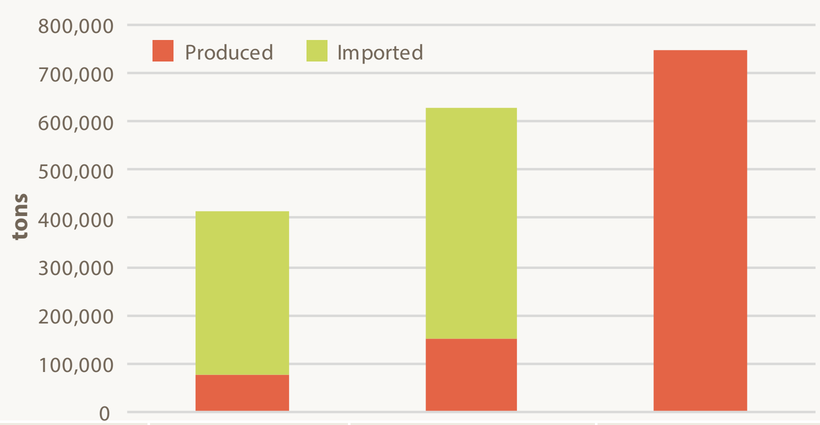
2. COUNTRY REPORTS

This section, produced by the country teams, summarizes achievements from each of the 13 countries under the SRI-WAAPP project. The names of core team members are listed at the end of each country chapter.

Each country chapter begins with a short overview of national rice production, consumption trends, a summary of local experience with SRI prior to SRI-WAAPP, then goes on to describe intervention approaches and project zones. The heart of each chapter is the summary presentation of results: yield comparisons, training reports, number of SRI farmers, and additional results from research, extension, or farmer activities and a success story. Additional information about participating institutions and publications produced is added at the end of each chapter. Due to limited space, the information in each chapter can represent only a snapshot of overall project activity, but more extensive reporting can be found on the project websites at https://sriwestafrica.org or https://sriafriqueouest.org.

BENIN

Benin reached 19% rice self-sufficiency in 2010. In the National Rice Development Strategy (NRDS, 2010) Benin targeted a production of 385,000 tons of milled rice (equal to 600,000 tons of paddy rice) by 2018, which would correspond to 68% self-sufficiency in that year. By 2016/2017, production had indeed increased by 88% since 2010, from 125,000 tons to 235,000 tons of paddy, but due to increased consumption, self-sufficiency had increased to only 24%. The NRDS' strategy was to increase production by expanding the rice-growing area from 35,020 ha in 2008 to 138,390 ha by 2018, combined with an average yield increase from 3 to 4 t/ha. By 2016/17, the rice-growing area had increased to 75,000 ha. This shows overall good progress since 2010, but in order to become self-sufficient by 2025, Benin will need to produce 1.166 million tons of paddy, nearly five times the production of 2016/2017 (Figure 7).



	2010	2016/2017	2025 estimated
Self-sufficiency rate (%)	19	24	100
Population (million)	9.51	11.46	13.94
Yearly per capita consumption (kg)	44	55	54
Production paddy (t)	124,975	235,001	1,166,626
Production milled (t)	78,734	151,000	746,641
Consumption milled (t)	414,583	626,000	746,641
Imported milled (t)	335,849	475,000	0

Data: Compiled by authors from FAO online database, Index Mundi online database, Fofana et al (2014)

Figure 7: Rice consumption, as a composite of production and imports, imports, self-sufficiency rate, population and per capita rice consumption for 2010, 2016/2017 and estimated for 2025 for the country of Benin

SRI ACTIVITIES PRIOR TO SRI-WAAPP

Although a first successful SRI trial was undertaken in 2002 (one farmer harvesting 7.5 t/ha rice), no further SRI activities are documented until 2009. During that year, a comprehensive evaluation of SRI was undertaken by Pascal Gbenou at Farm SAIN in Kakanitchoué, near Adjohoun in southern Benin. Based on results from 28 test plots, Pascal evaluated various components of SRI, including seedling age, plant density, use of compost and use of cono-weeders. Yield results were positive, enough so that the National Rice Growers Organization CCR-B planted 45 test plots at Dobga, on a natural flood plain with high natural soil fertility, the following year, in 2010. They obtained SRI yields of 5.76-9.83 t/ha under upland conditions -- increasing to as much as 11 t/ha in heavily manured plots -- and of 6.4-11.3 t/ha under lowland flooded conditions.

During 2012, the National Agriculture Research Institute INRAB, together with the extension service, held a national SRI workshop with 90 farmers, of whom 54 went on to set up SRI demonstration trials. In addition, the regional USAID-funded project E-ATP trained 43 people from 8 partner organizations (see Appendix 1). The 43 trainees went on to subsequently train 286 farmers, of whom 72 were women.

Other activities that year included trials undertaken by the International Fertilizer Development Centre (IFDC) in the Zou and Collines region and training carried out by the Peace Corps' West Africa Food Security Partnership (WAFSP) together with SRI-Rice from Cornell University. At two workshops, one in 2012 and one in 2013, WAFSP and SRI-Rice trained 49 Peace Corps volunteers and staff from Benin, the Gambia, Ghana, Guinea, Senegal, and Togo, and Songhoi Center staff from Benin and Nigeria, at the SAIN farm in Kakanitchoué.

In 2013, the NGOs DEDRAS and DeDESC, and the World Bank-funded PADA project began working with SRI in southern, central and northern regions in collaboration with the Regional Agriculture Center CARDER. To cite one result from the NGO DeDESC in the rainfed lowland area of Tchaourou, Department of Borgou, SRI yields over 10 sites averaged 4.34 t/ha compared to 1.84 t/ha using the conventional method. Although production costs per hectare for SRI were 249,500 CFA vs 182,800 CFA for conventional farming, net income per hectare using SRI was 401,500 CFA compared to only 93,200 CFA using conventional methods. In another activity, the national rice farmers organization CCR-B, which had been working with SRI since 2010, developed an inventory of SRI farmers in the Ouémé valley and the Plateau region, and published a technical manual for farmers using SRI.

In summary, before the SRI-WAAPP project began in 2014, many partners, including farmer organizations, the national research institute, local NGOs and multi-lateral projects, had begun to work on SRI in several regions throughout the country. The SRI-WAAPP national facilitator estimates that about 5600 farmers, of whom 1100 were women, were using the SRI method by the end of 2013. Approximate location of SRI sites at the beginning of project is show in Figure 8.

SRI-WAAPP PROJECT RESULTS

The National Agriculture Research Institute (INRAB), designated national SRI focal institution, based its approach on engaging already knowledgeable partners and SRI champions to undertake project activities: training farmers and technicians, setting up demonstration plots, and scaling-up SRI in all rice-producing regions of Benin. Although most work was focused on rainfed lowland rice systems, followed by irrigated systems, some farmers also adapted SRI to rainfed upland systems; see Figure 8 for a map with all the SRI-WAAPP sites by June 2016.

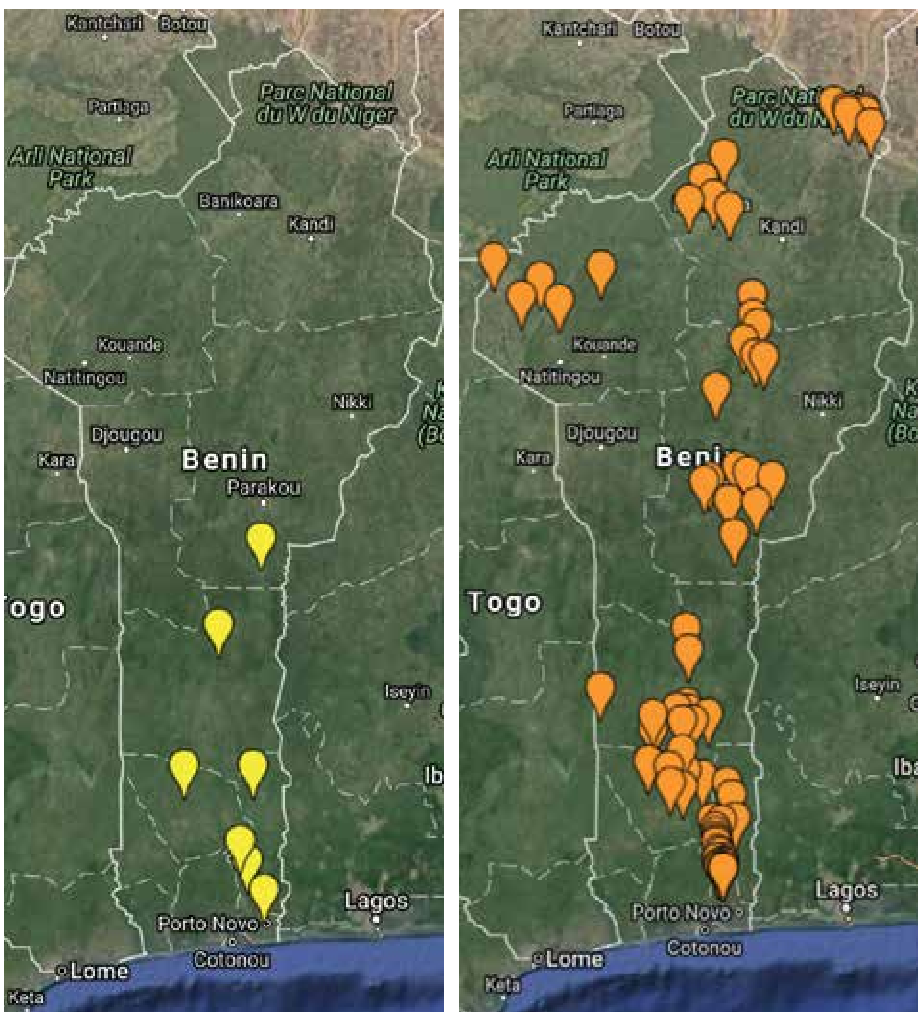


Figure 8: SRI-WAAPP sites in Benin, in January 2014 (estimated, left) and by June 2016 (inventoried, right)

During 2014, the SRI-WAAPP project team trained 300 producers at four workshops. They also trained 150 seed producers at the SAIN farm through the NGOs DEDRAS and DeDESC, organized exchange visits for farmers between the north and the south of Benin with help from the CCR-B and IFDC, and supported DEDRAS and DeDESC to train and advise producers in the central and northern regions. In order to accelerate dissemination, DEDRAS

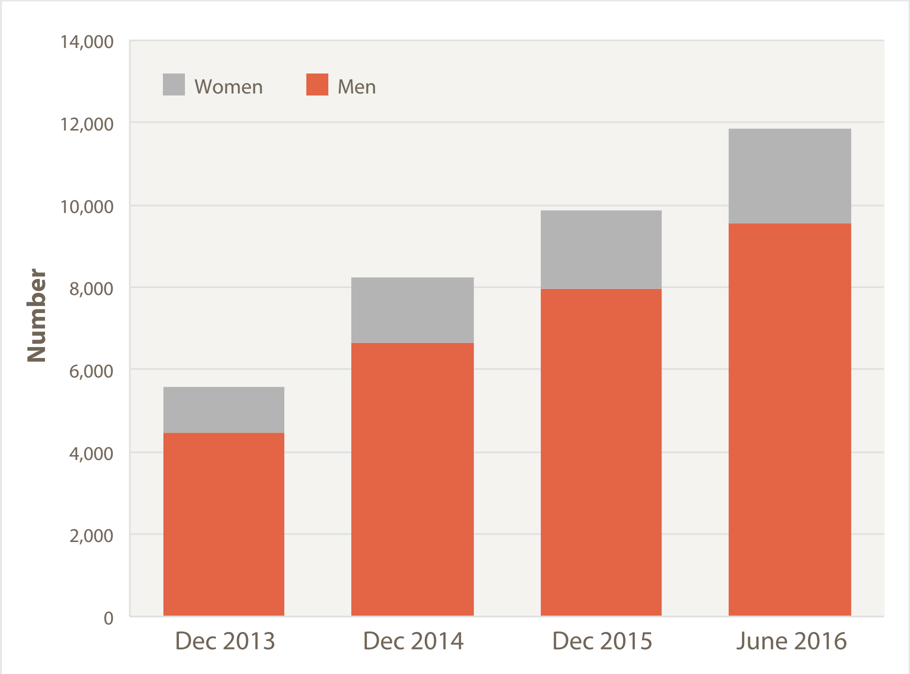


Figure 9: Number of SRI farmers (men and women) in Benin; at the beginning, during and at the end of the SRI-WAAPP project

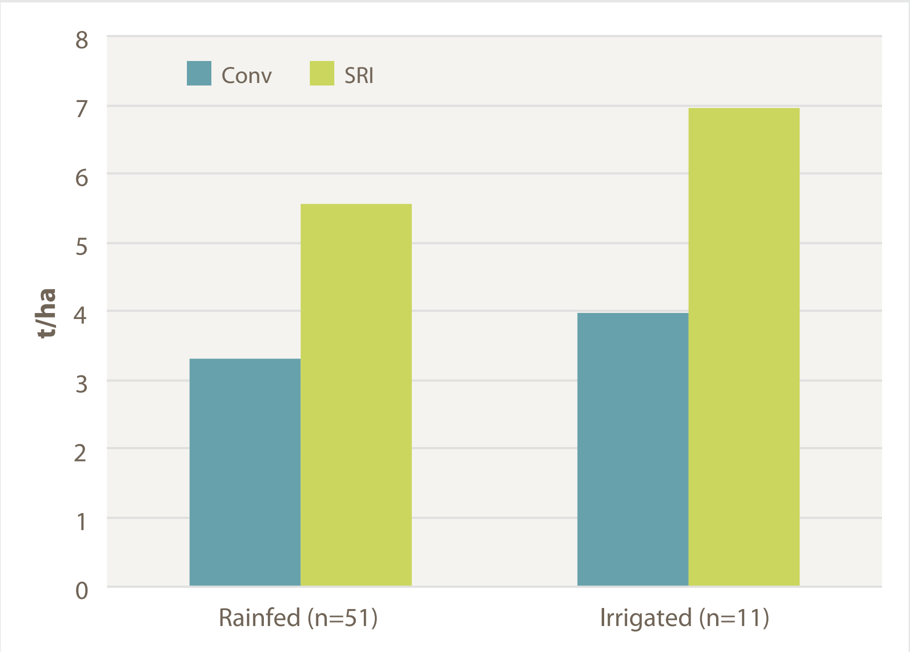


Figure 10: Yield comparison (t/ha) between SRI and conventional rice production in rainfed lowland and irrigated systems in Benin during 2015/2016

created a SRI network in the north. In addition, the PADA project reached a total of 600 farmers through farmer field schools. SRI was also integrated into Innovation Platforms (IP) in the Ouémé plateau and Zou-Colline, and the IP for the aromatic Dangbo rice. On the national level, the national rice farmer organization CCR-B recommended that SRI be supported and disseminated throughout the entire country.

Result: the **number of SRI farmers** increased from 5,600 (1,100 women) at the beginning of the project to 8,300 farmers (1,600 women) by the end of the first year (Dec 2014), to 9,950 farmers (1,900 women) by the end of the second year (December 2015), and to an estimated 11,900 SRI farmers (2,300 women) by the end of the project in June 2016 (Figure 9). By the end of the project an estimated total of 7,788 hectares were planted using the SRI method.

Yield comparisons across Benin showed SRI yields at 5.56 t/ha compared to 3.3 t/ha for the conventional system (a 69% increase). For irrigated rice systems, SRI yields reached 6.95 t/ha compared to 3.97 t/ha (a 75% increase) with the conventional approach (Figure 10).

Economic profitability of SRI: As part of the baseline study (Gogan, 2015), WAAPP-Benin evaluated the economic profitability of SRI as compared to conventional production methods at selected sites in four major rice production basins located in four agro-ecological zones of Benin. Results for rainfed lowland rice and irrigated rice are shown in Tables 2 and 3.

Table 2: Economic profitability for SRI and conventional production methods for rainfed lowland rice systems in four agro-ecological zones (AEZ) of Benin (in FCFA), in 2015

	AEZ 1*		AEZ 4		AEZ 5		AEZ 8	
	SRI	Conv	SRI	Conv	SRI	Conv	SRI	Conv
Total production costs (CFA)	494,240	370,280	376,662	279,833	584,845	321,200	542,738	387,248
Comparison production costs (%)	33%		35%		82%		40%	
Yields (kg/ha)	6,900	3,144	4,867	2,417	5,727	2,833	5,916	3,300
Comparison yields (%)	119%		101%		102%		79%	
Price /kg paddy rice (CFA)	160	160	163	170	151	151	164	170
Gross income (kg harvested x price/kg)	1,104,000	503,040	793,321	410,890	864,777	427,783	970,224	561,000
Comparison gross income (%)	119%		93%		102%		72%	
Net income (CFA)	609,760	132,760	416,659	131,057	279,932	106,583	427,486	173,752
Comparison net income (%)	359%		218%		163%		146%	

* AEZ 1: Agro-ecological zone one, Study was done in communes Malanville and Banikoara
* AEZ 4: Agro-ecological zone four, Tanguiéta and Matéri communes
* AEZ 5: Agro-ecological zone five, Glazoué and Dassa communes
* AEZ 8: Agro-ecological zone eight Adjohoun, Bopa, Dogbo and Covè communes

Table 3: Economic profitability for SRI and conventional production methods for irrigated rice systems in two agro-ecological zones (AEZ) of Benin (in FCFA), in 2015

	AEZ 1*		AEZ 5	
	SRI	Conv	SRI	Conv
Total production costs (CFA)	461,828	513,314	760,150	397,046
Comparison production costs (%)	-10%		91%	
Yields (kg/ha)	6,143	4,500	7,285	3,831
Comparison yields (%)	37%		90%	
Price /kg paddy rice (CFA)	170	170	160	158
Gross income (kg harvested x price/kg)	1,044,310	765,000	1,165,600	605,298
Comparison gross income (%)	37%		93%	
Net income (CFA)	582,482	251,686	435,850	205,780
Comparison net income (%)	131%		112%	

* AEZ 1: Agro-ecological zone one, Malanville and Banikoara communes
* AEZ 5: Agro-ecological zone five, Glazoué and Dassa communes

Although there are site and zonal differences, the general trend shows slightly higher production costs for SRI compared to conventional production, but also indicates significantly higher yields and gross income with SRI, and 150% to 350% higher net returns. Results for the irrigated system (Table 3) are similar, but net returns using SRI in irrigated systems are proportionally lower.

Given that production costs/area are slightly higher using SRI (with the exception of irrigated rice in AEZ1), it is important to ensure that farmers can access funding for labor, tools and machines in order to implement SRI over their entire rice production area. Farmers without the means for the slightly higher initial investment often plant only a small portion of their rice area using SRI, and thus cannot fully benefit from the methodology. This is an important consideration for scaling up SRI.

Declining soil fertility, another major constraint identified by the baseline study in rice production, is difficult for farmers to address (Gogan, 2015). Although the recommended SRI practice of adding organic matter to increase soil fertility is an effective remedy, it is an ongoing task to find efficient techniques that farmers will adopt.

SRI FARMER OUSMANE ADAM, GAROU VILLAGE, BENIN

Ousmane Adam lives in Garou Village in Northern Benin and cultivates 15 hectares of rice, millet and onions with his brother under both irrigated and rainfed conditions. He was trained in SRI in 2013 by the CCR-B *(Conseil de Concertation des Riziculteurs du Benin)* and the PADA Project *(Projet d'Appui a la Diversification Agricole)*. In 2015, he was recognized for his community leadership in SRI by the President of the Republic of Benin, Dr. Yayi Boni, winning the prize of a tractor and farming equipment.

Mr. Adam cultivates one hectare of SRI rice during the dry season and two hectares during the rainy season. Previously he harvested between 20-30 100 kg bags of paddy rice/hectare, while with SRI he harvests 80 bags per hectare. Last season, he sold 60 bags for 15,000 FCFA/bag, totaling 900,000 CFA, equivalent to 1,800 USD. "With the money from SRI rice production, I have built a house, bought a motor-bike and some goats". He also can pay the school fees for his 7 children, diversify the family diet, and repay loans.

SRI-WAAPPP project coordinators and collaborators

Focal Institution for SRI	Institut National des Recherches Agricoles du Benin (INRAB)
National SRI Facilitator	Cyriaque Akakpo
WAAPP coordinator	Bertin Adeossi
WAAPP program manager	Virginie Assogba-Miguel
WAAPP M&E officer	Guillaume Hounsou-Ve, Agbodemakou Toussaint
SRI Champions	Pascal Gbenou, Lionel Ayedegue, Antonin Akiyoko, Daniel Dahmesse, Raoul Kayodé Balagoun, Dagui Orou Banran, Samuel Kadi

Institutions involved with SRI in Benin

Short name	Name	Type
WAAPP-Benin	West Africa Agriculture Productivity Program	Government, SRI-WAAPP Coordination
INRAB	Institut National des Recherches Agricoles du Bénin	Government Research, SRI focal institution
MAEP	Ministre de l'Agriculture, de l'Elevage et de la Pêche	Governmental
CCR-B	Conseil de Concertation des Riziculteurs du Bénin	Rice Farmers Organization
DEDRAS	Organisation pour le Développement Durable, le Renforcement et l'Auto-promotion des Structures communautaires	Local NGO – project implementer and trainer
DéDESC ONG	Organisation non gouvernementale pour le développement durable, économique et socio-culturel	Local NGO - project implementer and trainer
Peace Corps Benin	Corps de la Paix	Governmental (International)
IFDC-Benin	IFDC	International NGO
SAIN	Ferme École SAIN	Local NGO
ProCAD	Programme Cadre d'Appui à la Diversification Agricole	Governmental
PADA	Projet d'Appui à la Diversification Agricole	Development Project
CARDER	Centres régionaux pour le développement rural	Extension Centers, Governmental
FoReVa	Fonds Régional de Vulgarisation Agricole	Governmental
PROTOS	PROTOS	Belgian NGO
BØRNEfonden	BØRNEfonden	Danish development organization
AGRHYMET	AGRHYMET	Governmental /regional institution
La Nouvelle Tribune	La Nouvelle Tribune	Media
L'Intégration	L'Intégration	Media
La Nouvelle Expression	La Nouvelle Expression	Media

SRI Publications from Benin

PhD Dissertation: Gbenou P. 2013. Evaluation participative du Système de Riziculture Intensive dans la basse vallée de l'Ouémé au Bénin. PhD dissertation, Université d'Abomey-Calavi (Benin).

Scientific poster: Gbenou P. 2014. Farmer Evaluation of the System of Rice Intensification (SRI) and the Conventional Rice Cultivation in Benin. Poster presentation at the 4th International Rice Congress, BITEC, Bangkok, Thailand, October 27-31, 2014.

Technical manual/handout: Bilgo A, Bazie P, Subsol S. 2014. Fiche technique: Diffusion du système de riziculture intensive pour l'amélioration de la production agricole au Sud Du Bénin. AGRHYMET/CILSS, Fond Français pour l'Environnement Mondial (FFEM/CC), Niamey, Niger, 4p.

Baseline study: Gogan AC. 2015. Etude de Reference du projet SRI-WAAPP au Benin. Etats des lieux avant Janvier 2014. République du Benin, Ministère de l'Agriculture, de l'Elevage et de la Pèche, Secrétariat General du Ministère, Programme Cadre d'Appui à la Diversification Agricole (ProCAD), Projet de Productivité Agricole en Afrique de l'Ouest (PPAAO Bénin), Cotonou, Benin, 129 p.

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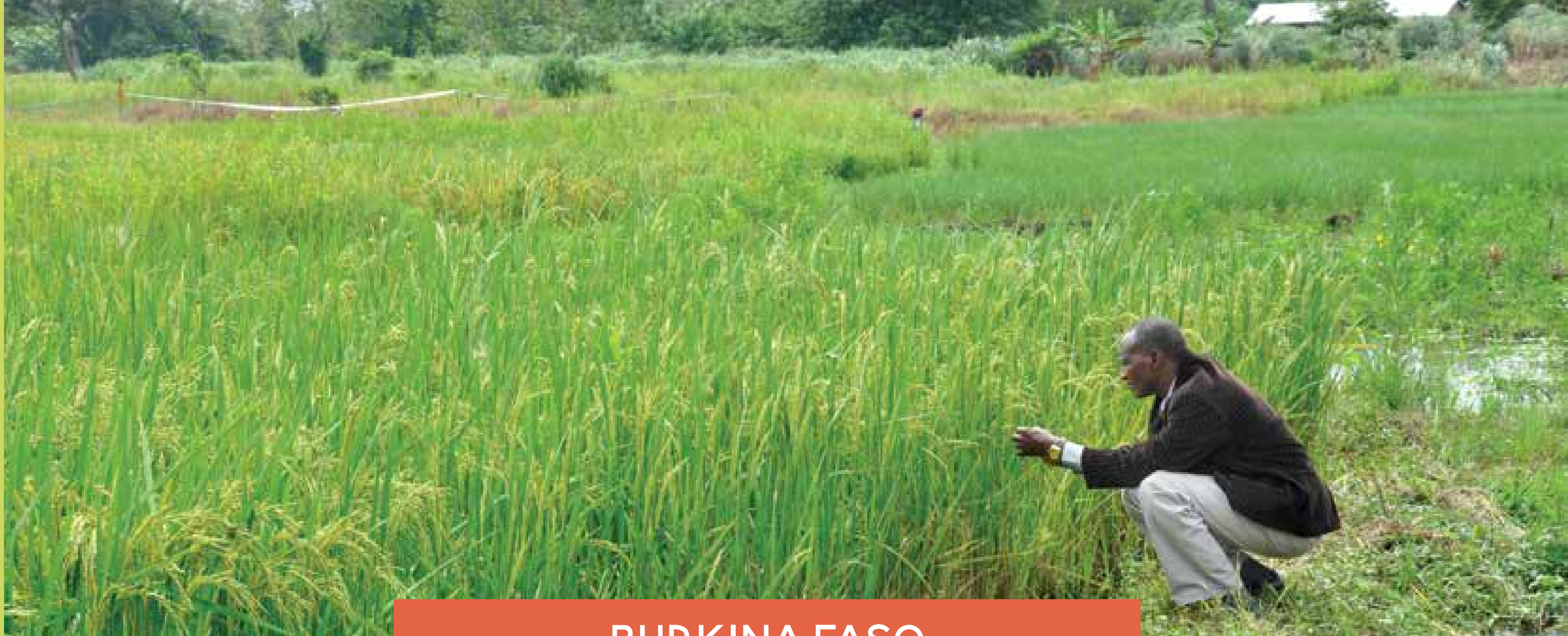
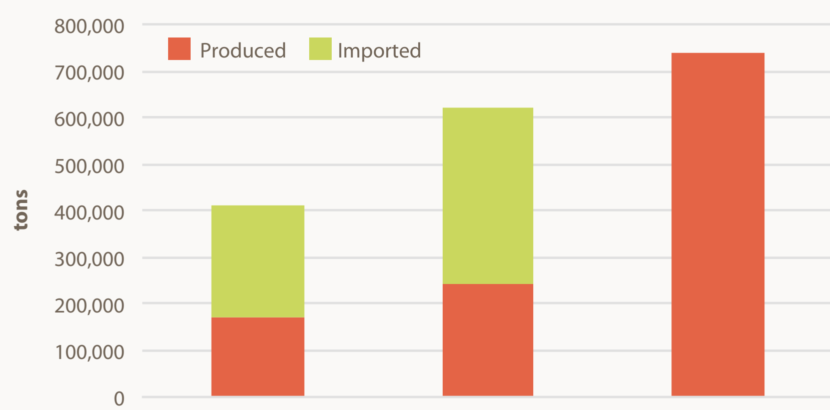
Final project report: Ayedegue L, Akiyoko A, Boukari R. 2016. Rapport Final d'Activités du Projeté Projet d'Intégration Régional de Vulgarisation et Adoption du Système de Riziculture Intensive (SRI) dans 4 Pays WAAPP (Bénin, Togo, Burkina Faso et Niger). Organisation non gouvernementale pour le Développement Durable, Economique et Socio-Culturel (DéDESC-ONG), République du Benin, Parakou, Benin, 43p.



BURKINA FASO

Per capita rice consumption was 26 kg/person in 2010, equaling a total of 410,726 tons of milled rice, of which 42% was produced in-country. The national rice strategy from 2011 called for an increase in rice production from 270,658 tons of paddy rice in 2010 to 842,065 tons in 2018, both by increasing the rice-growing area by 150% (from 71,500 ha to 191,500 ha) and by raising average yields by 50% (from 3t/ha to 4.5 t/ha). The number of rice farmers was expected to reach 200,000 by 2018 (NRDS Burkina, 2011). Although rice production increased by 41% from 270,658 tons in 2010 to 381,000 tons in 2016/2017, it was less than the increase in consumption, and the self-sufficiency rate declined to 39% in 2016/2017.



	2010	2016/2017	2025 estimated
Self-sufficiency rate (%)	42	39	100
Population (million)	15.63	19.17	23.90
Yearly per capita consumption (kg)	26.3	32	31
Production paddy (t)	270,658	381,000	1,155,771
Production milled (t)	173,221	244,000	739,693
Consumption milled (t)	410,726	619,000	739,693
Imported milled (t)	237,504	375,000	0

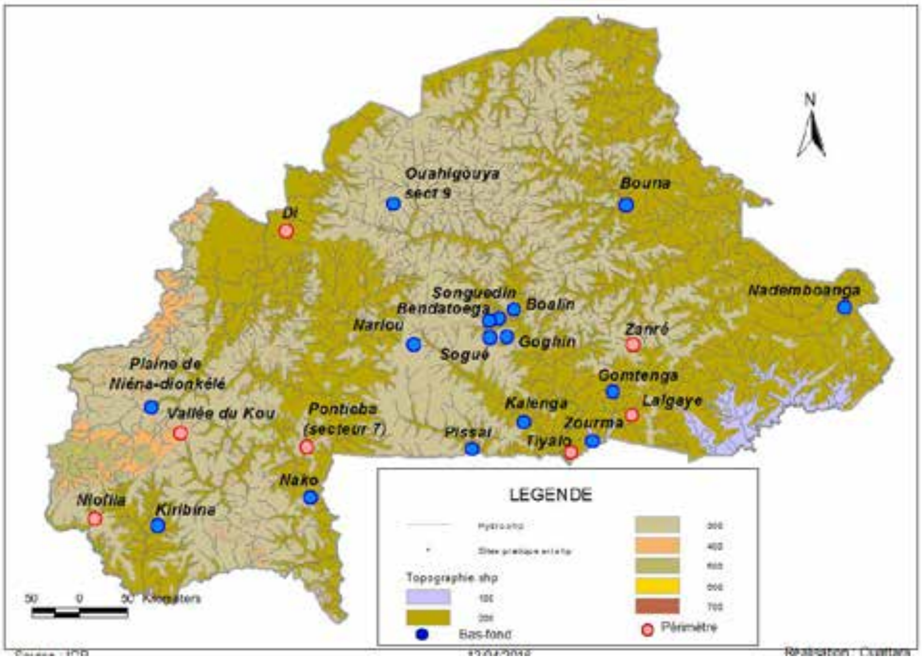
Data: Compiled by authors from FAO online database, Index Mundi online database, Fofana et al (2014)

Figure 11: Rice consumption as a composite of production and imports, self-sufficiency rate, population and per capita rice consumption for 2010, 2016/2017 and estimated for 2025 for the country of Burkina Faso

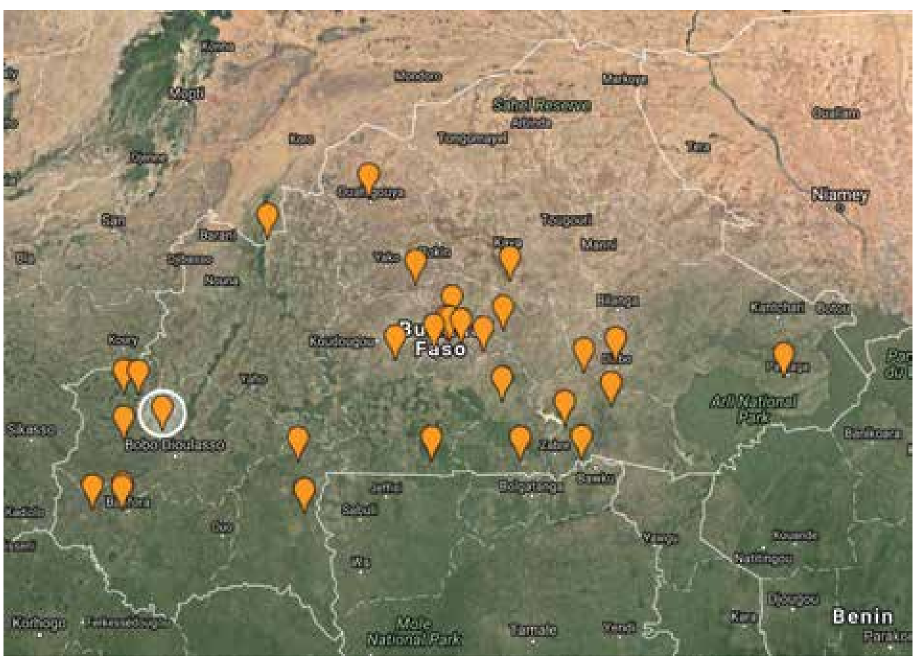
Nevertheless, there is major unexploited rice production potential in the country: less than 10% of some 500,000 hectares of suitable lowlands is exploited, and less than 5% of the more than 233,500 hectares suitable for irrigation has been developed. In 2008, irrigated systems accounted for 18% of the total rice-growing area (44% of total production), rainfed lowland systems used 65% (50% of total production), and upland rice occupied 17% (6% of total production). Average yields were 6 t/ha for irrigated rice, 3.5 t/ha for rainfed lowland and 1.5 t/ha for upland rice (NRDS Burkina, 2011). To reach self-sufficiency by 2025 while satisfying a projected milled rice consumption of 31 kg/person, production needs to increase to 1,155,771 tons of paddy, which is 3 times the production of 2016/2017. (Figure 11)

SRI ACTIVITIES PRIOR TO SRI-WAAPP

Before the SRI-WAAPP project began, most work with SRI was carried out in the Bama commune in the Boucle du Mouhoun region (see Figure 12). The first known SRI trials (2006) were set up by six farmers working with a graduate student from California USA, and attained an average yield of 7 tons/ha. During 2009 and 2010, the FAO conducted five trials in the same area, recording SRI yields of more than 7t/ha. From 2012 to 2014, the French NGO CODEGAZ, working with the local association AMAPAD, built on previous experience in Bama by providing training and technical assistance to more farmers. During 2014, 524 farmers cultivated SRI rice on 576 hectares, obtaining average yields of 8 t/ha, double their previous yields of 4 t/ha with conventional methods. 72 of these farmers became trainers for their neighboring farmers in turn. In 2012, the USAID-funded regional project E-ATP led the first national Training of Trainers workshop for SRI, bringing together 39 representatives (of whom 5 were women) from rice producer organizations, research institutions, and development agencies from across Burkina Faso (see list of organizations in Appendix 1). They then went on to train farmers in their own locations across the country. The Tinga Neera partnership supported training to 200 farmers in Banfora, Cascades Region and in the Center Region from 2013 to 2016.



SRI site map for 2015, Burkina Faso, (blue points: irrigated sites, red points: rainfed lowland sites) (by INERA)



SRI sites in Burkina Faso by June 2016 (circled site is the first SRI site of Burkina Faso in Bama)

Figure 12: SRI site map for Burkina Faso by June 2016

SRI-WAAPP PROJECT RESULTS

Under leadership of the National Institute of Environment and Agricultural Research (INERA), initial SRI project activities focused on collecting information about SRI activities already underway. 394 rice producers (48% women) and local officials visited SRI farmers in Vallee de Kou, Karfiguela, and Bagre to learn of their experiences. To achieve broad coverage across the national territory, the project identified sites for comparison trials between SRI and conventional practice: 15 sites in 2014, which expanded to 23 sites in 2015, located in 20 of the 45 provinces across all 13 regions of the country (Figure 12).

The goal was to evaluate SRI compared to conventional practices for both rainfed lowland and irrigated rice systems across the different agro-ecological zones in Burkina Faso. INERA researchers monitored the process, undertook adaptive research, measured crop performance and focused on identifying the underlying factors for success and constraints in regards to the SRI implementation. At the same time, SRI champions and technicians were trained to oversee test site implementation and to train farmers at two 3-day Training of Trainers workshops. These champions and technicians went on to train 477 farmers (183 in irrigated systems and 294 in lowland systems) and to oversee implementation of demonstration plots at each of the project sites.

In January 2015, national SRI facilitator Ibrahima Ouedraogo organized a national meeting to discuss first season results and plan activities for the second year. About 40 representatives from national rice farmer federations, rice innovation platforms, regional offices for agriculture, water resources and food security (DRARHASA), national research and extension services, NGOs, and bi-lateral and multi-lateral programs participated in the 3-day meeting.

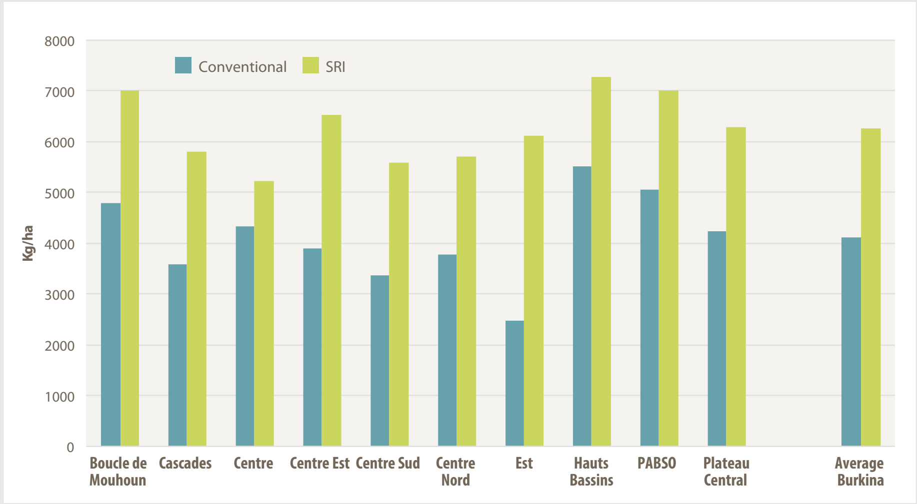


Figure 13: Conventional and SRI yields (kg/ha) for irrigated rice systems in 10 regions of Burkina Faso (2014/2015)

Figure 14: Conventional and SRI yields (kg/ha) for rainfed lowland rice systems in 9 regions of Burkina Faso (2014/2015)

Two national 3-day SRI refresher workshops were held at Banfora and Tenkodogo in March 2015, prior to the beginning of the rainy season, to train a total 80 SRI farmers, facilitators and trainers to become more effective trainers and field advisers. During the planting season, additional field visits were organized to learn what worked well for farmers and to identify constraints to be addressed in the next extension phase.

During the 2014/2015 season, a total of 104 tests were conducted at 15 sites: 44 tests in irrigated systems on 20.5 hectares and 60 tests in lowland systems on 15 hectares. At all 15 sites, SRI yields were higher than those of conventional plots. For irrigated systems, average yields from 10 regions were 4.1 t/ha for conventional rice compared to 6.25 t/ha for SRI (a 52% increase) (Figure 13). For the rainfed lowland systems, average yields from 9 regions were 2.72 t/ha for conventional methods compared to 3.74 t/ha for SRI (a 38% increase) (Figure 14). In addition, SRI plants were taller and produced more tillers and panicles, an increased number of grains/panicle, and fuller grains. Given these results and despite some of the identified constraints (see below), 394 farmers declared themselves ready to implement the SRI method, far exceeding the expected 100 farmers.

During the 2015/16 season, the project managed 23 sites: 16 rainfed lowland sites and 7 irrigated sites, with 104 farmers planting a total SRI area of 39 hectares. SRI yields were on average 6.22 t/ha compared to 4.21 t/ha for conventional practice.

Figure 15: Yield comparison (kg/ha) between SRI and conventional method when transplanted and direct seeded, Burkina Faso, 2015

Heap compositing training was associated with SRI trainings at SRI demonstration sites in Burkina Faso

ADDITIONAL SRI ACTIVITIES

INERA tested five rainfed lowland varieties (FKR19, FKR45N, FKR56N, FKR62N, TS2) and three irrigated rice varieties (FKR19, FKR62N and TS2), all resulting in significantly higher yields using SRI compared with conventional methods.

Another experiment compared two **establishment methods, transplanting and direct seeding,** for both SRI and conventional methods. SRI plots significantly produced higher yields under both establishment methods. SRI transplanted rice yielded 5.95t/ha compared to conventional rice 3.97 t/ha. SRI direct- seeded rice attained 4.33 t/ha compared to 2.99 t/ha for conventional rice (Figure 15).

The SRI-WAAPP team identified the following **constraints** for implementing SRI:

- Difficulty of accessing and transporting organic manure,
- Prolific weed growth under reduced irrigation management, and
- Difficulty of adjusting irrigation water distribution for individual SRI plots, as irrigation schedules for conventional rice cultivation and SRI were different.

The project trained farmers in **heap composting** along with SRI from the beginning of the project to address the lack of sufficient organic matter to fertilize the SRI plots.

SRI CHAMPION PIERRE BELEM, BURKINA FASO

Pierre Belem, who holds the title of *Knight of the Burkinabe Order of Merit*, Superior Agricultural Technician, has been one of the most active SRI champions in Burkina Faso, beginning with SRI in Bama where it all started. When the French NGO CODEGAZ came to Bama in 2012, Belem was recruited as SRI coordinator to train farmers and to work with them on SRI in their fields. By 2014, 524 farmers in Bama cultivated SRI rice on 576 hectares, and 72 of these farmers learned to train their neighboring farmers in turn. But Belem didn't stop reaching out. Through the Tinga Neere partnership program, supported by the local organizations Ingalan, Na Pam Beogo, *Conseil Regional du Centre*, and Amapad, he has continued to work in different locations and rice perimeters, training more than 200 farmers in Banfora, Cascades Region and the Center Region from 2013-2016. It would indeed be interesting to go back to all these locations and evaluate how many farmers have adopted SRI and how it improved their lives, based on the relentless and compassionate action and technical advice of this one champion!

SRI-WAAPPP project coordinators and collaborators

Focal Institution for SRI	Institut de l'Environnement et de Recherches Agricoles (INERA)
National SRI facilitator	Ibrahima Ouedraogo
WAAPP coordinator	Atamana Bernard Dabire
WAAPP program manager	Seraphine Sawadogo Kabore
WAAPP M&E officer	Abdou Aziz Thiombiano
SRI Champions	Salifou Ouédraogo, Pierre Adama Belem, Ms Siry Kabamagama, Augustin Zongo

Institutions involved with SRI

Short name	Name	Type
WAAPP-Burkina Faso	West Africa Agriculture Productivity Program	Government, SRI-WAAPP Coordination
INERA	Institut de l'Environnement et des Recherches Agricoles	Government Research, SRI focal institution
MAAH	Ministère de l'Agriculture et des Aménagements Hydrauliques	Government
UNPRB	Union Nationale des Producteurs de Riz au Burkina Faso	Farmer association
AMAPAD	Association Mawouro-bi pour la Promotion de l'Agriculture Durable	Civil Society
CODEGAZ	CODEGAZ	French NGO
DPASA	Direction Provincial de L'Agriculture et de la Securité Alimentaire	Government
BRICOP	Burkina Rice Commercialization Project	Development project
ODE	Office of Development of the Federation of Evangelical Missions and Churches of Burkina Faso	NGO
CAP/M	Centre Agricole Polyvalent de Matourkou	Education, NGO
AgriAdvice Center	AgriAdvice Center	Education, NGO
CISV	Comunita Impegno Servizio Volontariato	Italian NGO
PABSO	Program for Flood Plain Management	Bilateral Project KfW funded
aouaga.net	aouaga.net	Media
Le Faso.net	Le Faso.net	Media

SRI Publications

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Scientific article: Sanou AG, Dakouo D, Ouedraogo I. NA. Effect of System of Rice Intensification (SRI) on the attacks from main pests insects in rice-irrigated schemes of Karfiguéla and Kou Valley in Burkina Faso, non-published

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Technical Manual: Ouedraogo I, Kam H, Konate A, Kabore KB, Sanou A and Bako KA. 2016. Système de Riziculture Intensive (SRI). Manuel Pratique de mise en œuvre du SRI en écologie de Bas-Fond. Institute de l'Environnement et de la Recherche Agricole (INERA), Projet d'Amélioration de la Productivité agricole et de la Sécurité Alimentaire (PAPSA), Ouagadougou, Burkina Faso, 17pp.

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Baseline Study Contribution: INERA. 2015. Rapport d'étude de référence sur le Système de Riziculture Intensive (SRI). Programme Riz et Riziculture Institut de l'Environnement et de Recherches Agricoles (INERA), Burkina Faso, 93p.

WAAPP Burkina Newsletter: No 2, Dec 2012 Développement de la filière riz: Le SRI pour booster la productivité du riz, p. 6

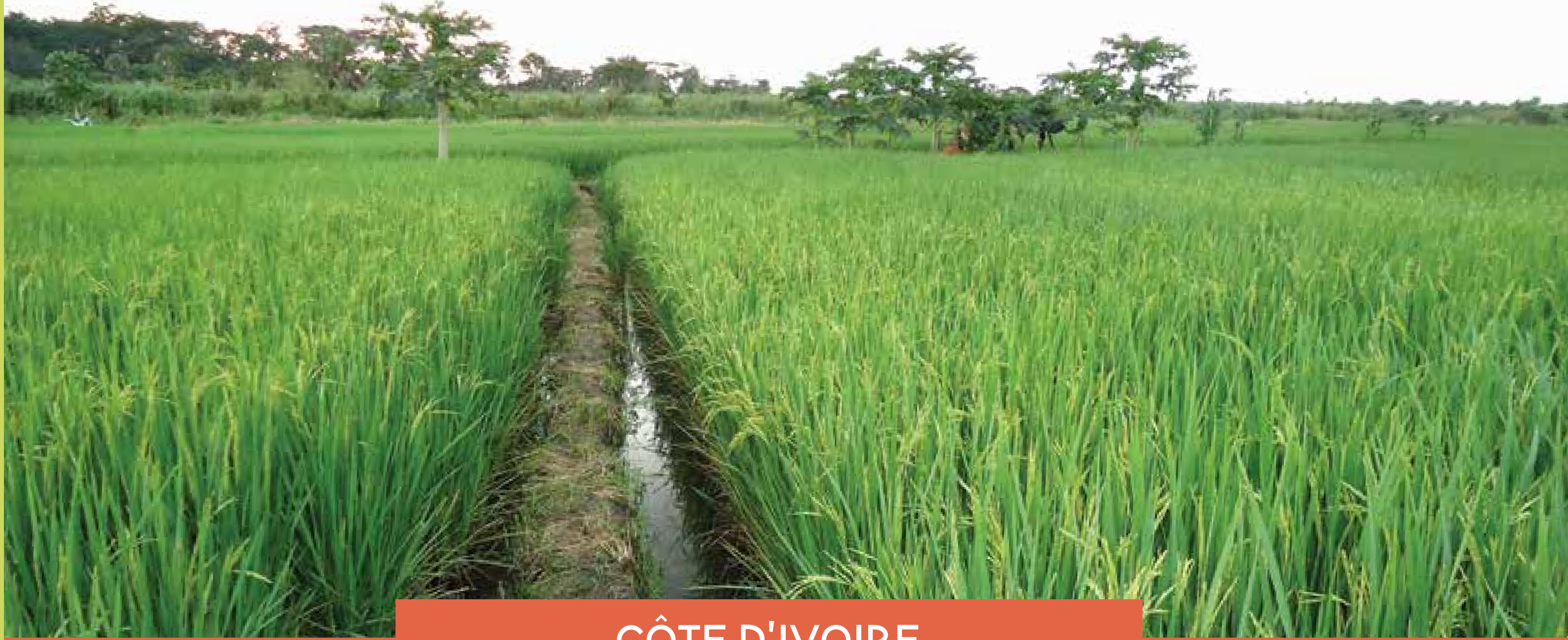
WAAPP Burkina Newsletter: No 8, June 2014: Le SRI pour accroitre la productivité du riz, p. 4

WAAPP Burkina Newsletter: No 8, June 2014: Système de riziculture intensive (SRI) Former pour mieux l'adopter, p. 5

Non-WAAPP publication: Belem P and Oscar A. 2013.: Burkina Faso: La formation aux méthodes SRI améliore le quotidien des paysans de Bama; *AGRIDAPE*, Vol 29 (1), p 6-9; http://www.iedafrique.org/IMG/pdf/Agridape_no29-1-final.pdf

News article: Nov 4, 2015: La bataille du riz (Ibrahim NF); http://magazinedelafrique.com/la-bataille-du-riz/

News article: Nov 8, 2016: bas-fonds de Namassa; projet riz pluvial (PRP): http://lefaso.net/spip.php?article74098



CÔTE D'IVOIRE

Rice production in Côte d’Ivoire was significantly impacted by the civil war during the period 2002-2011. Production plummeted from about 600,000 tons of milled rice in 2001 to less than 300,000 tons in 2003. It took until 2010 to reach the level of 2001 again. Imports increased steadily during the civil war period to satisfy demand. After the war, efforts to increase rice production were significant and production increased by almost 90%, from 760,000 tons of milled rice in 2010 to 1.43 million tons in 2016/2017, but rice consumption rose much faster than predicted, so by 2017 it had already reached the level originally estimated for 2025. The self-sufficiency rate increased from 47% in 2010 to 49% in 2017. Côte d’Ivoire must double its 2016/2017 production by 2025 in order to become self-sufficient.

	2010	2016/2017	2025 estimated
Self-sufficiency rate (%)	47	49	100
Population (million)	20.13	23.82	28.72
Yearly per capita consumption (kg)	80	122	102
Production paddy (t)	1,206,153	2,234,375	4,558,034
Production milled (t)	759,876	1,430,000	2,917,142
Consumption milled (t)	1,619,785	2,930,000	2,917,142
Imported milled (t)	859,909	1,500,000	0

Data: Compiled by authors from FAO online database, Index Mundi online database, Fofana et al (2014)

Figure 16: Rice consumption, as a composite of production and imports, self-sufficiency rate, population and per capita rice consumption for 2010, 2016/2017 and predicted for 2025 for the country of Côte d’Ivoire

There is a large potential for expansion of irrigated rice production on 200,000 ha of suitable land. Rice is produced in all regions of the country, the most important being the forest zone with 70% of the total rice-growing area. In 2010, upland rice occupied 64% of the total rice-growing area, lowland rice 33%, and irrigated rice 4%. According to the revised NRDS (2012), a first priority is to rehabilitate 35,000 ha of degraded irrigation schemes in order to produce two crops per year, and to expand it to 45,000 ha by 2018. Irrigated rice yields are planned to be at least 5 t/ha per cycle (up from 3.5 t/ha in 2008) or 10t/ha per year for two cycles. From 2008 to 2018, it is planned that the area devoted to rainfed rice will increase by 60% to reach 1.3 million hectares, and yields of rainfed rice will increase from 0.8 to 2t/ha. In addition, there is a plan to expand the area for flooded rice on the fertile alluvial plains, where intensive rice growing can reach 5t/ha, from 25,000 ha to 75,000 ha. (Figure 16)

SRI ACTIVITIES PRIOR TO SRI-WAAPP

The first two SRI comparison trials were set up in Tiassalé and Yamoussoukro in 2013, following the first regional SRI workshop in Ouagadougou in 2012, where the SRI-WAAPP project was conceived. The higher yields with SRI in both locations motivated farmers to continue the SRI evaluations and to seek training. Farmers were especially interested in the possibility of using SRI for seed production. Because they were not accustomed to apply organic matter to rice fields, they also expressed an interest for training in organic matter management and compost making.

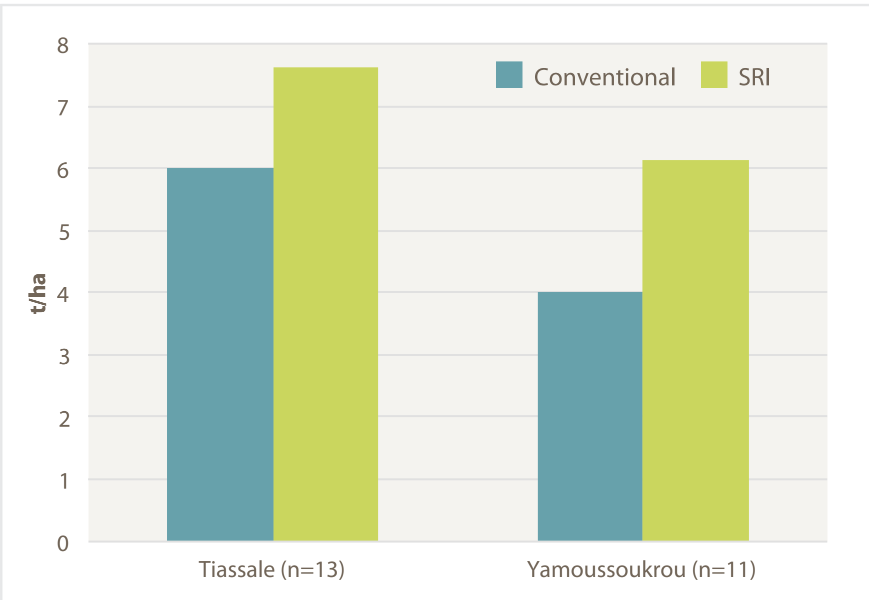


Figure 17: Yield comparison (t/ha) between conventional and SRI method in two locations, Côte d'Ivoire, 2014

SRI-WAAPP PROJECT RESULTS

In 2014, the project built on the first comparison tests from 2013, working with two interested farmers: Marcel Kouakou Yao in Yamoussoukro and Coulibaly Abdramane in Tiassale. Marcel and Coulibaly implemented SRI in their own fields, and mobilized neighboring farmers (11 in Yamoussoukrou, and 13 in Tiassale) to undertake side-by-side comparisons between the conventional and the SRI method. The National Agriculture Research Institute (CNRA) -- the national SRI focal institution -- monitored the fields and collected agronomic data. Marcel and Coulibaly, along with CNRA scientist and national SRI facilitator Alphonse Bouet, also attended the regional SRI training workshop in Kpalimé Togo in August 2014 to share their work and deepen their knowledge about SRI.

The 13 farmers in Tiassale implemented SRI on 12.32 ha, using the varieties Wita 9, GT 2 and BKE AM. Average age of seedlings was 11.6 days with SRI compared to 23.1 days with the conventional method. Number of tillers with SRI averaged at 20 compared to 14 with conventional methods. The crop cycle with SRI was 10 days shorter at 109.8 days compared to 119.7 days using conventional methods. SRI yields averaged at 7.61 t/ha compared to 6.02 t/ha with

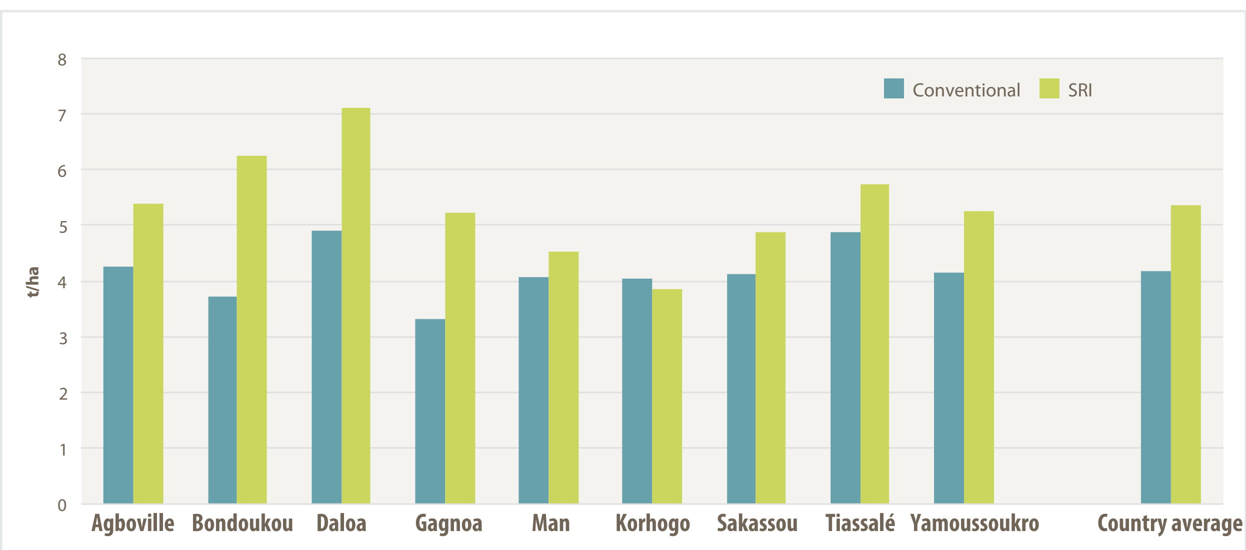


Figure 18: Yield comparison (t/ha) between conventional and SRI plots for 9 locations (average of 10 farmers/location) in Côte d'Ivoire, 2015/2016

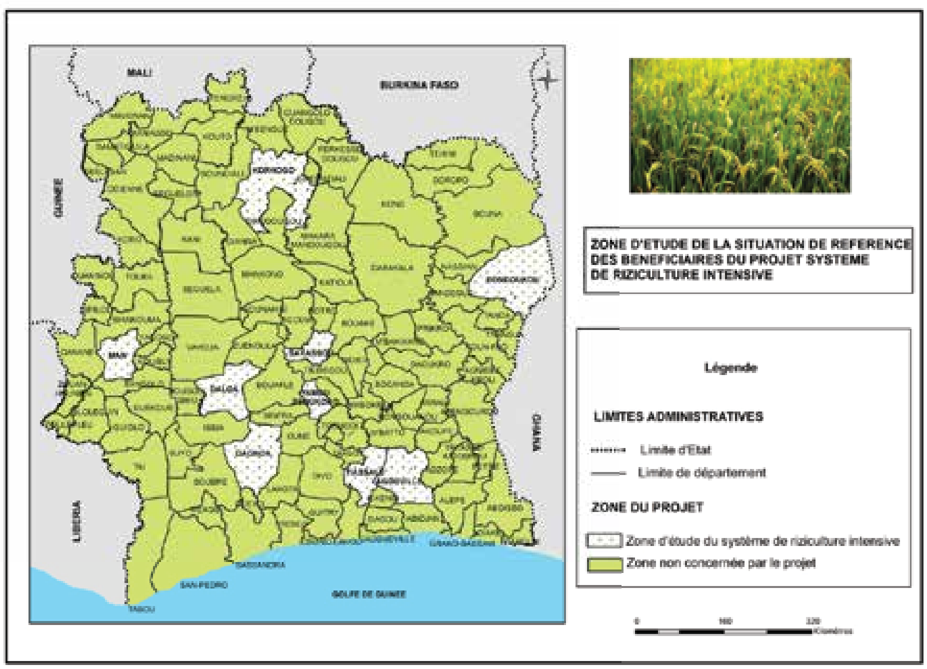


Figure 19: Map showing departments where SRI was introduced (below) provided by CNRA), and map with SRI sites (top), Côte d'Ivoire, June 2016.

conventional method, a 26% increase. In Yamoussoukrou (Subiakro) 11 farmers planted SRI rice on 11.84 hectares. Here farmers did not do side-by-side comparisons, but the average yield for irrigated rice was 4t/ha using the conventional method, while the six SRI plots averaged 6.13 t/ha (Figure 17). It is noteworthy that from the beginning farmers at both sites tested SRI on large plots. The 24 participating farmers planted a total of 24.16 hectares of SRI.

The positive results from 2014 having led to an increased interest in SRI, in early 2015 WAAPP-Côte d'Ivoire organized a nationwide Training of Trainers workshop, led by the SRI-WAAPP regional coordination team, for 23 ANADER extension technicians, 18 farmers and 2 CNRA researchers. ANADER technicians went on to train 208 farmers (of whom 33 were women) at nine regional training sessions. They also set up comparison tests working with 103 farmers (of whom 17 were women) in 15 villages in all nine departments across the country The same variety – WITA9 – was used for all sites. The average yields for 10 farmers at each of the 9 locations are shown in Figure 18. The average from all locations was 4.17 t/ha for conventional and 5.36 t/ha for SRI method. The conventional yield of 4.17 t/ha was slightly higher than the national average of 3.5 t/ha for irrigated rice.

During the SRI-WAAPP project, SRI was introduced only to irrigated rice systems. Two maps with the SRI sites at the end of the project are shown in Figure 19.

Identified constraints are the same as those often associated with rice production in general: a low level of intensification, degraded irrigation schemes, infestation by pests and plant diseases. Farmers appreciated that using SRI the rice plants grow many tillers, that SRI produces good yields, uses less water, is "better than farmer's practices," and that SRI can be used to produce seed. Farmers came up with slogans that spread quickly to neighboring villages and regions. To cite a few:

"With SRI, my kids don't go hungry anymore."

"SRI equals less cost."

SRI CHAMPION MARCEL YAO KOUAKOU, CÔTE D'IVOIRE

SRI Champion Marcel Yao Kouakou, a young rice farmer from Yamoussoukro, was one of the first SRI farmer champions from Côte d'Ivoire and became a lead farmer trainer. He has trained farmers from all over Côte d'Ivoire, both at his own farm or in other farmers' own fields. As a SRI Champion and lead trainer, he was invited by the Inter-Professional Fund for Agricultural Research and Council (FIRCA) to share his experience at the 4th International Salon for Agriculture and Livestock (SARA) in Abidjan from 17-26 November, 2017.

At SARA, which attracts more than 200,000 visitors, he was given his own stand to share his expertise and personal experience about SRI. Marcel told others how he now produces 8-9 tons of rice per hectare (up from the maximum of 5-6 t/ha he could reach before) giving him a net profit of 600,000 -700,000 FCFA (or 1,200 to 1,400 USD) per hectare. Because of this he encourages all interested farmers to adopt the SRI method as he did. He is most grateful to FIRCA/WAAPP for having introduced him to SRI.

Marcel has his own stand featuring SRI plants at the 4th International Salon for Agriculture and Livestock (SARA) in Abidjan, November 2017.

He says, "FIRCA taught me how to fish instead of giving me a fish. It is now my turn to teach others how to fish. From my time at the SARA fair, I already obtained a few contracts with projects and private businesses to help them learn how to use the SRI methodology."

SRI-WAAPPP project coordinators and collaborators

Focal Institution for SRI	Centre National de Recherche Agronomique (CNRA)
National SRI facilitator	Alphonse Bouet
WAAPP coordinator	Pierre Ackah Angniman
WAAPP deputy coordinator	Jean Paul Lorng
WAAPP M&E officer	Mohamed Sabah Soso
SRI Champions	Marcel Yao Kouakou, Abdramane Coulibaly, Nangolo Coulibaly, Jean-François Zouzou Konan

Institutions involved with SRI

Short name	Name	Type
FIRCA/WAAPP	Fonds Interprofessionnel pour la Recherche et le Conseil Agricoles/ West Africa Agriculture Productivity Program	Government, SRI-WAAPP Coordination
CNRA	Centre National de Recherche Agronomique	Government Research, SRI focal institution
ANADER	Agence nationale d'appui au développement rural	Government Extension
ONDR	L'Office national du développement de la riziculture	Government
	Rice farmer cooperative Yamoussoukrou	Farmer organization
	Rice farmer cooperative Tiassale	Farmer organization
ANARIZ-CI	Association Nationale des Riziculteurs de Côte d'Ivoire	Farmer organization
Abidjan.net	Abidjan.net	Media
La Diplomatique d'Abidjan	La Diplomatique d'Abidjan	Media
Fraternité Matin	Fraternité Matin	Media
Carnet d'Addresses	Carnet d'Addresses	Media

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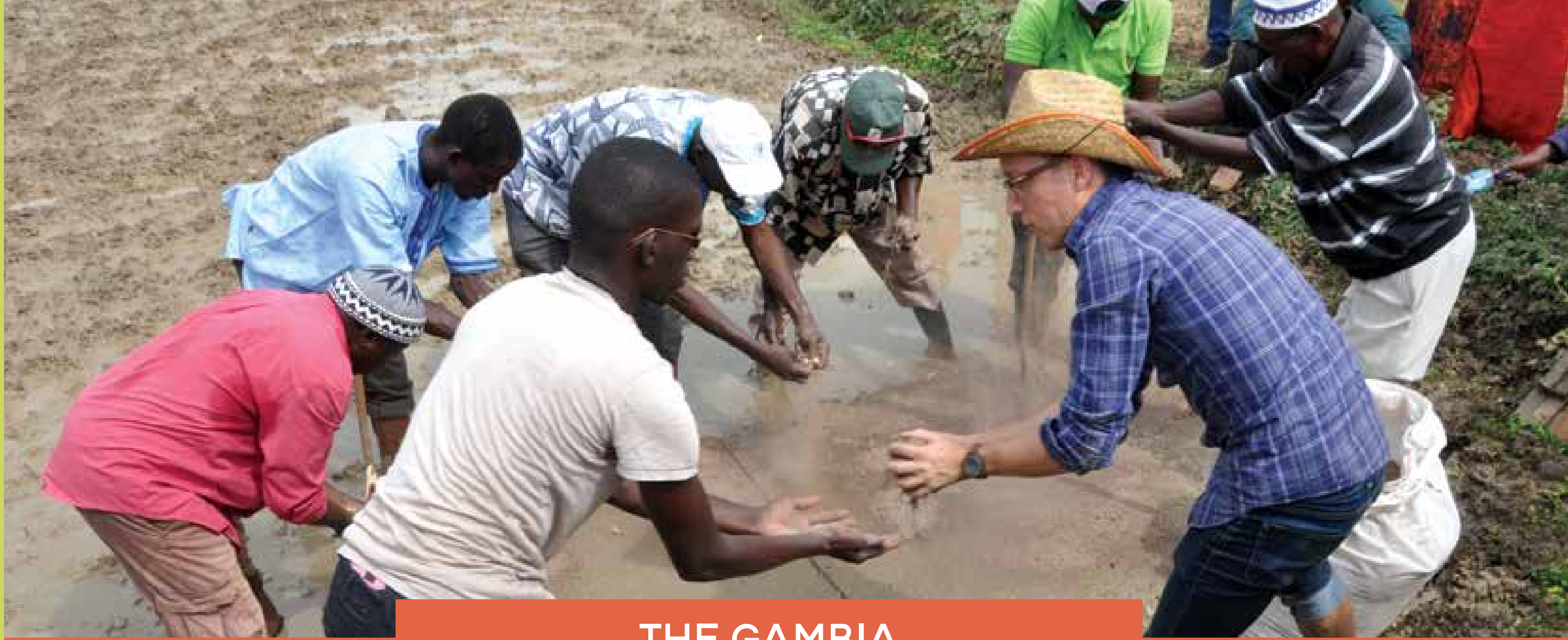
Baseline Study: ANADER. 2015. Rapport Enquête Situation de Référence des Bénéficiaires du Projet Système de Riziculture Intensive. Agence National d'Appui au Développemenet Rural (ANADER), Abidjian, Côte d'Ivoire, 33p.

Technical project report: Bouet A. 2016. Vulgarisation de Système de Riziculture Intensive en Côte d'Ivoire, Rapport de Synthèse du test de pré-vulgarisation du Système de Riziculture Intensive en Côte d'Ivoire en 2015. PPAAO, CNRA, 85p.

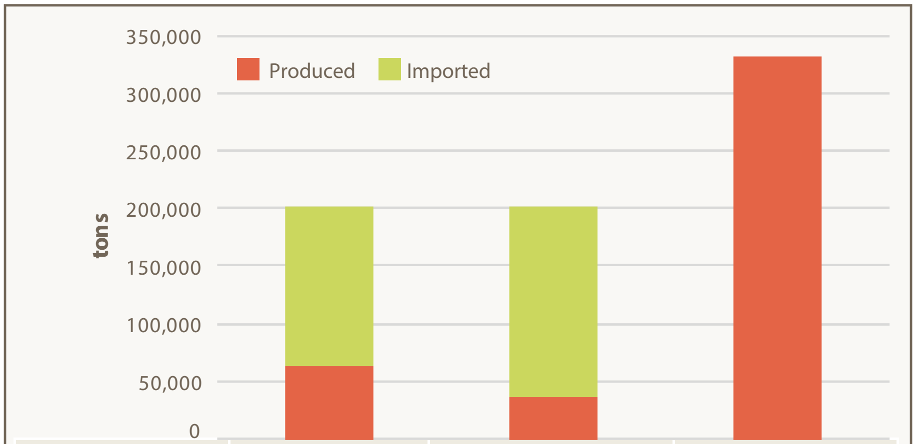
Scientific report 2016: Rapport de synthèse du projet de vulgarisation du SRI en Côte d'Ivoire, BOUET Alphonse, ESMEL Memel

Scientific Article: Bouet A, Bahan F, Boka A, Esmel M and Keli J. 2016. Performance agronomique du Systeme de Riziculture Intensive (SRI) en Côte d'Ivoire. *Asian Journal of Science and Technology*, Vol 7(8), pp 3447-3451,



THE GAMBIA

Rice is the main staple food in The Gambia and consumption rates are among the highest in West Africa: 119 kg/year in 2010, which is expected to rise to at least 123 kg/year by 2025. Rice production in 2010 was the highest ever achieved in The Gambia, but by 2017 it had declined to only 56% of its 2010 production. As of 2017, the Gambia has the lowest self-sufficiency rate of all SRI-WAAPP countries, at only 18% (see figures for all 13 countries in Table 1).



	2010	2016/2017	2025 estimated
Self-sufficiency rate (%)	31	18	100
Population (million)	1.69	2.12	2.70
Yearly per capita consumption (kg)	119	94	123
Production paddy (t)	99,890	56,250	518,854
Production milled (t)	62,931	36,000	332,067
Consumption milled (t)	202,275	201,000	332,067
Imported milled (t)	139,344	165,000	0

Data: Compiled by authors from FAO online database, Index Mundi online database, Fofana et al (2014)

Figure 20: Rice consumption, as a composite of production and imports, self-sufficiency rate, population and per capita rice consumption for 2010, 2016/2017 and predicted for 2025 for the country of the Gambia

The NRDS (2014) targeted self-sufficiency in rice production by the year 2024, planning to produce 322,000 tons of milled rice or 518,854 tons of paddy rice, which is more than 5 times the 2010 production, and more then 9 times the 2017 production. The NRDS planned to reach self-sufficiency by expanding the rice production area from 68,000 hectares in 2013 to 188,400 hectares by 2024. This includes upland, lowland and irrigated systems, but most importantly expands the lowland systems area by a highly ambitious 10,000 ha every year, including to rainfed inland valley swamps, flood-plains of the river Gambia, and mangrove swamps. This strategy is based on an available 216,121 hectares of lowland ecologies suitable for rice production. Given the importance of rice in the diet and the availability of land, significant increases in rice production should be feasible, despite some setbacks in recent years. (Figure 20)

SRI ACTIVITIES BEFORE SRI-WAAPP

After Madagascar, where SRI originated, the Gambia was one of the first countries where SRI was evaluated. Beginning in 2000, Mustapha Ceesay, a researcher with the National Agricultural Research Institute (NARI), compared SRI to conventional rice production methods as part of his Ph.D. research program at Cornell University. After seeing the on-station experiments in Sapu (Central River Region) (see Figure 21), ten farmers tried SRI on their own farms by dividing their plots into two portions: SRI on one half and conventional rice growing on the other. Their average SRI yield reached 7.4 t/ha compared to 2.5 t/ha with conventional practice.

There were no follow-on SRI interventions from 2003 to 2013, although the early SRI farmers continued to plant younger seedlings and fewer plants/hill. However, full implementation of SRI practices was hindered by poor water control in rice irrigation perimeters, unsynchronized cropping calendars among farmers, poor access to land preparation and weeding equipment, and most importantly, absence of a lead institution to assist farming communities to transition to the SRI cropping methodology.

SRI-WAAPP PROJECT RESULTS

Following the SRI-WAAPP preparation workshop in Saly, Senegal in 2013, the project preparation team from National Agriculture Research Institute (NARI) and WAAPP organized a farmer information workshop in Central River Region (CRR) South and North during December 2013, which was attended by 34 farmers (of whom 14 were women). Interested farmers were identified and SRI demonstration sites were set up. The SRI-WAAPP project concentrated on Central Rice Region – both North and South, with some expansion by the end of the project to the Upper River Region (Figure 22). These regions, where irrigated rice is produced, have no saltwater intrusions.

Figure 21: Sapu site was the only reported site in the Gambia before SRI-WAAPP started in January 2014

Figure 22: SRI sites in the Central River Region and Upper River Region of The Gambia, June 2016

The project began work in 2014 with 101 farmers at 15 sites located in 12 villages. An additional 164 farmers, not directly associated with the project, joined in setting up SRI trials. Results from eight villages are reported in the tables and figure below.

In the Central River Region-North (CRR-N) region, SRI was implemented in 6 villages on 20 plots totaling 7.3 hectares. The six villages were: Sukuta, Kayai, Wassu, Touba Kuta, Fulla Kunda, Kuntaur Jakaba. Results from three villages are summarized in Table 4.

In the Central River Region-South (CRR-S) region, SRI was also introduced to 6 villages, at 7 sites and over 81 plots totaling 25.4 hectares. Results from all the villages are shown in Table 5.

Yields at all sites were significantly higher using SRI. The overall average for all sites reached 4.25 t/ha for SRI versus 1.99 t/ha for conventional farming (Figure 23).

Table 4: Results from comparison trials between SRI and conventional rice system from three villages in the Central River Region-North, the Gambia in 2014

Parameters		Village Sukuta	 Kayai	 Wassu
Number of plots		14	5	1
Area under SRI (ha)		6.2	1	0.1
Rice system where SRI is introduced		Tidal irrigation	Tidal irrigation	Tidal irrigation
Average yield SRI (t/ha)		4.35	5.45	5.5
Average yield non-SRI		2.3	2.1	2
Challenges for SRI farmers		Water control, Labor	Water control, Land prep	Water control, Harvesting
Average production cost ($/Ha)	SRI	$636.25	$636.25	$636.25
	Non-SRI	$616.25	$616.25	$616.25
Average revenue ($/Ha)	SRI	$973.25	$1,380.25	$1,398.75
	Non-SRI	$234.75	$160.75	$123.75

Table 5: Results from comparison trials between SRI and conventional rice system from six villages in the Central River Region-South, the Gambia in 2014

Parameters		Village Touba Demba Sama	 Sambel Kunda	 Wellingara and Saruja	 Kerewan Samba Sire	 Tabanani
Number of plots		31	16	3	18	13
Area under SRI (Ha)		7.1	3.2	1	7.9	6.2
Rice system		Tidal irrigation	Tidal irrigation	Tidal irrigation	Tidal irrigation	Pump irrigation
Average yield SRI (T/Ha)		4.4	4.2	3.8	2.9	3.4
Average yield non-SRI (T/Ha)		1.8	1.9	2	2	1.8
Challenges encountered by SRI farmers		Land prep. Water control	Land prep. Water control	Land prep.	Land prep.	Water control
Average cost of production ($/Ha)	SRI	$636.25	$636.25	$636.25	$636.25	$636.25
	Non-SRI	$616.25	$616.25	$616.25	$616.25	$616.25
Average revenue ($/Ha)	SRI	$991.75	$917.75	$769.75	$436.75	$621.75
	Non-SRI	$49.75	$86.75	$123.75	$123.75	$49.75

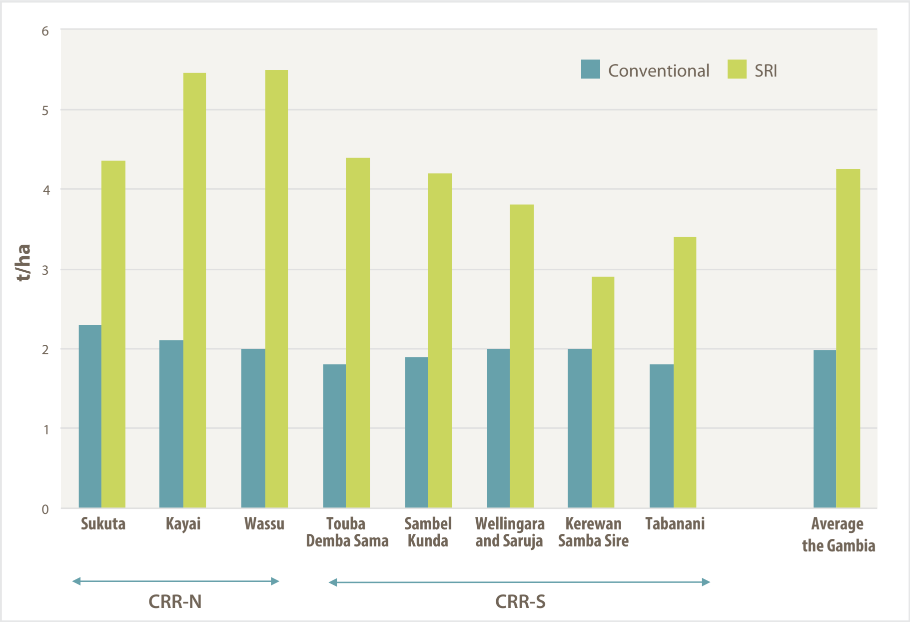


Figure 23: Yield comparison (t/ha) between conventional and SRI plots in southern (CRR-S) and northern (CRR-N) Central River Region of the Gambia in 2014/2015

For farmers to break even, yields must be more than 1.6 t/ha, a level not always attained with conventional methods. With generally low yields and fairly high production costs, conventional rice production has not been very lucrative for farmers.

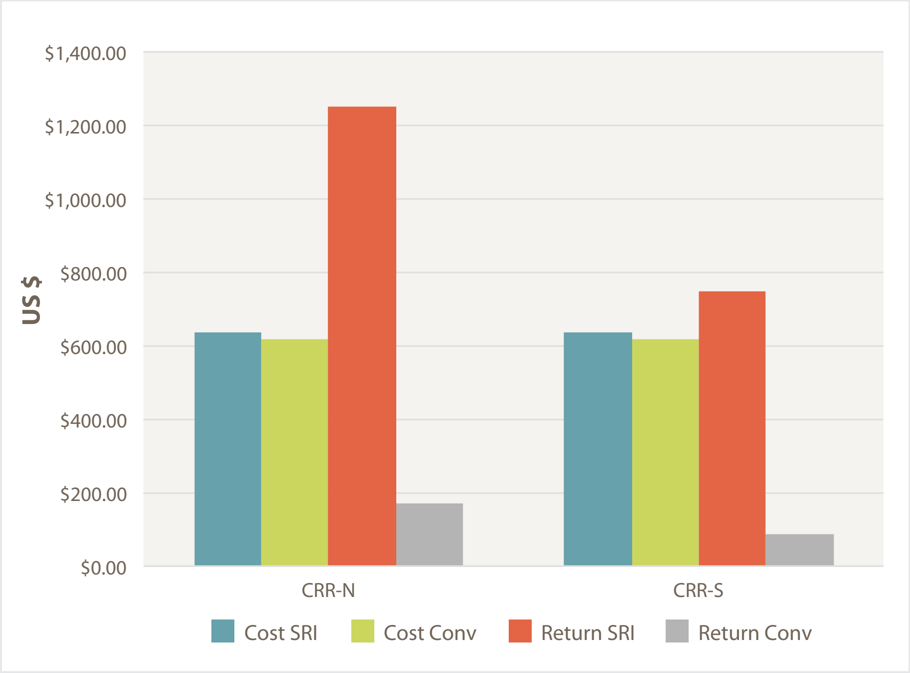


Figure 24: Production costs and net return for SRI and conventional rice production in CRR-N and CRR-S Region (in US$), the Gambia, 2014

Returns with SRI were substantially higher, despite increased costs for land preparation. These are similar to the results in Benin. It will be important to work closely with farmers to optimize SRI practices and transition to the SRI methodology (Figure 24).

In December 2015, the regional coordination team led a national Training of Trainers workshop in Sapu for 60 participants: farmers, extension staff, NGO representatives, a Peace Corps volunteer and staff, researchers and project leaders from the Ministry of Agriculture and the WAAPP program. The new trainers followed up in January 2016 by training 119 farmers at three locations: Niamina, Jahally/Patcharr and Niani.

During the second year (2015), the number of farmers directly working with the project increased to 153 and to 414 (65% women) in 2016. The total area under SRI cultivation increased from 27 ha to 147 ha. 224 farmers external to the SRI-WAAPP project also began to practice SRI.

ADDITIONAL SRI RELATED ACTIVITIES

- In 2015/2016, when the managers at the President's farm were unable to source sufficient seedlings to plant rice using conventional methods, they took advice from trained technicians and SRI farmers and planted the entire farm area of 14 hectares with SRI.
- A training session in compost- making combined with SRI was organized by the SRI-WAAPP team in 2014. Although only 65 people were expected to attend, 150 people came and learned to make compost.
- Peace Corps Gambia volunteers designed a weeder using old vehicle tire rims. Iron rods welded onto the rims served as weeder teeth. The rims were then fitted with a handle to push the weeder through the field.

Participants of the national training of SRI trainers in Sapu, the Gambia, in December 2015

14 hectares of SRI at the President's Farm in Sapu, the Gambia in 2016

- SRI was included in three innovation platforms: The Wellingara Rice Platform, the Jahally Rice Platform, and the Jurungu Rice Innovation platform. These platforms shared information about SRI practices and techniques with fellow farmers, in part through broadcasts on community radio.

Farmers are motivated to adopt SRI because of both the good yields and the reduced amount of seed and irrigation water required. To date, farmers have not yet developed satisfactory strategies to add organic matter to their lowland rice plots, as the usual practice is to burn the rice straw or feed it to livestock. Often there is no transportation available to bring organic matter to rice fields. Farmers perceive the higher demand for labor as a problem, especially during the transition period from conventional rice cultivation to SRI. Problems with weeding and water control have also made it difficult for farmers to implement SRI well.

KINSA SIDIBEH – SRI FARMER LEADER AND INNOVATOR

Kinsa Sidibeh, rice farmer from Center River Region North, is president of her women's farmer group and a SRI pioneer in the Gambia. After traveling to the regional SRI workshop in Kpalimé, Togo in August 2014 (where she was the only full-time female farmer in attendance), she set up the first SRI field in her village and trained other women from the area in SRI.

While still gaining experience with SRI, she came up with a simple yet effective innovation to better control the water level in her plot: using a short piece of plastic PVC pipe to bring in water from the irrigation canal, or to drain the plot. Regardless of others' irrigation schedules, she can open or close the pipe as needed, and the earthen bund between the canal and the plot remains intact, reducing the problem of unwanted flooding or draining due to broken bunds. Kinsa shared this innovation with 80 of her fellow SRI farmers.

Left: Kinsa (on right) with her rice farmer colleagues during a field visit

SRI-WAAPPP project coordinators and collaborators

Focal Institution for SRI	National Agriculture Research Institute (NARI)
National SRI facilitator	Momodou Sambou
Previous SRI facilitator	Essa Drammeh
WAAPP coordinator	Momodou Mbye Jabang
Previous WAAPP coordinator	Falalo M Tourey
Previous WAAPP coordinator	Sheikh T Sosseh
Previous WAAPP regional focal point	Mhumed Tambajang
WAAPP M&E officer	Ramatouile Sanyang Hydara
Previous M&E officer	Yassin Khan
SRI Champions	Ms Kinsa Sidibeh, Ms Samba Fatou Njai

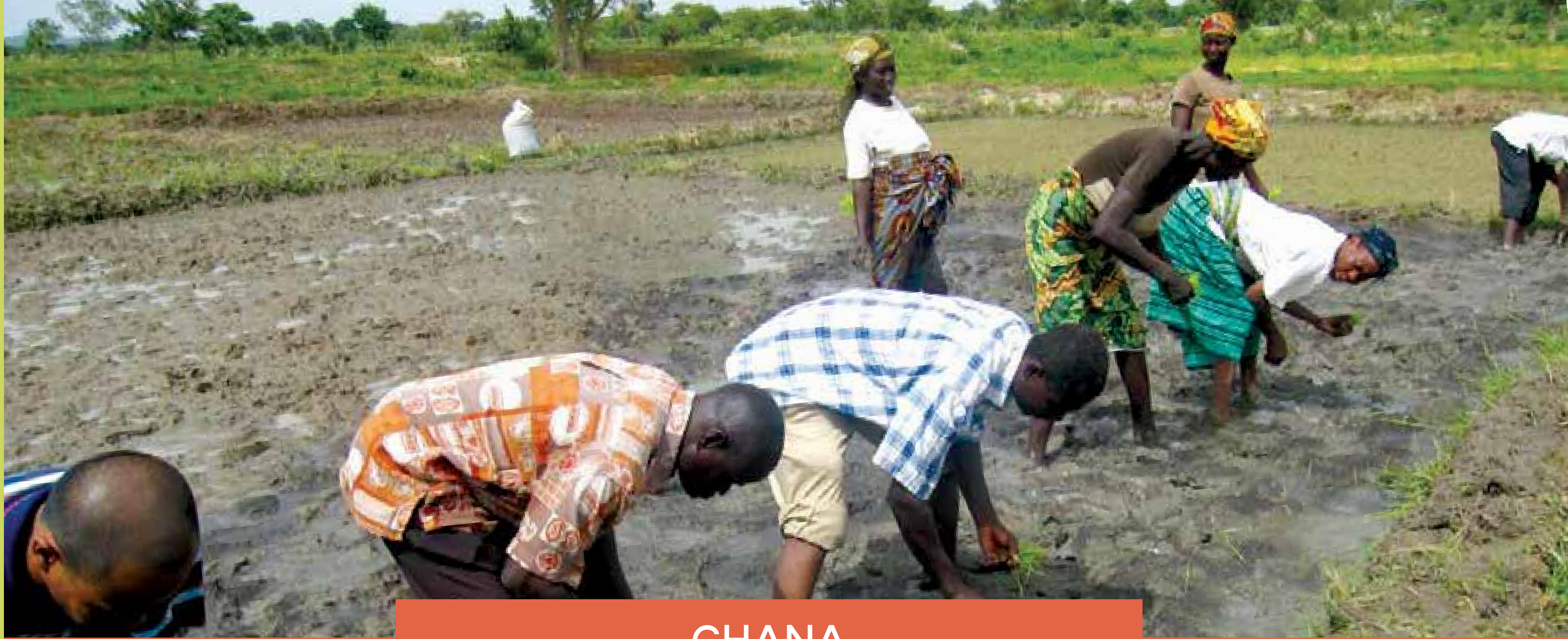
Institutions involved with SRI

Short name	Name	Type
WAAPP-Gambia	West Africa Agricultural Productivity Program	Government, SRI-WAAPP Coordination
NARI	The Gambia National Agricultural Research Institute	Government Research, SRI focal institution
DOA - Gambia	Department of Agriculture – The Gambia	Government
NAWFA	Gambia National Women Farmers Association	Farmer organization
NYSS	National Youth Service Scheme	Civil Society
Peace Corps Gambia	Peace Corps	USA Government

SRI Publications

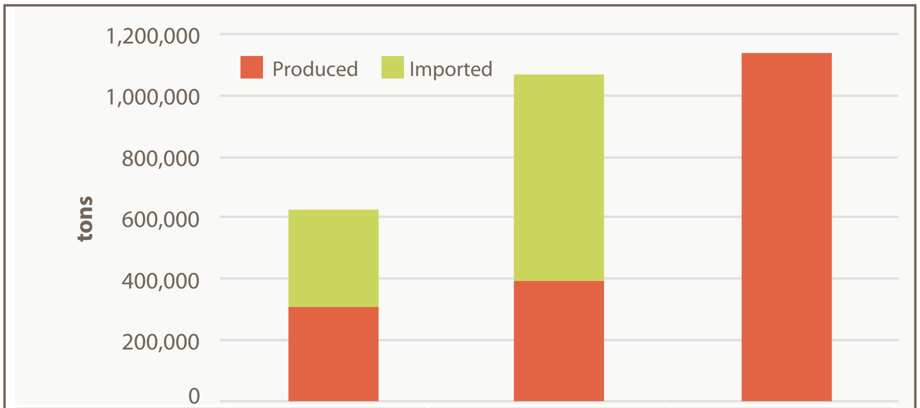
Baseline Study: Ceesay, M. 2016. SRI Baseline Survey: The Gambia; Conducted on behalf of the SRI-WAAPP project, Banjul, The Gambia, 34p.

2 Videos from project activities, WAAPP Gambia, 2015



GHANA

In 2010, rice consumption in Ghana was 26kg per capita, and the self-sufficiency rate was at 49%. The goal of the NRDS (2009) was to increase rice-growing area by 3.2 times from 2008 to 2018 --from 118,000 ha to 375,000 ha -- and to increase yield levels by 50% under all rice-cropping systems during the same period. Rice is produced in all agro-ecological zones and regions of the country: about 70% in the north, and 30% in the south. In 2008 rainfed lowland rice occupied 78% of the rice-growing area (92,000 ha), followed by irrigated rice at 16% (18,900 ha), and rainfed upland rice with 6% (7,100 ha). Out of a total of 7.8 million hectares of land used for agriculture, rice occupies less than 3% (MOFA, 2011). The potential of rice production in Ghana is barely developed. To cite one example, there are more than 4 million ha of unexploited rainfed lowlands.



	2010	2016/2017	2025 estimated
Self-sufficiency rate (%)	49	37	100
Population (million)	24.31	28.66	33.68
Yearly per capita consumption (kg)	26	37	34
Production paddy (t)	491,603	609,375	1,772,390
Production milled (t)	309,710	390,000	1,134,329
Consumption milled (t)	629,853	1,065,000	1,134,329
Imported milled (t)	320,143	675,000	0

Data: Compiled by authors from FAO online database, Index Mundi online database, Fofana et al (2014)

Figure 25: Rice consumption, as a composite of production and imports, population and per capita rice consumption for 2010, 2016/2017 and predicted for 2025 for the country of Ghana

Per capita consumption had been predicted to increase to 34 kg by 2025, but by 2017, at 37 kg per capita, it had already exceeded this anticipated amount, translating to an overall consumption of more than 1 million tons of milled rice. Imports more than doubled from 2010 to 2017, consequently the self-sufficiency rate declined to 37%. To reach self-sufficiency by 2025, production must increase to 1.772 million tons of paddy, up from 609,000 tons in 2016/2017 (Figure 25).

SRI ACTIVITIES PRIOR TO SRI-WAAPP

SRI first came to national attention in 2012, when the Ghana Rice Inter-Professional Body (GRIB), with support from the Skills Development Fund (SDF), introduced SRI to 6 out of the 10 regions in Ghana: Ashanti, Volta, Western, Brong Ahafo, Upper East and Northern. SRI demonstration plots were established under both irrigation and rainfed ecologies in selected communities. Field days and classroom trainings were organized for a total of 920 farmers (of whom 314 were women). The average yield for all 6 regions was 3.27 t/ha compared to 1.89 t/ha for conventional rice production.

Also during 2012, the regional USAID-funded project E-ATP held a Training of Trainers workshop for 47 participants (10 of whom were women) coming from five organizations (see list in Appendix 1). These partners subsequently included SRI into their programming and trained more farmers. Among these partners, during 2013 and 2014 representatives from the USAID project ADVANCE and GRIB introduced SRI to communities in Brong Ahafo, Upper East and Northern regions, achieving an average yield of 7.6 t/ha compared to 5.3 t/ha under conventional production in the Northern and Upper East Regions. GRIB/ADVANCE helped install demonstration plots, provided SRI training to farmers and organized field days, reaching a total of 2701 beneficiaries (of whom 1313 were women). Finally, the private firm AMSIG Resources, buying rice for processing from 3600 farmers in Northern Ghana, trained 1020 farmers in 65 communities in SRI, assisting them to achieve higher yields and better rice quality. See approximate location of sites in Figure 26.

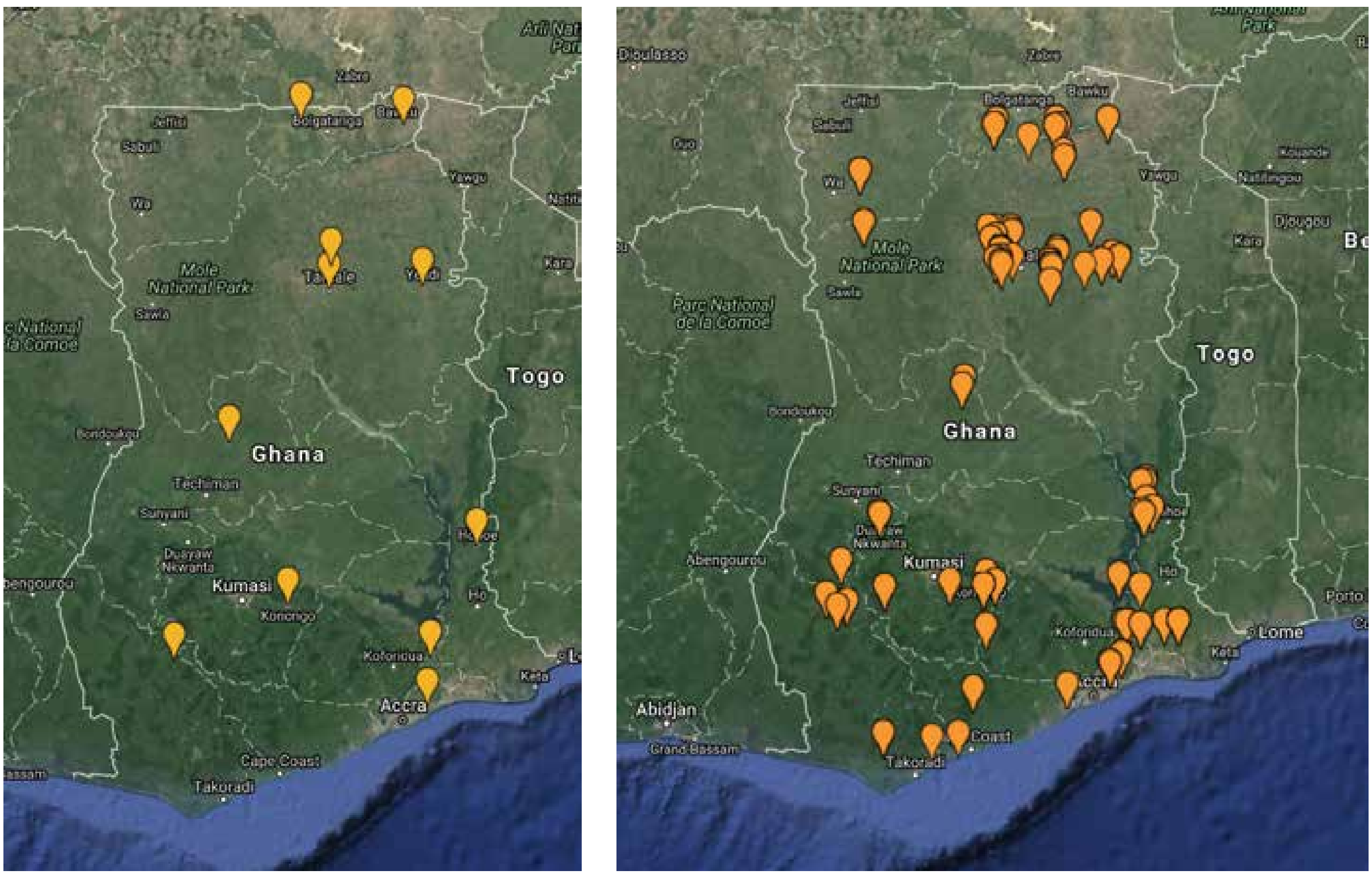


Figure 26: Approximate location of SRI sites before January 2014 (left), and SRI-WAAPP sites for rainfed lowland rice (yellow) and irrigated rice (blue), Ghana, June 2016 (right)

SRI-WAAPP PROJECT RESULTS

The SRI-WAAPP project in Ghana began only in April 2015, one year later than in the other project countries, and carried out activities during only one year. All project sites are mapped in Figure 26. The project sought wide coverage and worked with a total of 15 partners, most of whom already had some experience with SRI. For efficient implementation, project coordination was divided into two zones: northern and southern.

The northern zone, covering the Northern, Upper East and Upper Western Regions, was coordinated by the Savanna Agriculture Research Institute (CSIR-SARI). Associated

Table 6: Targets and achievements of SRI-WAAPP Ghana for 2015

Parameters	2015 Target	Achievements		
	Total	Southern Zone	Northern Zone	Total
Number of Regions	5	6	3	9
Number of districts		28	12	40
Number of communities	50	33	77	110
Implementation partners	10	6	12	15
Number of SRI champions	20	22	23	45
Number of Demonstrations	50	44	46	84
Total number of trained farmers	2500	845 (448w)	1390 (445w)	2235 (893w)
Potential number of adopters	10,000	9650	8000	17,650
% women involved in SRI activities	30%	53% (5115)	32% (2560)	43% (7675)
Awareness creation through radio/TV	5	3	4	7
Number of exchange visits	4	7	4	11

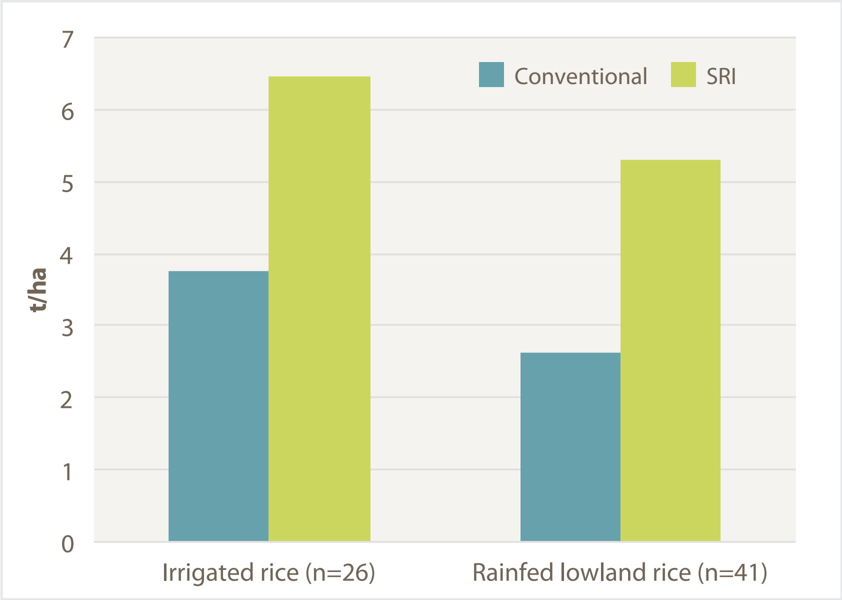


Figure 27: Yield comparison (t/ha) between conventional and SRI rice production for irrigated and rainfed lowland systems in Ghana (2015/2016)

partners were: AMSIG Resources, AgXtension Africa Ltd, JICA, ICOUR, Quality rice development Project (QRDP), Navrongo IP, Golinga IP, MoFA, the Rice sector support project (RSSP), Adventist Relief Agency (ADRA), SNV, and the ADVANCE project.

The southern zone, covering the Volta, Ashanti, Greater Accra, Western, Central, Brong-Ahafo and Eastern regions, was coordinated by the Crops Research Institute (CSIR-CRI). Partners were the Ghana Rice Inter-Professional Bodies (GRIB), the Ministry of Food and Agriculture (MoFA), Ghana Irrigation Development Authority (GIDA) of MoFA, Japan International Cooperation Agency (JICA), the Rice Sector Support Project (RSSP) and various Farmer-Based Organizations (FBOs).

Although active for only one year, the project clearly surpassed most its initial targets, implementing a total of 84 demonstration plots (44 in the north, 40 in the south) and supporting 45 SRI Champions (23 in the north, 22 in the south), to reach 110 communities in 40 districts in 9 out of Ghana's 10 regions (Table 6). 2235 farmers were trained during 45 farmer training sessions, followed by 11 exchange visits to motivate farmers to implement SRI in their own fields.

Comparative yield evaluations showed that in irrigated systems yields reached 3.76 t/ha under conventional practices, while yields were 6.46 t/ha for SRI. In rainfed lowland systems, conventional practices yielded 2.63 t/ha compared to 5.3 t/ha for SRI (Figure 27).

Additionally, SRI was included in several of the rice innovation platforms (IP) that bring together rice value-chain stakeholders: at Kumasi, Jasikan and the Weta Irrigation site in the south, and at the Navrongo, Savlegu and Wa rice IPs in the north.

An original initiative, unique to Ghana, was the "SRI transplanting gangs," when young people formed small teams to offer SRI transplanting services for a fee.

Identified constraints were mostly related to erratic rainfall patterns affecting rainfed rice (a constraint for rice production in general, not limited to SRI). Additionally, farmers often mentioned that it is difficult to access to organic matter for fertilization.

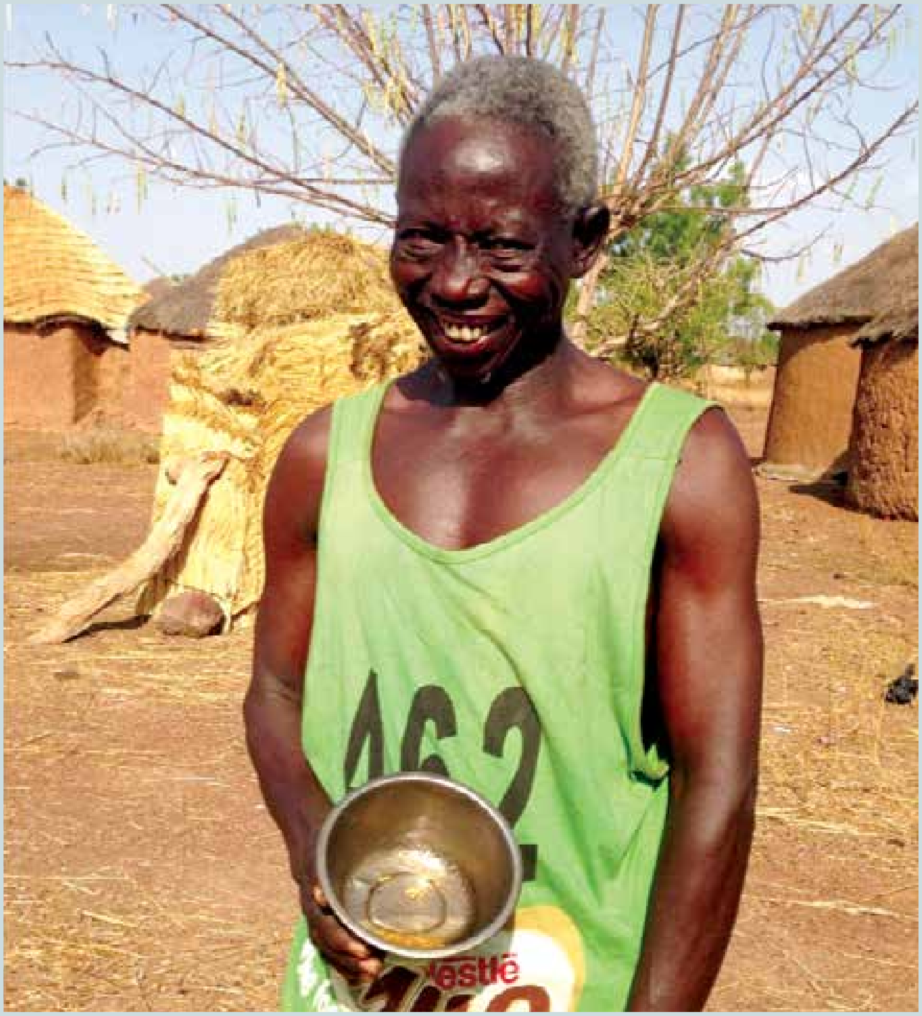
SRI FARMER CHAMPION IDDRISU ZAKARIA

Like many farmers in northern Ghana, Iddrisu Zakaria from Gbanjong village never went to school, and has been a farmer all his life. He supports a household of seven on three hectares growing rainfed rice, maize, yam, pepper and groundnuts. But when he was selected by the District Director from the Ministry of Food and Agriculture to be a lead farmer for SRI, he was determined to succeed.

Seeing the small, widely-spaced seedlings in the newly-planted SRI test plot, some passers-by laughed at him at first. So much work for so few plants! Iddrisu admitted to being worried that the effort would be wasted but remained optimistic. After all, he had seen the good results at the demonstration site. When his SRI plants grew to three feet tall, higher than any rice plants in his neighbors' fields, the laughing stopped. And the seeds were so full and heavy that the tillers hung down in a way no one had ever seen. Other farmers stopped to ask questions, and wanted to know how he did it.

It was a hard, dry growing season with little rain, but Iddrisu still managed to harvest 240 kg from his 0.1-hectare SRI plot, while his conventional field yielded almost nothing. Despite the lack of rain, Iddrisu's yield from his SRI plot was equivalent to what he harvested from the same amount of land with conventional practice the previous year, with adequate rains.

Iddrisu sold 1.5 bags of SRI rice and kept half a bag for seed and home consumption. He opened a bank account for the income he made because he knew it would encourage him to save and eventually even get a loan. Even though the rice yields weren't high, they ate better than their neighbors did. His success in producing upland rice in such a challenging year did not go unnoticed. Three field days held at his plot drew a total of 150 farmers from five communities, and Iddrisu won the District-level Award for *Best Farmer - Innovative Practices.*



Iddrissu showing an almost empty bowl, with a few grains only he harvested from his conventional plot – he smiles because he produced 240 kg on his SRI plot and enough to feed his family and even sell some on the market

SRI-WAAPPP project coordinators and collaborators

Focal Institution for SRI	Savannah Agricultural Research Institute (CSIR-SARI)
National SRI facilitator	Wilson Dogbe
WAAPP coordinator	Azara Ali Mamshie
WAAPP M&E officer	Augustine Danquah Oppong
Previous WAAPP M&E officer	Edward Martey
SRI Champions	Ms Janet Atimoliga, Gilbert Atanga, Gina Odarteifio, Evans Teye Sackey

Institutions involved with SRI

Short name	Name	Type
WAAPP-Ghana	West Africa Agricultural Productivity Program	Government, SRI-WAAPP Coordination
CSIR-SARI	Council for Scientific and Industrial Research – Savanna Agricultural Research Institute	Government Research, SRI focal institution
ADRA	Adventist Development and Relief Agency	International humanitarian agency
ADVANCE Ghana	Ghana Agricultural Development and Value Chain Enhancement	Bilateral development project, USAID
AGXTENSION	AGXTENSION Africa Limited	Local Business
AMSIG Resources	AMSIG Resources	Private Enterprise
Daily Graphic	Daily Graphic - Graphic Online	News Media
EWD	Engineers without Borders	International NGO
Footprint to Africa	"Business news made in Africa"	News Media
GIDA	Ghana irrigation development agency	Government
GNA	Ghana News Agency	News Media
GRIB	Ghana Rice Inter-Professional Body	Professional Organization
MoFA Ghana	Ministry of Agriculture	Government Extension
Peace FM	Peace FM Online	Online Radio
QRDP	Quality rice development project	Government, funded by AFDB
RSSP	Rice Sector support project	Governmental, funded by France
SDF	Skills Development Fund	Donor
SNV	SNV Netherlands	International NGO

SRI Publications

Conference Paper: Amengor, N.E.; G.K. Acheampong; M.D. Asante and W. Dogbe. 2015. Innovation Platform; A Tool for Sustainable Rice Production in Ghana.

Baseline study: CSIR. 2015. Baseline Report on SRI: System of Rice Intensification (SRI)-West Africa Agricultural Productivity Programme (WAAPP), Savanna Agricultural Research Institute (SARI) of the Council for Scientific and Industrial Research (CSIR), Ghana, 69p.

Technical Reports: Acheampong, G.K. and N.E. Amengor. 2015. Improvement and scaling up of the system of rice intensification (SRI) in Ghana – Southern Zone:

- Mid-Year Technical Report,
- 2nd Half Year Technical Report,
- CSIR –CRI Annual Technical report.

Final project summary report: CSIR-SARI. 2016. System of Rice Intensification (SRI). Annual Report (Jan-Dec 2015). Presented to PCU WAAPP 2A. 9p.

GUINEA

Guinea is the third largest rice producer in West Africa after Nigeria and Mali. Rice is the main staple food in Guinea with a high per capita consumption of 107 kg per year in 2010, and expected to increase to 131 kg by 2025. In 2010, the self-sufficiency rate, at 80%, was high compared to other countries in the region. Total production increased by 45% from 2010 to 2016/2017, reaching 2.165 million tons of paddy, but imports during the same period rose even faster, by 75%, due to increased consumption. The National Rice Development Strategy (NRDS, 2009) targeted self-sufficiency in rice by 2018, producing 2,726,460 tons of paddy, and furthermore to become a rice exporter to the sub-region. Average yields were to increase from 1.43 t/ha in 2008 to a planned 2.75 t/ha by 2018. The 2016/2017 production achieved 80% of this goal.

	2010	2016/2017	2025 estimated
Self-sufficiency rate (%)	80	66	100
Population (million)	11.01	13.29	16,25
Yearly per capita consumption (kg)	107	150	131
Production paddy (t)	1,498,962	2,165,625	3,327,119
Production milled (t)	944,346	1,386,000	2,129,356
Consumption milled (t)	1,182,356	2,086,000	2,129,356
Imported milled (t)	238,010	700,000	0

Data: Compiled by authors from FAO online database, Index Mundi online database, Fofana et al (2014)

Figure 28: Rice consumption, as a composite of production and imports, self-sufficiency rate, population and per capita rice consumption for 2010, 2016/2017 and predicted for 2025 for the country of Guinea

Rice production in Guinea is dominated by rainfed systems. In 2008, rainfed upland rice farming was by far the most widespread system at 65% of the total cultivated area, but with yields often lower than 1 ton/ha. Lowland rice production accounted for 10% of the total cultivated area with yields ranging from 1.5-2.5 t/ha. Mangrove rice production occupied 16% and alluvial plains 9% of total rice area with yield averages of 2.5 and 1.5 t/ha, respectively. Production for self-sufficiency for 2025 will require an increase to 3.327 million tons of paddy, equal to 2.129 million tons of milled rice. Production in 2017 equaled 65% of projected 2025 consumption requirements, putting Guinea in the group of countries, together with Mali, Sierra Leone and Côte d'Ivoire, in best position to close the gap between production and consumption (Figure 28).

SRI ACTIVITIES BEFORE SRI-WAAPP

The first SRI trials, in combination with tests of Chinese hybrid rice, were undertaken in 2003 in Koba county by the China National Hybrid Research and Development Centre. Six hybrid varieties were tested using the SRI method, achieving yields between 5.59 t/ha and 9.32 t/ha. No further SRI activities were recorded until 2011, when the Biblical Institute of Télékoro in Kissidougou, Southern Guinea, tested SRI, and consequently in 2012 funded an experiment led by the University ISAV in Faranah, Central Guinea. The ISAV comparison trial with full water control yielded 12.54 t/ha for SRI compared to 9.7 t/ha with conventional practices. During the same year, in 2012 a Peace Corps volunteer and her colleague from the National School of Agriculture and Livestock (ENAE) in Lower Guinea attended a regional SRI training in Benin (see Benin section for details). Upon their return they organized a SRI workshop at the school for 60 agricultural students and professors.

Figure 29: SRI site locations before January 2014

Figure 30: Mapped SRI Sites for Guinea, June 2016

Following the first regional SRI workshop in Ouagadougou in 2012, where the SRI-WAAPP project was conceived, the National Agricultural Research Institute (IRAG) undertook a comparison trial in Koba, in Western-Central Guinea, under rainfed conditions without water control, obtaining yields of 4.2 t/ha with SRI and 1.5 t/ha with conventional practices. Site locations Télékoro, Faranah and Koba are shown in Figure 29.

SRI-WAAPP PROJECT RESULTS

As WAAPP Guinea funding was available for only 2013 and 2014, SRI activities began earlier -- in 2013 -- than in other countries. There was no WAAPP funding available for 2015 and 2016, but the project team was able to mobilize funds from other donors to continue some limited SRI activities. A map with all SRI-WAAPP sites by 2016 is shown in Figure 30.

After the Ouagadougou SRI workshop in 2012, Barry Billo from IRAG organized an initial national workshop on SRI in Kankan in 2013, with 29 participants from 13 partner institutions. They were briefed on the Ouagadougou workshop, and introduced to the basics of SRI. The participants selected 11 sites in the four large geographic regions of Guinea, where SRI comparison trials were to be set up in farmers' fields during 2013/2014 cropping season. The trials were supervised by 16 technicians who were trained in SRI in July 2013.

Comparison trial results from the 2013/2014 season from eight sites located across the four large geographic regions of Guinea showed yield increases with SRI from 25% to 204% higher than farmer practice, with an average yield increase for all sites of 65% (Figure 31). The highest productivity increases occurred at sites with the greatest constraints and with traditionally low yield levels.

Also in 2013 **a variety test** was undertaken with 6 varieties: four improved varieties and two traditional ones at KOBA station, Tatema site. Results are shown in Figure 32.

In addition to the 2013/2014 field trials, SRI-WAAPP led 24 training sessions for 320 farmers (45 women), and the non-WAAPP projects held 14 training sessions with 180 farmers (30 women), thus a total of 500 farmers (75 women) were trained in the four regions of the country.

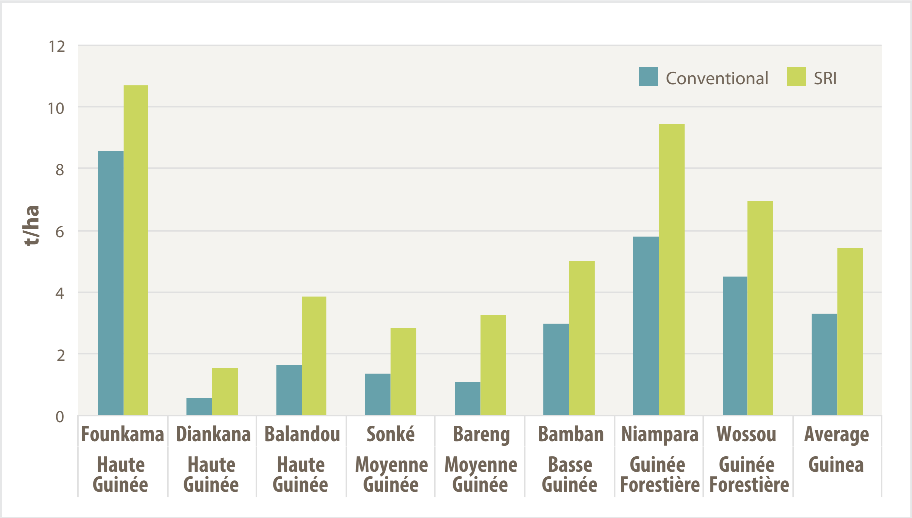


Figure 31: Yield comparisons (t/ha) between conventional and SRI rice production in 8 different sites in 4 regions of Guinea in 2013/2014

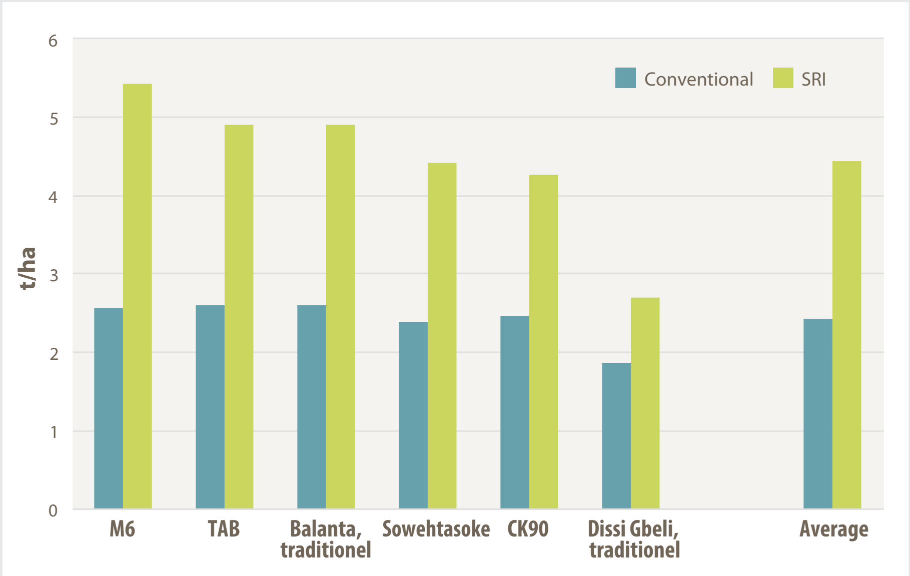


Figure 32: Variety test with conventional and SRI production method with six varieties (4 improved, 2 traditional) in 2013/2014 (t/ha)

During the **2014/15 cropping season**, the project team introduced SRI to more villages in the different regions, and worked with partners to provide technical assistance to farmers in 19 villages (12 WAAPP and 7 non-WAAPP) in the four ecological zones of the country. 41 farmers planted a total of 8.5 hectares of SRI, following the SRI practices of young, single seedling establishment, wide spacing and organic matter application, but did not have mechanical weeders available and water control was not possible. Average yields were 4.7 t/ha for SRI and 2.6 t/ha for conventional. This confirmed results obtained in the previous year.

Seed multiplication with SRI: During 2014/2015, IRAG continued to evaluate how different varieties respond to SRI planting methods. Working at one of their research stations in Koba, they used SRI to multiply the variety M6 to share with farmers.

Seeking to interest more farmers, the project began to introduce SRI in **peri-urban lowland farming** plots. Rice there is planted in rotation with vegetables, and the rice crop can benefit from the same fertilization – easily available household waste --used for the vegetable gardening. 40 farmers at eight peri-urban lowland sites in the four major region of Guinea started working with SRI. Sites were set up at Dubréka, Coyah and Kindia in Basse Guinée, Mamou and Timbi Madina at Pita in Moyenne Guinée, Faranah and Kankan in Haute Guinée, and N'Zérékoré in Guinée Forestière. The average yield from 18 farmers was 4.67 t/ha for SRI compared to 2.46 t/ha for conventional methods.

Constraints identified in Guinea for the implementation of SRI were the lack of funding for outreach to farming communities and training. SRI practices are not yet well-developed for all regions and systems, and thus it is recommended to continue to develop best practices through technical adaptations and farmer trials. Support for smallholder mechanization and installation of simple irrigation systems would address shortages of labor and water availability. Composting the organic matter widely available in urban areas can address the lack of organic matter on peri-urban farms.

Field day to visit seed multiplication plots planted with the SRI method in Guinea, 2014

Farmer, government representative and WAAPP representative note the progress made thanks to the SRI method for efficient M6 variety seed multiplication

A seed controler checking a seed multiplication plot planted with the SRI method

COMPOST MAKING IN ASSOCIATION WITH SRI TRAININGS

Adding organic matter, or compost, to the soil is one of the principles of SRI, but it is not common for farmers to do for rice production in Guinea. So the project team included compost-making in their SRI training, teaching farmers to use materials, like easily available cow manure, the *calapo* legume *(Calopogonium mucunoïdes)*, grasses, shrubs, palm leaves...even household waste. The latter is especially easily accessible for peri-urban rice farmers. The project trained 430 farmers or more in compost making.

Unused cow manure piles – a source for compost

Household waste and biomass from surrounding vegetation are mixed up and composted

Training in compost-making and heap compost demonstration set up next to the SRI rice fields

SRI-WAAPPP project coordinators and collaborators

Focal Institution for SRI	Institut de Recherche Agronomique de Guinée (IRAG)
National SRI facilitator	Barry Mamadou Billo
WAAPP coordinator	Boubacar Diallo
WAAPP M&E officer	Ibrahima Sambégou Gassama
SRI Champions	Aboubacar Bangoura, Kakoly Mamy, Mamady Diaby, Ms Julienne Male

Institutions involved with SRI

Short name	Name	Type
WAAPP-Guinea	West Africa Agricultural Productivity Program	Government, SRI-WAAPP Coordination
IRAG	Institut de recherche agronomique de Guinée	Government Research, SRI focal institution
AEMIP	Agriculture Education and Market Improvement Program	Development Project
ANPROCA	Agence Nationale de la Promotion Rurale et du Conseil Agricole	Government, Extension
FEPRORIZ-GF	Fédération des Unions des Producteurs de Riz	Farmer organization
FOP-BG	Fédération des organisation paysanes de la basse guinée	Farmer organization
FUPRORIZ	Fédération des Unions des Producteurs de Riz de la Haute Guinée	Farmer organization
IBT	Institut Biblique de Telekoro	Education
ISAV	Institut Supérieur Agronomique et Vétérinaire de Faranah	Governmental, Education, Research
Peace Corps	Peace Corps	Governmental, International, USA
PNAAFA	Programme National d'Appui aux Acteurs des Filieres Agricoles	Government
PUAPA2	Projet d'Appui à la Productivité Agricole	Government
Winrock International	Winrock International	International NGO

SRI Publications

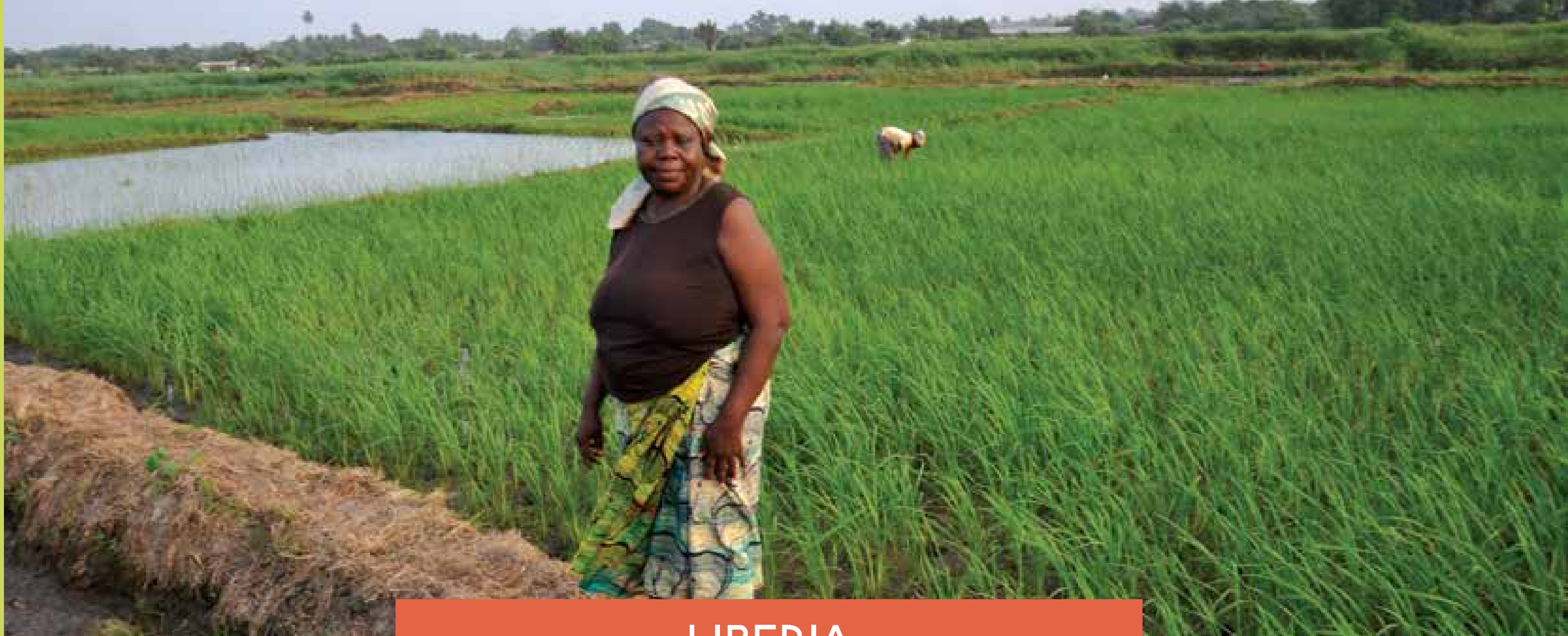
Research report: Diallo D. 2012. Comparaison du rendement de deux systèmes de riziculture: intensive (SRI) et traditionnelle (SRT) dans la plaine Founkama (ISAV de Faranah). Rapport de recherche. INSTITUT SUPERIEUR AGRONOMIQUE ET VETERINAIRE «VALERY GISCARD D'ESTAING» DE FARANAH (ISAV-VGE/F), MINISTERE DE L'ENSEIGNEMENT SUPERIEUR ET DE LA RECHERCHE SCIENTIFIQUE, RÉPUBLIQUE DE GUINÉE, 15p.

Technical Report: Barry MB. 2014. Le Système de Riziculture Intensive (SRI) en Guinée : Des rendements du riz jusqu'à plus de 10 tonnes par ha confirmés par la recherche! PPAAO et IRAG, 4p

Technical Report: Barry MB. 2014. Note sur l'introduction et l'adaptation du Système de Riziculture Intensive (SRI) en Guinée, PPAAO et IRAG, 3p.

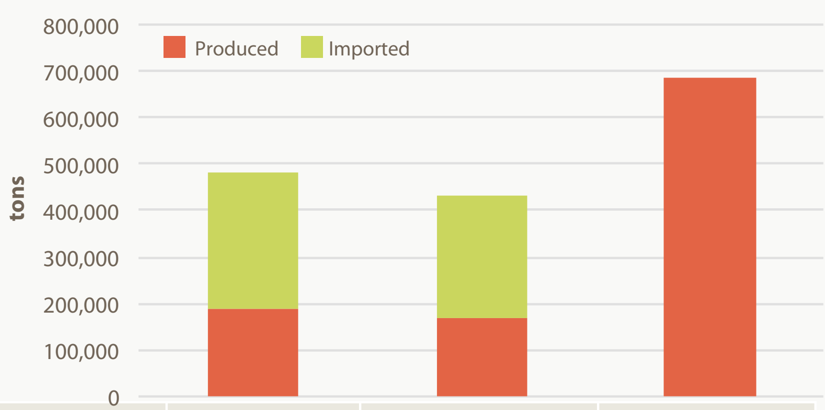
WAAPP Newsletter: 2015. Bulletin d'Information du Programme de Productivite Agricole en Afrique de l'Ouest – Guinee, No 009/2015: article: Le SRI (système de riziculture intensive), une pratique culturale en passe de devenir une réponse pour développer la riziculture péri-urbaine en Guinée p. 6-7

Research report: Barry MB, Conte NG and Bah SD. 2014. Recherche de variétés adaptées au Système de Riziculture Intensive (SRI) en Basse Guinée, IRAG, 13p.



LIBERIA

At 122 kg/capita (2010), rice consumption in Liberia is among the highest in West Africa. In 2010, 90% of the total rice-growing area was in the uplands, characterized by shifting cultivation and very low average yields of 0.9 t/ha. Lowland rice occupied 9% of rice area with 1.2 t/ha yields and irrigated rice used only 1% of rice area, with yields of 2t/ha. The self-sufficiency rate was 39% in 2010. The 2012 NRDS set an ambitious target to reach self-sufficiency by 2018, to be achieved as follows: upland rice- growing area to remain constant but with increased productivity from 0.9t/ha to 2t/ha in 2018; rainfed lowland rice-growing area to be tripled from 20,000 ha to 64,000 ha by 2018 with yield increases from 1.2 t/ha to 3.5 t/ha; and the irrigated area to increase from 2000 ha to 45,000 ha, along with tripling of yields from 2 t/ha to 6t/ha.



	2010	2016/2017	2025 estimated
Self-sufficiency rate (%)	39	40	100
Population (million)	3.96	4.73	5.73
Yearly per capita consumption (kg)	122	91	120
Production paddy (t)	296,090	261,538	1,073,998
Production milled (t)	186,537	170,000	687,359
Consumption milled (t)	481,040	430,000	687,359
Imported milled (t)	294,503	260,000	0

Data: Compiled by authors from FAO online database, Index Mundi online database, Fofana et al (2014)

Figure 33: Rice consumption, as a composite of production and imports, self-sufficiency rate, population and per capita rice consumption for 2010, 2016/2017 and predicted for 2025 for the country of Liberia

Unlike other West African countries, where production has steadily increased since 2010, the rice-growing area, rice production, consumption, and imports in Liberia all declined from 2010 to 2016/2017.
To achieve rice self-sufficiency by 2025, production must quadruple, from 261,538 tons in 2016/17 to 1,073,998 tons of paddy rice. (Figure 33)

SRI ACTIVITIES PRIOR TO SRI-WAAPP

Robert Bimba, then National Coordinator of the Liberia Farmer Union Network (FUN), first learned of SRI at the regional workshop in Ouagadougou in July 2012. He went on to install the first SRI test plot in Liberia at Paynesville, Monrovia in December 2012 (see Figure 34). The results convinced him and the SRI-WAAPP project preparation team of the potential of the SRI method. In anticipation of the project start-up planned for January 2014, they held the first national SRI training workshop in December 2013.

SRI-WAAPP PROJECT RESULTS

SRI largely began in Liberia with SRI-WAAPP. The project was formally launched by her Excellency the President of Liberia, Ellen Johnson Sirleaf, on May 19, 2014, during a field day organized at CHAP Paynesville SRI fields. Unfortunately, WAAPP funding was available for only the 2014 rice growing season (May 2014 to May 2015), which largely overlapped with the difficult period of the Ebola crisis (March 2014 to January 2015).

As stated above, Robert Bimba had organized a national SRI training workshop in December 2013, inviting SRI champion Daniel Saidu from Sierra Leone and Gaoussou Traore from CNS-Riz Mali to act as trainers. 84 participants – 50 representatives from all 15 counties of Liberia and 34 from government institutions, multi-lateral and bi-lateral projects, NGOs, and civil society – met in Kakata, Margibi County. One representative from each county was selected to install a 1 ha SRI demonstration plot upon his or her return and to help train other farmers. Demonstration plots were successfully installed in 10 of the 15 counties.

Under the SRI leadership of Robert Bimba, it became a natural choice for his NGO Community of Hope Agriculture Project (CHAP) to become the national focal institution for SRI, the only NGO to do so within SRI-WAAPP. From the beginning, national facilitator Robert had invited most rice stakeholders to training workshops and field days, and frequently shared project updates via an extensive email list. Other projects soon joined the effort, including the USAID/FED project, the German NGO Welthungerhilfe, and Oxfam. The latter also helped facilitate the Rice Innovation Platform.

Permanent SRI fields were set up at the CHAP farm in Paynesville, Monrovia. The farm is easily accessible and serves as demonstration site both for those based in the capital, and for farmers traveling to Monrovia.

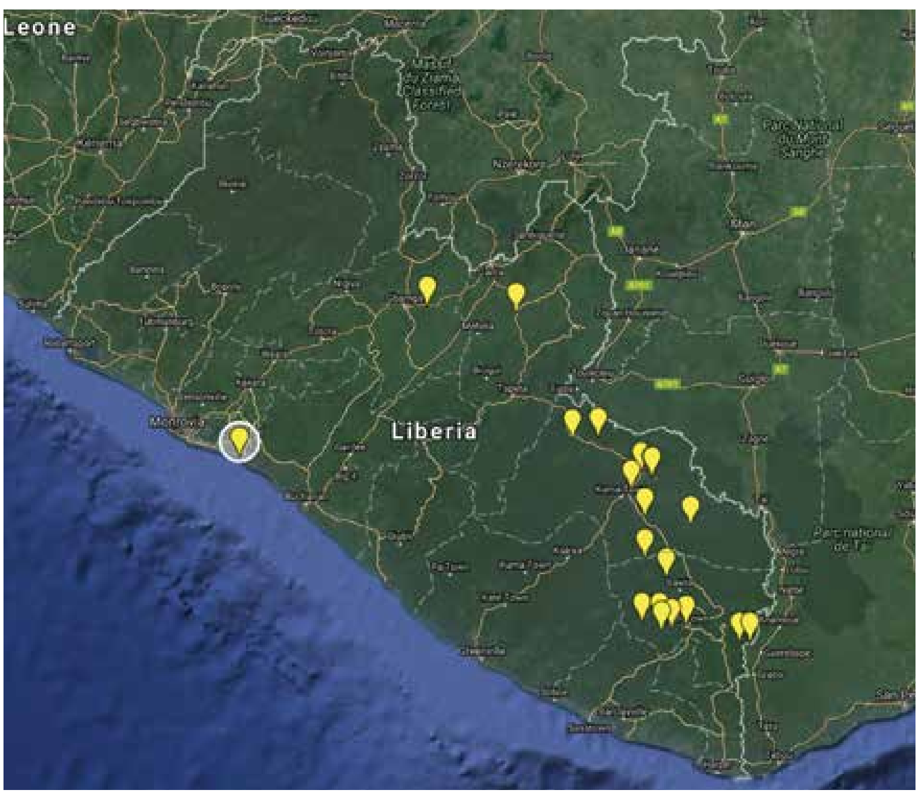


Figure 34: SRI-WAAPP field sites, Liberia, June 2016
(circled site is the first SRI site in Liberia, Paynesville, Monrovia planted in 2012/2013)

The project worked only on the rainfed lowland areas. SRI-WAAPP field sites are mapped in Figure 34.

The project focused its efforts on two counties, Grand Gedeh and River Gee in the Southeast (a region less affected by Ebola), working with 30 farmers in each of six districts for a total of 180 farmers, of whom 58% were female. These were joined by 17 farmers from Nimba county and 19 farmers from Zwedru City. The average yield from these 216 farmers was 5.62 t/ha for SRI compared to 3.03 t/ha for the conventional method (Figure 35). In addition to the SRI-WAAPP activities, the German NGO Welthungerhilfe introduced SRI to another 142 farmers in Grand Gedeh.

Twelve **training sessions** were held for technicians, who went on to train a further 502 farmers in the southeastern part of the country: Grand Gedeh, River Gee, Sinoe, Maryland, and Grand Kru. Field days in Montserrado and Grand Gedeh attracted more than 250 people. The project estimates that by 2015, radio broadcasts, TV spots and field days had motivated 1750 farmers in the south-eastern counties to try SRI.

A number of other projects joined the effort. The USAID/Fed project conducted SRI trials in combination with urea deep placement techniques. Based on the excellent results, they decided to introduce this technical innovation -- combining SRI with urea deep placement -- to 15,000 farmers. The NGO BRAC Liberia, one of the most important rice seed producers in Liberia, started using SRI after learning about it through CHAP. Building on what SRI-WAAPP had begun, the Smallholder Agriculture Productivity Enhancement Commercialization Project, with three-year funding from the Global Agriculture Food Security Program (GAFSP), announced plans to scale up SRI in five counties, starting in 2015.

Effective outreach and communication: SRI was unknown in Liberia before the SRI-WAAPP project began, so national facilitator Robert Bimba opted to effectively communicate the SRI story from the first day. He cultivated the press and media outlets, inviting journalists to meetings, to training sessions, and to SRI field days. Robert gave interviews on the radio, helped produce broadcasts about SRI, and also produced a video clip that aired on national television. Result? More than 17 articles about SRI in the Liberian press while the project was underway. But it didn't stop with the press: Robert Bimba set up field visits for rice sector stakeholders – in government, agriculture, development agencies, and business -- so they could see SRI for themselves.

First Sub-Regional Anglophone SRI Exchange Meeting: This unique and successful outreach approach was quickly noticed by the other SRI-WAAPP country teams, who wanted to better understand how the project operated in Liberia. With support from WAAPP Liberia and the Regional Coordination Unit CNS-Riz, Mali, CHAP organized a sub-regional Anglophone SRI exchange meeting from 22-24 June, 2015 in Monrovia, inviting SRI project team members from The Gambia, Sierra Leone, and Ghana.

Most important **constraints** identified by the project team were:

- Lack of capacity of technicians and farmers to implement SRI well.
- Lack of equipment, such as weeders or roto-tillers to alleviate the workload.
- Difficulties in managing water during the rainy season, leading to field damage during heavy rainfalls.
- Logistical difficulties caused by bad roads and lack of transportation.
- Ebola outbreak kept farmers away from training and field visits.

Recommendations include: expand training of technicians and farmers, provide close technical assistance to farmers in the field, make small equipment available for them, adjust cropping calendars, by advancing the planting date to avoid heavy rains during the rice plant vegetative and flowering stages, and to organize an exchange visit to Mali to learn how SRI has been successfully adopted there.

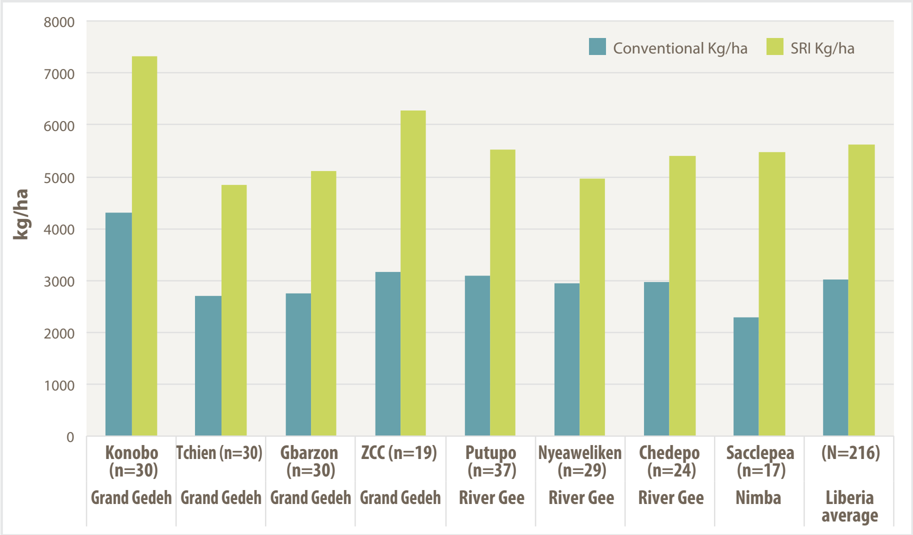


Figure 35: Yield comparison between conventional and SRI production in rainfed lowland systems in 8 districts of River Gee, Grand Dedeh and Nimba County in Liberia, 2014/2015

Follow-up success: In 2016, CHAP obtained a Japanese-sponsored grant through IFAD and MOA to begin growing rice as a cash crop, using SRI. Rice from 1800 ha in Lofa, Grand Cape Mount, Bomi, Grand Bassa and Montserrado counties will be sold on the Liberian market with the slogan "Love Liberian Rice".

Ministry of Agriculture

WAAPP LIBERIA INFO

WAAPP / PPAAO

www.waappliberia.org

February 13, 2015

COMMUNITY OF HOPE AGRICULTURE PROJECT (CHAP) HOSTS NATIONAL WORKSHOP ON THE SYSTEM OF RICE INTENSIFICATION (SRI)

As Lawmaker Calls for Sustained Support to the Agricultural Sector and the Promotion of Corporate and Group Farming.

Group Picture of Participants and Officials at the SRI Workshop in Monrovia

News paper clip from one of the SRI events organized in Liberia

PRESIDENT ELLEN JOHNSON SIRLEAF LAUNCHES SRI-WAAPP PROJECT IN LIBERIA

High visibility for the project was assured when Her Excellency Ellen Johnson Sirleaf, President of Liberia, personally launched the SRI-WAAPP project on May 19, 2014.

Representatives from partner organizations USAID/FED, SAPEC, WAAPP, MOA, Chana, CARI, BRAC, WHH, Oxfam, CRS, AEL, LRC, ACDI/VOCA, IFAD, CDA, UNMIL Radio were also in attendance.

By this time, SRI and the SRI-WAAPP project had become well-known in Liberia, and Robert was able to leverage this public interest into effective partnerships with several other development organizations – Welthungerhilfe, USAID project FED, seed producer BRAC, and Oxfam – all of which began to include SRI in their field activities. Liberian government agencies took an interest as well. CARI, the national research organization, set up its own on- station research trials to study SRI and also agreed to oversee others' evaluation trials for SRI.

Ribbon cutting for SRI-WAAPP project launch in Paynesville, Monrovia by Her Excellency President Ellen Johnson Sirleaf, assisted by Robert Bimba, SRI national facilitator and Minister of Agriculture Dr Florence Chenoweth (from right to left - holding on to ribbon)

SRI-WAAPPP project coordinators and collaborators

Focal Institution for SRI	Community of Hope Agriculture Project (CHAP)
National SRI facilitator	Robert Bimba
WAAPP coordinator	J. Cyrus Saygbe, Sr.
WAAPP M&E officer	Edward Borloh
CHAP M&E officer	Hanson Tuowal Delwlebo
SRI Champions	Ms Mariam Saah, Ms Amis Cecelia M. Nah

Institutions involved with SRI

Short name	Name	Type
WAAPP-Liberia	West Africa Agricultural Productivity Program	Government, SRI-WAAPP Coordination
CHAP	Community of Hope Agriculture Practice	Local NGO, SRI focal institution
ALM	Agricultural Land Management Company (Liberia) Ltd.	Private Enterprise, Development Project
BRAC	BRAC-Liberia	International NGO, Bangladesh
CARI	Center for Agriculture and Research Institute	Government, Research
Daily Observer	Daily Observer	Media
FED	Food and Enterprise Development (FED) Liberia	Development Project, USAID funded
Front Page Africa	Front Page Africa	Media
FUN	Farmers Union Network	Farmers Organization
LSRI	Liberia Self Relevant Institute	Local NGO
MOA	Ministry of Agriculture – Liberia	Government, Extension
Oxfam	Oxfam	International NGO
The New Dawn	"Truly Independent"	Media
Welthungerhilfe	Welthungerhilfe	International NGO, Germany

SRI Publications

Final Project Report: CHAP. 2015. Pilot Project on the System of Rice Intensification, Final Report, WAAPP, CHAP, Monrovia, Liberia, 42p.

Inception Project Report: CHAP. 2014. Pilot Project on the System of Rice Intensification, Inception and 1st Quarterly Report, WAAPP, CHAP, Monrovia, Liberia, 30p.

Technical Manual: CHAP. 2015. SRI Farmers Picture Guide Book. WAAPP, CHAP, 19p

WAAPP Newsletter: Community of Hope Agriculture Project (CHAP) Hosts National Workshop on the System of Rice Intensification (SRI); WAAPP Liberia Info, Feb 2015

Videos from farmers' SRI fields, shown during trainings sessions.

Radio: seven radio programs in 2014

TV Clips: https://goo.gl/rRKzTZ

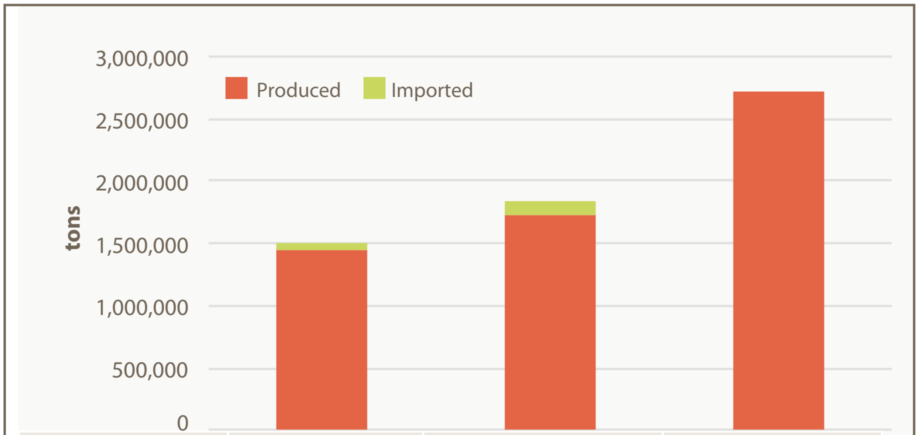
A SRI Directory was established for all SRI actors in the country

Press articles:

- Sierra Leone News: WAAPP Sierra Leone on Sub-Regional SRI Champions Experience Sharing in Liberia; Awoko Newspaper | Awoko.org | Staff writer | 25 June 2015
- The West Africa Agricultural Productivity Programme (WAAPP) : Rice farming sector support through Japan Policy and Human Resources Development Fund (PHRD), World Bank Blog, October 2014
- PRESIDENT SIRLEAF URGES LIBERIANS TO GET BACK TO THE SOIL, Front Page Africa FPA, May 2014
- President Sirleaf Initiates Farm Jobs For 100 Youth, The Daily Observer, July 2014
- National ToT Workshop On SRI Practices Ends In Kakata, The Daily Observer, December 2013
- Liberia Leading In WAAPP's SRI Rice Production, The Daily Observer, June 2015
- Government of Liberia Needs to Empower Farmers to Boost Rice Production, Says Lawmaker, Oryza, June 2015
- Farming in Liberia and President Johnson-Sirleaf, the Borgen project, June 2014
- Farmers to Adopt New Method For Rice Production, Daily Observer, December 2013
- Farmer's Organization Receives Support, For SRI Practice In Liberia, Daily Observer, March 2014

MALI

As of 2010, Mali was the second largest rice producer in the region after Nigeria, producing 2.3 million tons of paddy rice (18% of the total production for West Africa), giving the country a 96% self-sufficiency rate. The NRDS goal (2009) was to produce 4 million tons of paddy by 2018, of which 1.5 million tons were to be exported. Although by 2016/17, Mali produced 2.71 million tons of paddy, the self-sufficiency rate had decreased to 91% due to increased consumption.



	2010	2016/2017	2025 estimated
Self-sufficiency rate (%)	96	95	100
Population (million)	15.17	18.69	23.70
Yearly per capita consumption (kg)	100	102	115
Production paddy (t)	2,305,612	2,710,938	4,249,466
Production milled (t)	1,452,536	1,735,000	2,719,658
Consumption milled (t)	1,510,130	1,835,000	2,719,658
Imported milled (t)	57,594	100,000	0

Data: Compiled by authors from FAO online database, Index Mundi online database, Fofana et al (2014)

Figure 36: Rice consumption, as a composite of production and imports, self-sufficiency rate, population and per capita rice consumption for 2010, 2016/2017 and predicted for 2025 for the country of Mali

Rice is produced in all regions of Mali except Kidal. Mali has a large potential for rice production; only 19% of the 2.2 million hectares with irrigation potential are currently utilized. Mali is characterized by very diverse rice ecologies, ranging from irrigated systems (both large and small-scale), to the extensive natural flood plains of the Niger river, to the rainfed lowland systems situated in the south. Systems of lesser importance include rainfed upland systems in the south, deep-water systems and recession systems along the Niger River in the north.

Rice has been a staple in Mali since the domestication of African rice *(Oryza glaberrima)* 3500 years ago. With an increasing urban population, rice consumption increases as well, and is estimated to reach a per capita consumption of 115 kg/year by 2025, meaning Mali will need to produce 4.25 million tons of paddy rice to reach self-sufficiency by that year. Still, in 2016/2017, Mali was able to produce 64% of the projected 2025 demand. Among the countries of West Africa, Mali, together with Guinea, is closest to attaining full self-sufficiency. (Figure 36)

SRI ACTIVITIES PRIOR TO SRI-WAAPP

SRI was introduced to Mali by Africare in 2007, testing the method with one farmer in the Timbuktu region. An initial positive result of 9 t/ha led to expanded trials with 60 farmers in 2008, and then to 270 farmers in 2009. Average SRI yields were 7.5 t/ha compared to 4.5 t/ha with conventional methods. Based on these results, the USAID-funded project IICEM began to introduce SRI in the Gao, Timbuktu, Mopti, Sikasso and Segou regions, and the Syngenta Foundation worked with Office du Niger and in Mopti, all with similar positive results. All project activities were directly supported from the start by the Ministry of Agriculture extension service, working with farmers; and by the National Research Institute (IER), collecting data and reporting on the results. In early 2010, a first national SRI workshop was organized in Bamako by Ministry of Agriculture, IICEM, and Africare, and introduced many more stakeholders to SRI.

Figure 37: SRI locations (showing communes but not individual field sites) in Mali before January 2014

Figure 38: SRI field sites in Mali, June 2016

Use of SRI continued to expand. During 2010-2012, rice farmer organizations from the Office du Niger region and from San (ARPASO) led initiatives for widespread farmer adoption of SRI in their irrigation schemes. In 2011-2012, SRI champion Hamidou Guindo through the local association 3a-Sahel introduced 450 farmers in Douentza to SRI, and the World Bank project PAPAM started funding SRI initiatives in 2013. By this time, the SRI method was being integrated into many of the rice programs across the country, including those financed by USAID, GIZ and the World Bank, and those implemented by both local and international NGOs such as FIBANI and Swiss Contact, Nyèta Conseil, Care Mali, and Riz Lac Débo. The widespread success of SRI in Mali sparked interest from many rice producers in other countries of the region, and the technical capacity that was developed in Mali made it possible for them to learn and start working with the SRI method.

Malian technicians played an important role in training others across the region, especially through the USAID-funded E-ATP project that partnered with IICEM. Together they organized a regional workshop in Mali in 2010, inviting 40 participants from eight West African countries. This was followed by separate training workshops in Benin, Burkina Faso, Ghana, Nigeria, Senegal, and Togo in 2011 and 2012, all of which improved technical capacity and served to further stimulate interest across the region.

There were an estimated 4350 farmers cropping 635 hectares of SRI rice before the SRI-WAAPP project began in 2014. Approximate SRI locations are shown in Figure 37.

SRI-WAAPP PROJECT RESULTS

As SRI had already been introduced and was known in all rice-producing zones, the project focused on reinforcing the capacity of technicians and farmers to scale up SRI. SRI champions and partners were mobilized through the seven Regional Offices of Ministry of Agriculture to train more farmers, to set up demonstration plots, and to provide access to production materials and tools, such as weeders. The project was present in all rice-growing regions in the country, working in irrigated systems along the Niger River and in rainfed lowland systems in the southern and western parts of the country (Figure 38).

During the 2014/2015 season, both WAAPP and non-WAAPP projects worked with 12,894 farmers (37% women) on 1104 hectares of demonstration plots in 274 villages across the seven regions: Kayes, Koulikoro, Sikasso, Ségou, Mopti, Tombouctou and Gao. 69 technicians were trained on SRI, and they in turn trained more than 1000 farmers. The project also purchased and distributed 630 rotary weeders.

Average yields for irrigated rice reached 7.5 t/ha for SRI compared to 4.5 t/ha for conventional practice. Rainfed lowland rice was planted in the Sikasso, Kayes and Koulikoro regions, where SRI yields were 3.3 t/ha compared to 2 t/ha with farmer practice. Some farmers adapted the SRI practices to their upland fields and harvested 2 t/ha with SRI compared to 1.2 t/ha with their usual methods (Figure 39).

As use of SRI expands, there is a natural evolution to pass from individual SRI farmer plots to larger SRI areas, eventually covering entire irrigation schemes. This was done in a number of irrigation schemes in Mopti, Modibo Kimbiri, Farafassiso, and Sikasso, covering a total of 1800 hectares. The farmer organization ARPASO in San (Segou region) organized its 2000 producers to plant SRI on 1200 ha – the first large-scale success story in West Africa.

During 2015/2016, the project worked directly with 15,807 farmers on 440 demonstration plots, covering an area of 1650 hectares (Table 8; Figure 40). Because 2015/2016 had more favorable weather, yields were generally slightly higher than the previous year (Figure 39). The results presented concern only the number of SRI farmers and SRI area monitored by the project. It would be of real interest to undertake a more in-depth evaluation of SRI uptake across Mali.

Table 7: Number of SRI villages, SRI farmers, SRI demonstration plots, farmers trained in SRI and weeders distributed, in 2014/2015, Mali

Parameters	WAAPP	Non-WAAPP*	Total
Regions	7	2	7
Villages	220	54	274
SRI Producers	5808	7086	12894
Demonstration plots	1162	459	1621
Women Demo plot leaders	286	275	561
Technicans trained	52	17	69
Farmers leaders trained	156	390	546
Farmers trained	1014		1014
Area SRI Demo plots	256	848	1104
Weeder Distribution	630	0	630

Constraints and recommendations: As SRI is scaled-up in Mali, stakeholders often fail to coordinate their efforts, for example, researchers seldom collaborate with NGOs to monitor on-farm actions or to undertake adaptive research. The country team recommends that a national SRI network be created, where donors and program managers can better coordinate their activities, and where researchers, extension agents, and farmers can better communicate with each other.

Although many have already been trained, demand for training remains high. SRI-WAAPP Mali recommends refresher training for experienced SRI practitioners and

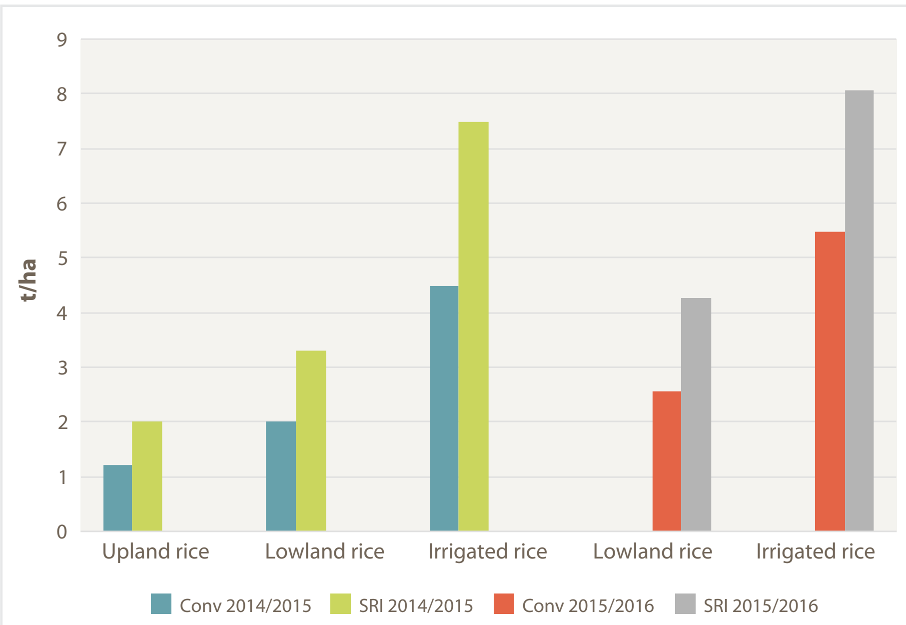


Figure 39: Yield comparison (t/ha) for conventional and SRI method for 3 rice systems in Mali in 2014/2015 and 2015/2016

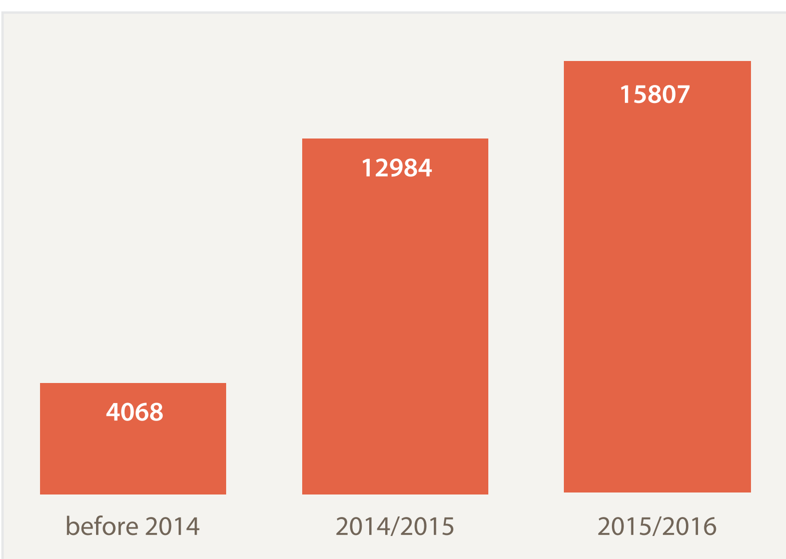


Figure 40: Number of SRI Farmers in Mali (associated with SRI-WAAPP) before, during and at the end of the project

trainers, and continued farmer training. Standards for good quality training should be developed, and training tools such as videos and handouts should be made widely available in local languages.

Identified technical constraints include unsatisfactory land leveling, insufficient organic matter for soil amendments, low levels of mechanization for transplanting, weeding, and harvesting; and the difficulty of implementing SRI practices -- transplanting, weeding, irrigation -- in a timely manner.

Table 8: Number of SRI farmers and SRI demonstration plots and area of SRI demonstration plots (ha) for seven regions of Mali in 2015/2016

Region	SRI farmers (number)	Men (number)	Women (number)	Demo plots (number)	Area Demo plots (ha)
Kayes	572	325	247	26	19
Koulikoro	413	387	26	50	11
Sikasso	2970	970	2000	70	150
Ségou	296	249	47	38	108
Mopti	10,800	9000	1800	121	1097
Tombouctou	341	286	55	99	130
Gao	415	385	30	36	135
Total	15,807	11,602	4205	440	1650

FARMER INNOVATION – SYSTEM OF WHEAT INTENSIFICATION IN TIMBUKTU

This innovation came about a few years ago when SRI Champion Harouna Ibrahim, then with the NGO Africare, was working on SRI with some local farmers. In that area, many farmers plant wheat during the cooler season, after the rice has been harvested. Having seen how well SRI worked with rice, they wondered what would happen if they applied the same SRI principles to growing wheat. Soon they decided to set up some trial plots, as they had done before with rice, and Harouna helped as technician.

The traditional wheat-growing practice was to use soil from termite mounds as a fertilizer, and plant by the ancient method of broadcasting the seed. For the trials, farmers decided to use cow manure as a fertilizer and, after testing various planting parameters, farmers settled on direct-seeding wheat at 2 grains/hill, spaced at 15 cm × 15 cm. The amount of irrigation water applied was slightly reduced as well. All these new practices lowered overall production costs. The new system was called (in French) *le Système de la culture du Blé Intensif* (**SBI**), in English, the System of Wheat Intensification (**SWI**).

The trials were a success. Using the traditional methods, farmers in the Timbuktu area could expect yields of 1-2 tons of wheat per hectare. But using the newly-developed SWI practices, yields were double or more: 3-5 t/ha. Today, the villages where farmers pioneered SWI plant all of their wheat that way, and farmers in neighboring villages have begun to adopt SWI for themselves. During the 2016/2017 season, it is estimated that about half of the wheat area within a 12-village area was planted with SWI. This may well be an underestimate: due to the jihadist occupation of the area in 2011 and continued insecurity, most outside development projects have left, and there has been no institutional or financial support or follow-up. This new technique was developed by the farmers themselves, alone, with a little help and encouragement from just one SRI Champion.

SRI-WAAPPP project coordinators and collaborators

Focal Institution for SRI	Direction Nationale de l'Agriculture (DNA)
National SRI facilitator	Keffa Dembélé
Previous SRI facilitator	Jean Parfait Dako
WAAPP coordinator	Aly Kouriba
Previous WAAPP coordinator	Rejane Kone A Dembele
WAAPP technical officer	Yaya Traore
WAAPP M&E officer	Tahirou Tangara
SRI Champions	Hamidou Guindo, Djiguiba Kouyate, Harouna Ibrahim

Institutions involved with SRI

Short name	Name	Type
WAAPP-Mali	West Africa Agricultural Productivity Program	Government, SRI-WAAPP Coordination
DNA	Direction Nationale de l'Agriculture	Government, SRI focal institution
Africare	Africare	International NGO, USA
ARPASO	Association des Riziculteurs de la Plaine Aménagée de San Ouest	Rice farmer organization
Care Mali	Care Mali	International NGO
CNRA - Mali	Comité National de la Recherche Agricole	Government, Research
CNS-Riz	National Center of Specialization in Rice	Government
DRA	Direction Regionale de l'Agriculture	Government,
FIBANI	Fibani project - Swiss Contact	Development project, funded by Switzerland
Fondation Syngenta	Syngenta Foundation	International Foundation
IER	L'Institut d'Economie Rurale	Government, Research
IFDC	International Fertilizer Development Centre	International NGO
IICEM	Initiatives Integrées pour la Croissance Économique au Mali	Development Project, funded by USAID
MaliActu.net	MaliActu.net	Media
Notre Printemps	Notre Printemps	Media
Nyeta Conseils	Nyeta Conseils	National NGO
ODRS	Office de Développement Rural de Sélingué	Government
Office du Niger	Office du Niger	Government
ORTM	ORTM - Mali	National Radio
PASSIP/GIZ	Programme d'Appui au Sous-Secteur de l'Irrigation de Proximité	Development Project, funded by Germany

SRI Publications

Baseline Study: Diakite L, Diarisso T, Drame Z. 2016. Etude de la situation de référence du projet commissionné sur le "Système de Riziculture Intensif (SRI) dans le cadre du WAAAP 2A au Mali", PPAAO, CNRA, Ministère de l'Agriculture, Mali, 81p.

Technical project report: DNA. 2015. Le point d'execution du plan d'action du SRI PPAAO/WAAPP 2-A, Campagne 2015-2016. Partenariat : DNA, WAAP-PPAAO/CNS-RIZ, SRI RICE. Mali, 4p.

Technical project report: DNA. 2014. Le point d'execution du plan d'action du SRI PPAAO/WAAPP 2-A, Campagne 2014-2015. Partenariat : DNA, WAAP-PPAAO/CNS-RIZ, SRI RICE. Mali, 8p.

Scientific article by Harouna Ibrahim, Erika Styger (co-authors), 2017. System of crop intensification for more productive, resource-conserving, climate-resilient, and sustainable agriculture: experience with diverse crops in varying agroecologies. *International Journal of Agricultural Sustainability*, published online Nov 20, 2017. Open-access.

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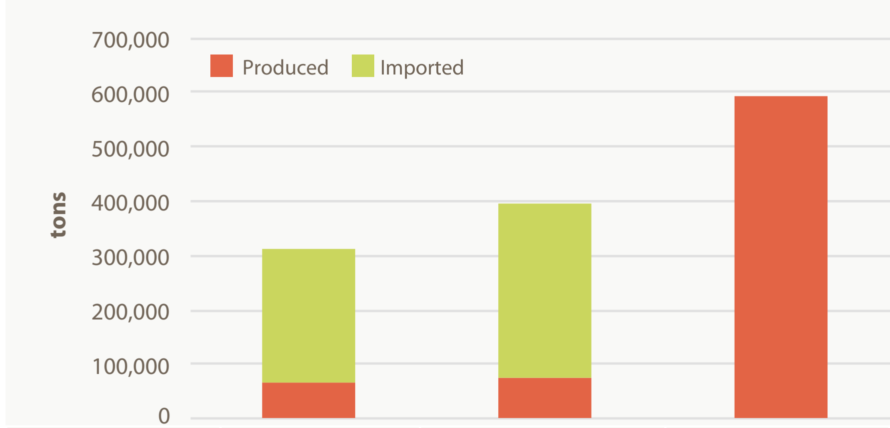
NIGER

In 2010, paddy rice production reached 103,000 tons or 66,000 tons of milled rice, which accounted only for 21% of domestic consumption. At only 20 kg/year, Niger has one of the lowest per capita rice consumption rates in West Africa. Nevertheless, domestic consumption increased from 2000 to 2016/17 from 55,000 tons to 395,000 tons of milled rice, while production grew only from 40,000 tons to 75,000 tons, and imports soared from 15,000 tons to 320,000 tons. The self-sufficiency rate in 2016/2017, at 19%, was lower than in 2010.



	2010	2016/2017	2025 estimated
Self-sufficiency rate (%)	21	19	100
Population (million)	16.29	21.56	29.65
Yearly per capita consumption (kg)	19.1	18	20
Production paddy (t)	103,125	117,188	926,393
Production milled (t)	66,000	75,000	592,892
Consumption milled (t)	311,000	395,000	592,892
Imported milled (t)	245,000	320,000	0

Data: Compiled by authors from FAO online database, Index Mundi online database, Fofana et al (2014)

Figure 41: Rice consumption, as a composite of production and imports, self-sufficiency rate, population and per capita rice consumption for 2010, 2016/2017 and predicted for 2025 for the country of Niger

Niger does not have a NRDS document per se, but in a document called *Etat des lieux de la riziculture au Niger (2015) it states that the national goal is to* cover 90% of national rice consumption with domestic production by 2020. This is ambitious, given that the potential for expansion of rice-growing land is more limited than in other countries. Most rice is produced in irrigation schemes along the Niger River. In 2010 this accounted for 9,300 ha out of a total 15,000 ha of rice area. Land area with irrigation potential is estimated at 24,000 ha. On the positive side, irrigated rice yields in Niger are high: 5-7 t/ha and potentially 10t/ha. With the possibility of two cropping cycles a year, these irrigation systems could be highly productive.

To reach self-sufficiency in 2025, Niger's production must increase to 926,393 tons of paddy rice, or nine times the 2010 production. The 2016/2017 production covers about 12% of the required amount for self-sufficiency 2025, which along with The Gambia is among the lowest rates in the region (Figure 41).

SRI ACTIVITIES PRIOR TO SRI-WAAPP

There is no record of any experience with SRI in Niger before the SRI-WAAPP project began in 2014.

SRI-WAAPP PROJECT RESULTS

The project team selected a few irrigation perimeters along the Niger River, working with 3 to 5 farmers in each one (see Figure 42 for map). SRI plot size for each of the farmers was from 0.25 to 0.5 ha. Project implementation was the responsibility of the National Office for Agriculture Water Infrastructure (ONAHA) and the National Agriculture Research Institute (INRAN, also the national focus institution for SRI) together with farmer cooperatives in the regions of Tillaberi, Dossa and Niamey.

Project activities started in 2014 with information sessions about SRI for 71 farmers and 5 technicians at the four irrigated rice perimeters of Dayberi, Say II, Seberi and Sakondji, followed by training for 60 farmers and technicians in Niamey. The first comparison tests were designed for a total of 16 farmers across the four sites. Three sites were inside irrigation perimeters and one relied only on natural flooding. In total, the four perimeters were 1116 hectares in size and were cultivated by 2366 farmers.

Figure 42: SRI-WAAPP sites in Niger, June 2016

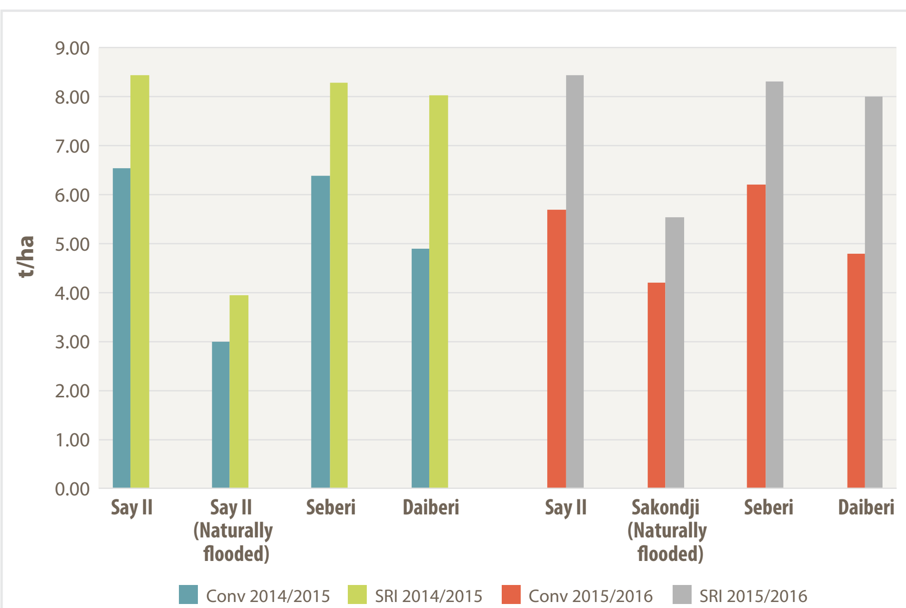


Figure 43: Yield comparison (t/ha) between conventional and SRI rice production in three irrigation perimeters and one naturally flooded site in Niger in 2014/2015 and 2015/2016

Average SRI yield from the three irrigated sites was 8.24 t/ha compared to 5.92 t/ha for conventional rice, a 47% increase. In the naturally flooded environment, SRI yields were 3.94 t/ha compared 3.0 t/ha obtained with conventional rice (Figure 43). Average tillers/hill reached with SRI 48.3 under SRI, and 32.6 under conventional methods.

In Daiberi, farmers were surprised to achieve very satisfactory yields of 8t/ha without using chemical fertilizers, but by using 50% more organic matter than at the other sites, where farmers combined the application of organic matter with chemical fertilizer (Figure 43).

In the second year, during the 2015/2016 cropping season, the same tests were repeated on three perimeters and at one site reliant on natural flooding. These four production areas total 2235 hectares, farmed by 6933 farmers. Average SRI yield from irrigated rice was 8.25 t/ha and 5.57 t/ha for conventional rice. Under naturally flooded conditions SRI yielded 5.54 t/ha compared to 4.2 t/ha for conventional cultivation (Figure 43). In this second year, INRAN had the Indian weeders -- procured from CNS-Riz -- copied by local blacksmiths and tested by 25 farmers.

Constraints and recommendations:
Farmers were eager to reduce amount of irrigation water by using SRI, as the cost of diesel fuel to pump irrigation water is their most expensive input. Although prolific weed growth can be a problem when soils are no longer flooded, farmers were able to use mechanical weeders to address this constraint. Declining soil fertility has been addressed by amending soils with organic matter, as illustrated by the success story below. As two years of confirmed SRI yield results have become known, farmers increasingly express interest in SRI training.

RESTORING SOILS AND IMPROVING RICE YIELDS IN NIGER'S IRRIGATION PERIMETERS

The SRI-WAAPP project shared insights and news of its results in the press, in newsletters, in scientific communications, and by letting farmers speak for themselves on video. SRI pilot farmer Amadou Bonkano at the Sébéri irrigation perimeter had this to say:

For we farmers, the most important benefits when we change to the SRI methodology are that we use less seed, less chemical fertilizer and less water, in addition to better yields and improved soil quality. Rice farmers have noticed that soils have been slowly degrading over the years, but until now we never added organic matter, we just increased the amount of chemical fertilizers. With SRI, farmers have started to create compost pits next to the rice fields. We compost manure from our animals, rice straw and millet residues. We also compost water hyacinth, an invasive species that grows in abundance in the irrigation canals and clogs them up. Now that we use compost, farmers use half the Urea fertilizer – 100 kg/ha rather than 200 kg/ha – that they did before, and to everyone's surprise, the rice fields maintained a darker green color, even during the maturation period.

Even using less fertilizer, yields increased from the 2.5-4 t/ha previously to 5-7t/ha using SRI.

SRI-WAAPPP project coordinators and collaborators

Focal Institution for SRI	Institut National de la Recherche Agronomique du Niger (INRAN)
National SRI facilitator	Adamou Haougui
WAAPP coordinator	Abdoulaye Gouro
WAAPP deputy coordinator	Mariama Altine Seydou
WAAPP M&E officer	Hamidou Souley
Previous WAAPP M&E officer	Garba Issoufou
SRI Champions	Amadou Bonkano, Seydou Issa Cisse, Ms Saharatou Adamou

Institutions involved with SRI

Short name	Name	Type
WAAPP-Niger	West Africa Agricultural Productivity Program	Government, SRI-WAAPP Coordination
INRAN	Institut National de la Recherche Agronomique du Niger	Government, Research, SRI focal institution
Africare	Africare - Niger	International NGO, USA
AGRHYMET	Centre régional AGRHYMET	Research Institute
CNRA	Conseil national de Recherche Agronomique	Government, Research
FUCOPRI	Fédération des Unions des Coopératives des Producteur de riz du Niger	Farmers Organization
La Riz du Niger, S.A.	La Riz du Niger, S.A.	Professional Organization,Local NGO
MINAG	Ministère de l'Agriculture - Niger	Governmental
MORIBEN	Fédération des Unions des Groupement Paysans du Niger	Farmers Organization
ONAHA	Office National des Aménagements Hydro-Agricoles	Governmental

SRI Publications

Scientific Poster: Système de Riziculture Intensive, une approche pour booster la production du riz au Niger, Haougui Adamou, Souley Hamidou, Rabi Alou, Issoufou Garba, Mahamadou Chamsou Maigari, Amadou, Bonkano, Cissé Alfaïzé Saidou, Basso Adamou, Sido Amir, Mossi Maïga Illiassou, Saminou El hadj; INRAN, ONAHA, CNRA, WAAPP.

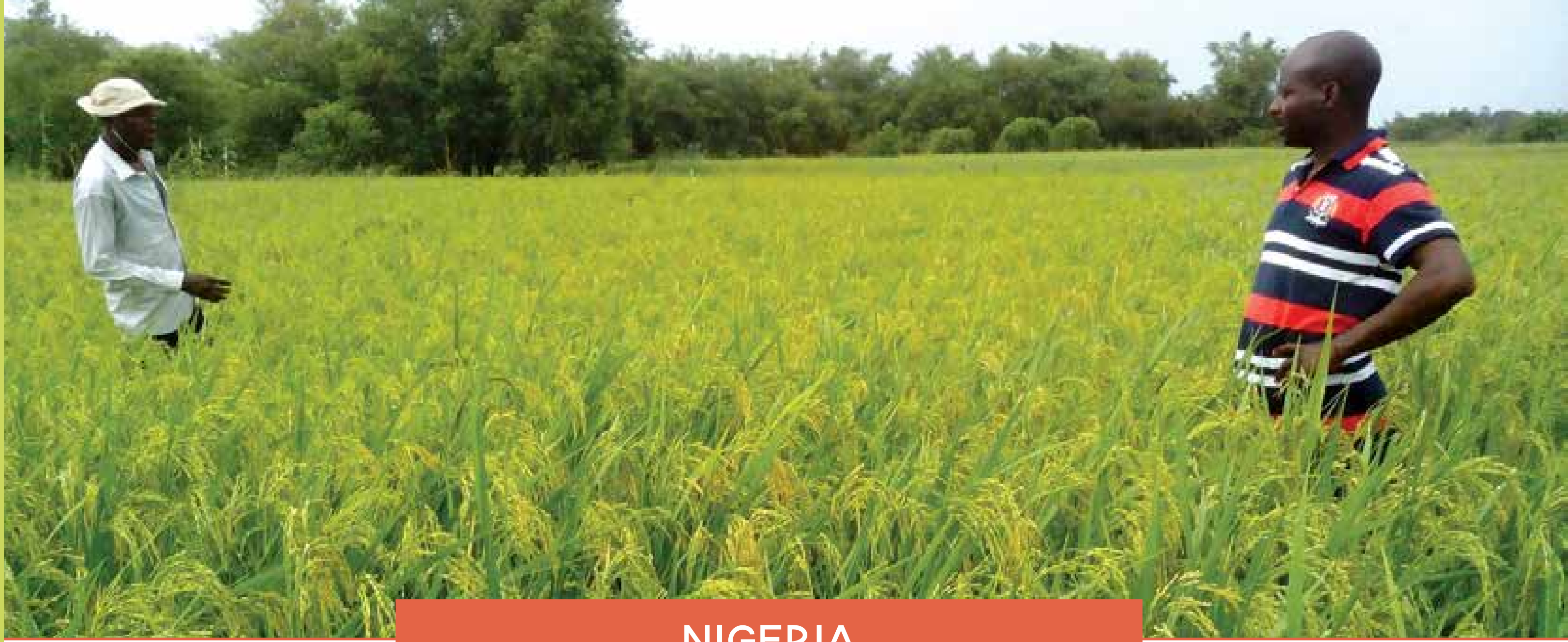
Online Article: SRI /Système de Riziculture Intensive, publié 21 Décembre 2015, sur le site web Réseau National des Chambres d'Agriculture du Niger (RECA), http://www.reca-niger.org/spip.php?article870

Online Article: Le Système de Riziculture Intensive, par Mahaman Chamsou Maïgary (PPAAO) et Dr. Haougui Adamou (INRAN), publié sur site web PPAAO Niger, http://www.ppaao-niger.org/index.php?option=com_content&view=article&id=171:le-systeme-de-riziculture-intensive-sri&catid=91&Itemid=483

Technical Report: Haougui A, Souley H, Alou R. 2015. Rapport d'Activités sur les tests d'introduction du Système de Riziculture Intensive au Niger. Campagne 2014-2015. PPAAO Niger, 11p.

Newsletter Article: Le SRI: Innover les pratiques culturales pour augmenter la productivité, Mahaman Chamsou Maïgary (PPAAO) et Dr. Haougui Adamou (INRAN). Dans: Les Nouvelles du PPAAO/WAAPP-Niger, bulletin Trimestriel d'informations, No20, Avril-Mai-Juin 2015, p14.

Video: SRI Niger entrevue avec un cultivateur pilote du SRI au zone irrigué à Sébéri (français / djerma) 13:17 min https://www.youtube.com/watch?v=RoEv-1IJQWg&feature=youtu.be&list=PLoOqsnw69SmRhZZzha-2bn_E8XGaHjV3s



NIGERIA

In 2010, Nigeria produced 4.47 million tons of paddy, achieving 60% rice self-sufficiency. Per capita consumption was at 29 kg/year in 2010, which is expected to rise to 36 kg/year by 2025. The NRDS (2009) targeted self-sufficiency for 2018 by producing 13.25 million tons of paddy. To achieve this, the plan calls for an expansion of rice-growing areas (from the 2008 baseline) as follows: 72% increase for rainfed upland areas, 66% increase for rainfed lowland areas and 1060% for irrigated areas.

	2010	2016/2017	2025 estimated
Self-sufficiency rate (%)	60	56	100
Population (million)	159.43	191.84	233.56
Yearly per capita consumption (kg)	29	26	36
Production paddy (t)	4,472,520	4,331,000	13,226,936
Production milled (t)	2,817,688	2,772,000	8,465,239
Consumption milled (t)	4,700,447	4,972,000	8,465,239
Imported milled (t)	1,882,759	2,200,000	0

Data: Compiled by authors from FAO online database, Index Mundi online database, Fofana et al (2014)

Figure 44: Rice consumption, as a composite of production and imports, self-sufficiency rate, population and per capita rice consumption for 2010, 2016/2017 and predicted for 2025 for the country of Nigeria

But from 2010 to 2016/2017, rice production levels were largely stagnant or even decreased slightly: Nigeria produced only 4.33 million tons of paddy in 2016/2017, compared to 4.47 million tons in 2010. Therefore, the challenge to increase production remains, as the 2016/2017 rice production covers only about 30% of the amount needed to achieve self-sufficiency by 2025. (Figure 44)

SRI ACTIVITIES PRIOR TO SRI-WAAPP

SRI was introduced to Nigeria in 2011 at a national training workshop in Jigawa State, northern Nigeria, by the regional E-ATP project, when the first comparison trial for SRI and conventional method was set up. The NGO GSARDI followed the plot to harvest, which achieved a yield of 10.5 t/ha compared to 5t/ha with conventional methods. 60 people representing four different organizations (see list in Appendix 1) were trained in SRI. Following the workshop, trainees went on to set up demonstration plots in Lagos, Cross River, Abuja, Kano, and Kaduna states. In 2012, GSARDI set up 12 demonstration plots with farmers in Jigawa State, followed in 2013 by an additional 25 plots. They also organized farmer field days and aired a radio program to reach farmers in the surrounding villages.

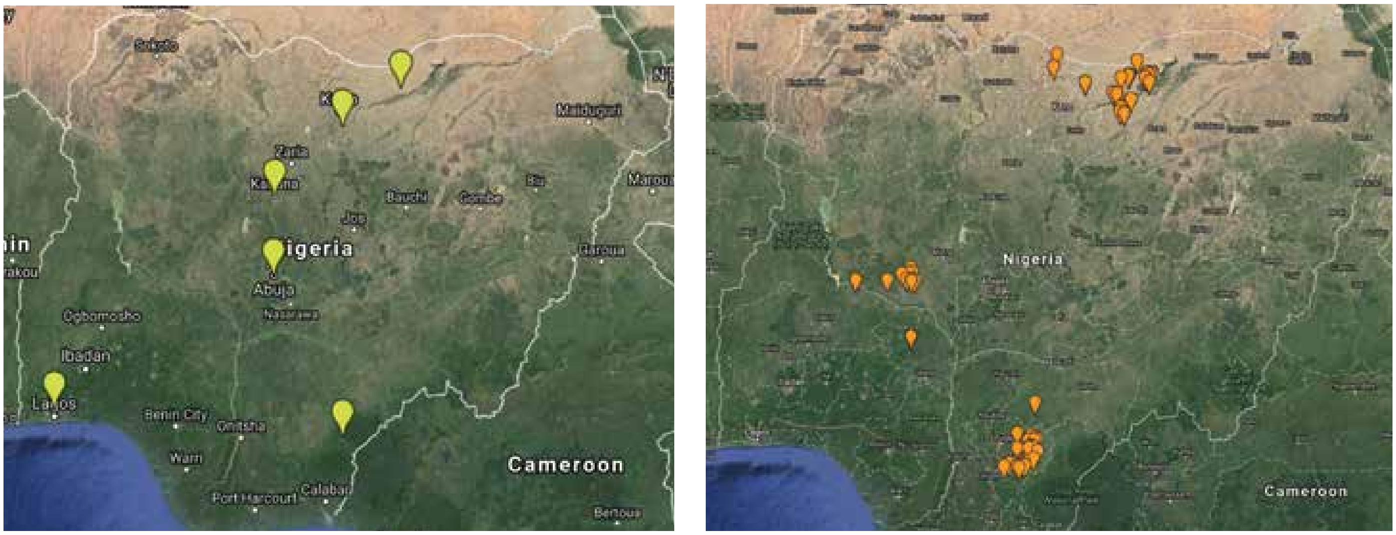


Figure 45: First SRI sites in Nigeria, as reported before 2014 (left), and SRI-WAAPP sites in Jigawa, Niger and Ebony States in Nigeria in 2015 (right)

SRI-WAAPP PROJECT RESULTS

The project was funded for only one year: 2014/2015, and intervened in three states: Jigawa, Niger and Ebony (Figure 45). 70 demonstration plots were installed in the three states, plus an additional eight demonstration sites by GSARDI in Jigawa State. Total SRI area was 19.5 hectares, as each of the 78 plots was 0.25 ha in size. The project also distributed 70 weeders to the demonstration sites.

The project worked in rainfed lowland systems in Niger and Ebony states and in irrigated systems in Jigawa State. Evaluation of yields showed a 96% increase using SRI practices over conventional methods for lowland rice, and a 80% increase using SRI for irrigated rice (Figure 46).

Economic calculations done in in Ebony State, based on yields of 2.51 t/ha for conventional and 4.93 t/ha for SRI, indicate a net return of 700 USD/ha for SRI, whereas this was only 191 USD/ha for conventional production (Figure 47).

Seeing the performance of SRI demonstration plots has stimulated a high demand for training from farmers in the project areas, but the project team cites insufficient resources to respond adequately. For rainfed rice, erratic rainfall and difficulties with water management were identified as constraints, as well as the lack of the rotary weeders for weed control. Despite the constraints, farmers found the increased yields and the possibility of selling their surplus rice production to be highly attractive.

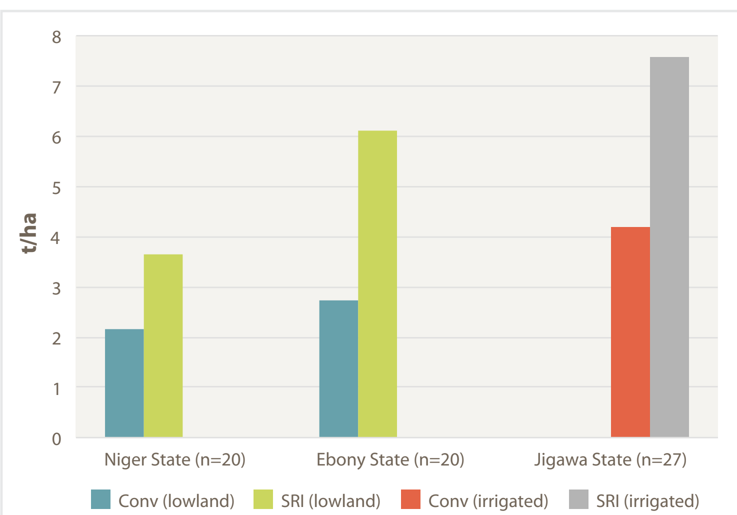


Figure 46: Yield comparison (t/ha) between SRI and conventional rice production in lowland and irrigated systems in three States of Nigeria (2014/2015)

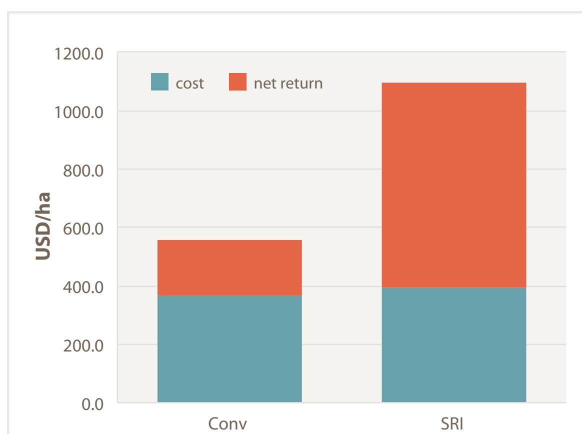


Figure 47: Economic gross return (USD/ha) from sale of rice produced with SRI and with conventional methods (divided in costs and net return) in Ebony State, Nigeria in 2014/2015

MUHAMMAD ADAMU – "SRI CHAMPION OF NIGERIA"

When funding from WAAPP-Nigeria ended after only one year, in 2015, SRI champion Muhammad Adamu from NGO GSARDI – who had planted the first SRI plot in Nigeria in 2011 – didn't stop looking for ways to continue sharing his knowledge about SRI, and was able to find support from the GIZ-SSAB and CARI projects to continue his work. He went on to train 434 farmers in Jigawa, Kano, Niger and Kebbi states, and trained 12 members of the Agricultural Graduate Association of Nigeria (AGAN), in Niger State, who went on to train 227 rice farmers (of whom 42 were women). AGAN then worked with 30 farmers to set up 30 SRI demonstration plots of one hectare each. Thus Muhammad was able to share his knowledge with 749 farmers (of whom 138 were women) in 2015.

Muhammed also organized four radio broadcasts about SRI in Jigawa State and launched a SRI WhatsApp group - which is still active - where farmers and practitioners can consult with each other, discuss questions, or even post photos directly from the field. Because of Muhammad's dedication and personal initiative, SRI continues to expand in Nigeria. This is what a SRI champion looks like!

Muhammad during one of his training sessions

SRI-WAAPPP project coordinators and collaborators

Focal Institution for SRI	National Cereals Research Institute (NCRI)
National SRI facilitator	Emmanuel Abo
WAAPP coordinator	James Ocheme Apochi
Previous WAAPP coordinator	Damian Chikwendu
WAAPP M&E officer	Charles Ebojei
SRI Champions	Muhammad Adamu, Nwanja C Zeck, Patrick Osondu Ogbuinya

Institutions involved with SRI

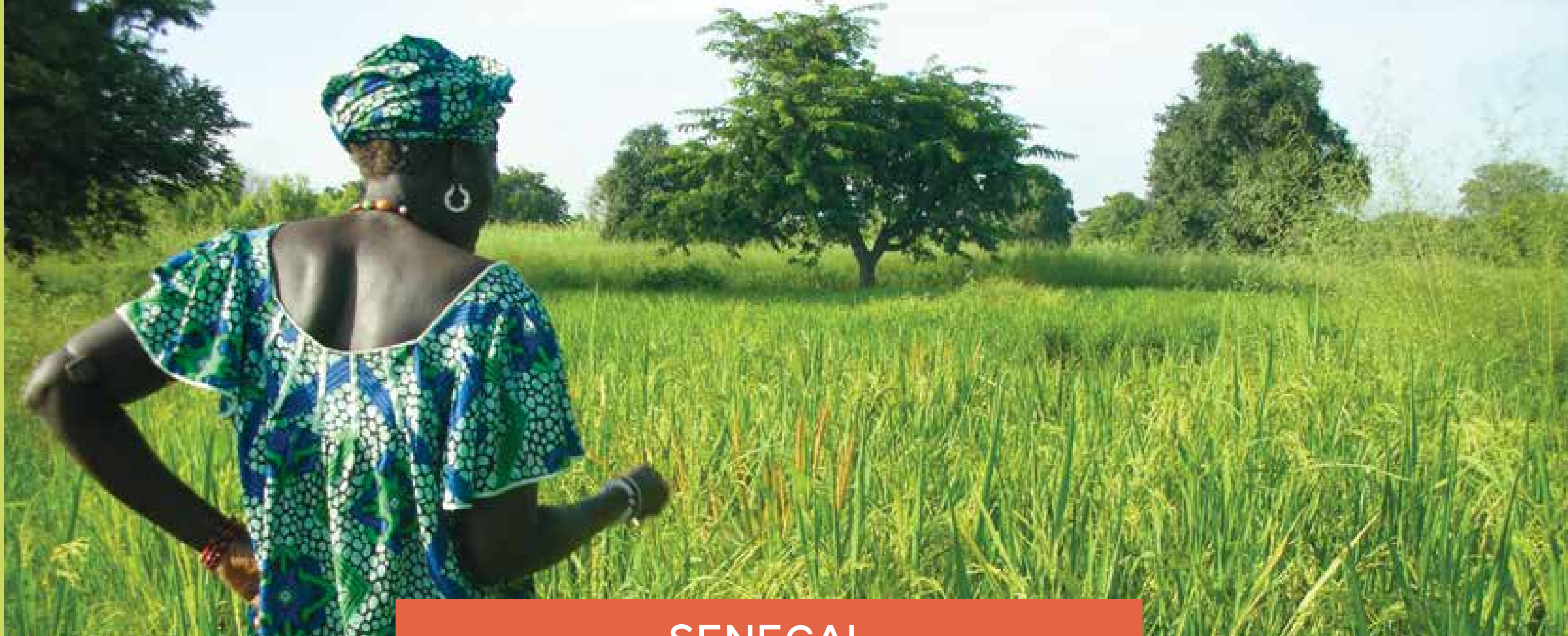
Short name	Name	Type
WAAPP-Nigeria	West Africa Agricultural Productivity Program	Government, SRI-WAAPP Coordination
NCRI	National Cereals Research Institute	Government, Research, SRI focal institution
ADEA Farms	Adewale Aladesuyi Farms	Private Enterprise
CARI - Nigeria	Competitive African Rice Initiative	Development Project
Daily Trust	Daily Trust	Media
EBSADP	EBSADP Abakaliki Ebonyi State	Education
FADAMA III	Third National Fadama Development Project	Development Project
GSARDI	Green Sahel Rural Development Inititative	Local NGO
Gurin Rice Company	Gurin Rice Company	Private Enterprise
IAR Zaria	Institute for Agricultural Research	Government
JSADI	Jigawa State Agricultural Development Association	Government
Leadership Newspaper	Leadership Newspaper	Media
NAMDA	Niger State Agricultural and Mechanization Development Agency	Governmental
RIFAN	Rice Farmers Association of Nigeria	Farmer organization
SSAB	Sustainable Smallholder Agri-Business	Development Project
The Nation	The Nation	Media
The New Telegraph	The New Telegraph	Media
This Day Live	This Day Live	Media
Tribune (Nigeria)	Tribune (Nigeria)	Media
University of Agriculture, Makurdi	University of Agriculture, Makurdi	Education
University of Calabar	University of Calabar	Education
Wems Agro	WEMS Agro Companies Limited	Private Enterprise

SRI Publications

Final technical project report: Abo ME. 2015. Report of Activities of System of Rice Intensification (SRI) on Demonstration Plots in Nigeria for 2014. WAAPP Nigeria, 23p.

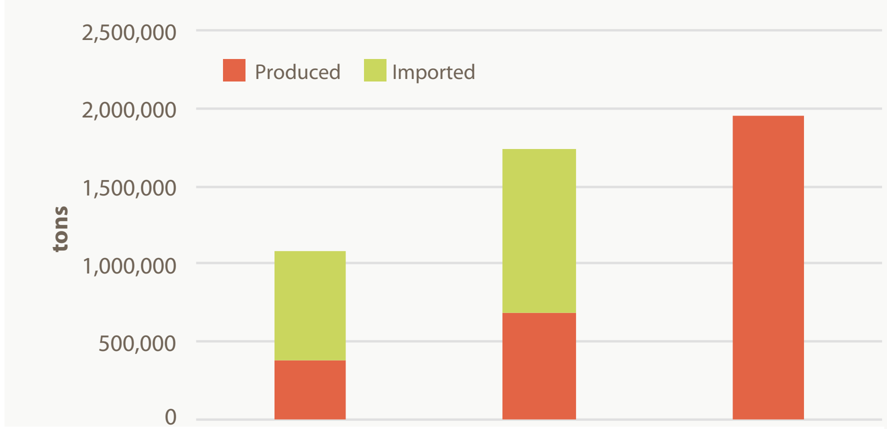
Press articles:

- How to achieve alternative food security; the Nation (31 May, 2014)
- Enriching lives of small rice farmers; the Nation (April 10, 2015)
- Agency collaborates with Niger State Government on improved rice production; *Leadership* (November 15, 2014)
- Nigeria: Rice Value Chain Initiative Launched; Daily Trust (February 8, 2014)
- We are investing N2.2b in rice production – Wems Agro; *Vanguard* (19 September, 2014)
- Group announces $2.2m rice farming investment (September 16, 2014)
- Exploring SRI technique to boost rice production; *New Telegraph*, (October 3, 2014)
- WAAPP collaborates with agriculture graduates on rice production; *AgriUpdates* (February 15, 2015)



SENEGAL

In 2010, Senegal produced 604,000 tons of paddy, a 35% self-sufficiency rate. Yearly per capita consumption is high in Senegal: 84 kg in 2010, and expected to increase to 98 kg by 2025. The country's first attempt to achieve self-sufficiency was in 2012, aiming to produce 1.0 million tons of milled rice. Only 320,000 tons were produced, less than one-third of the targeted amount. A second attempt was set for 2017, with a predicted consumption of 1.02 million tons. But consumption in 2017 was already at 1.73 million tons, and imports had risen to 1.05 million tons, as production reached only 680,000 tons. Nevertheless, rice production more than doubled from 2012 to 2017, a considerable increase.



	2010	2016/2017	2025 estimated
Self-sufficiency rate (%)	35	39	100
Population (million)	12.96	16.05	20.04
Yearly per capita consumption (kg)	84	108	98
Production paddy (t)	604,043	1,062,001	3,059,480
Production milled (t)	380,547	680,000	1,958,067
Consumption milled (t)	1,087,245	1,730,000	1,958,067
Imported milled (t)	706,698	1,050,000	0

Data: Compiled by authors from FAO online database, Index Mundi online database, Fofana et al (2014)

Figure 48: Rice consumption, as a composite of production and imports, self-sufficiency rate, population and per capita rice consumption for 2010, 2016/2017 and predicted for 2025 for the country of Senegal

There is much potential to increase rice production from the wide variety of rice systems existing in Senegal. Irrigated agriculture is concentrated in the Senegal River Valley. Lowland and upland rainfed rice is concentrated in Senegal's central Fatick, Kaffrine, Kaolack, and Thies regions. Mangrove rice production dominates in the coastal zone, and rainfed lowland rice systems are characteristic of the southern zone. In order to be self-sufficient by 2025, Senegal must triple its 2016/2017 rice production, as consumption is estimated to reach 1.96 million tons of milled rice, or 3.06 million tons of paddy (Figure 48)

SRI ACTIVITIES PRIOR TO SRI-WAAPP

The first few SRI plots were set up in 2005 by FAO in the village of Ndiaye, Dagana department. From there SRI was introduced to the department of Podor, but all efforts were at a modest local scale.

Beginning in 2008, the PRODAM project, located at Matam in the Senegal River valley, started a longer-term SRI initiative. The first five years (2008-2013) were devoted to rigorous testing and feasibility studies for using SRI methods, including identifying and addressing the associated constraints. In 2013, PRODAM began scaling-up, implementing SRI on 3000 ha of rehabilitated and newly constructed irrigation schemes. These large-scale irrigation schemes were leveled specifically to suit SRI requirements and reduce irrigation water application by 30-50%.

The other large-scale rice area development projects in Matam, the PADAER *(Programme d'Appui au Développement Agricole et à l'Entreprenariat Rural)* and the parastatal SAED *(Société Nationale d'Aménagement et d'Exploitation des Terres du Delta, du Fleuve Sénégal et des Vallées du Fleuve Sénégal et de la Falémé)* followed PRODAM in training farmers to use the SRI methodology on both their newly-rehabilitated and newly-built irrigation schemes. SAED's goal is to expand use of SRI, initially to 6000 hectares, and then to further north in the Senegal River Valley.

Figure 49: Approximate SRI locations in Senegal before January 2014

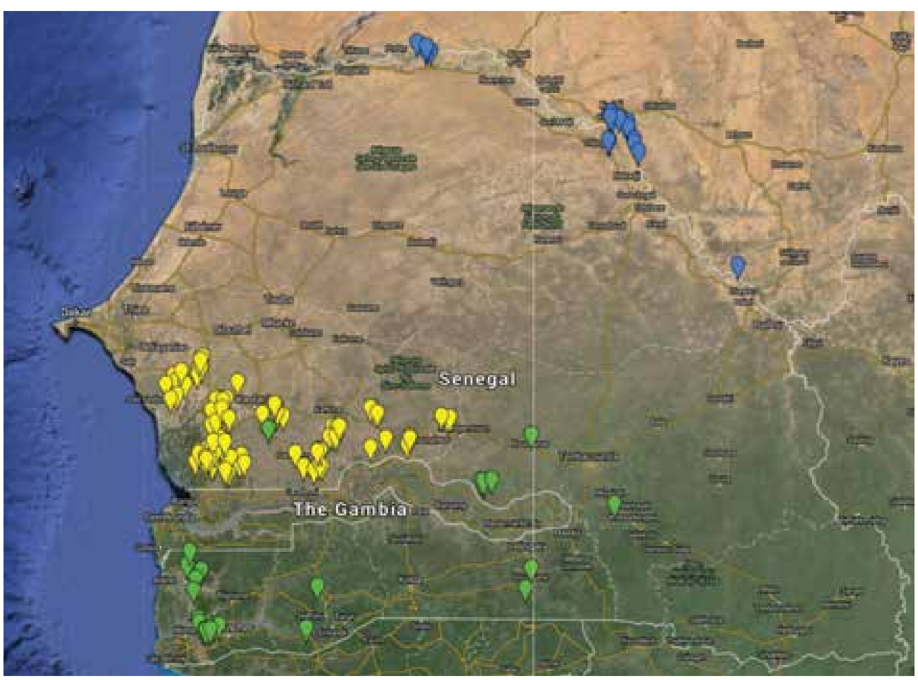


Figure 50: SRI sites in Senegal: rainfed WAAPP-sites (yellow), rainfed non-WAAPP sites (green), irrigated non-WAAPP sites (blue), June 2016

In 2012, the USAID-funded E-ATP project led a national training workshop in Senegal for 33 trainers (including 9 women) from seven partner organizations (list in Appendix 1). These trainers went on train a further 516 producers (331 of whom were women).

The National Agriculture Extension Agency (ANCAR) has also been a leading proponent of SRI. ANCAR staff first experimented with SRI in the rainfed area of Toubacouta in 2009 after seeing the SRI plots in Podor. The good results motivated ANCAR staff to continue to work with SRI. ANCAR's national mandate and its active role in supporting innovation development with and for farmers made it a natural candidate to become the SRI national focal organization under SRI-WAAPP. Approximate SRI locations before the project started, are shown in Figure 49.

SRI-WAAPP PROJECT RESULTS

Because the SRI-WAAPP project was not funded in Senegal during 2014 and 2016, project activities were restricted to 2015. Large-scale projects were already underway in the Senegal River Valley to implement SRI for irrigated rice, so SRI-WAAPP focused its efforts on the challenge to improve rainfed rice production in Senegal, specifically in the rainfed rice-growing areas of the Kaolack, Fatick, Kaffrine and Thies regions (Figure 50).

The project team developed a three-pronged approach i) provide good training to farmers, ii) assist them to install SRI demonstration sites, and iii) organize field exchange visits for farmers to witness first-hand how other farmers adapt SRI practices to their specific environments and to learn from their experiences. The target was to reach 4461 farmers at 169 sites in 25 communes located in 101 lowland valleys in the southern groundnut basin.

SENEGAL

The project began with a national launch meeting, followed by workshops in five zones reaching a total of 161 participants. Subsequent farmer training workshops were held in 25 locations, training a total of 4555 farmers of whom 2963 (65%) were women. It was initially planned to install 169 demonstration plots, but only 114 were planted due to delay in rainfall. Of the 114 sites, only 88 plots achieved maturity, due to lack of sufficient rainfall in Fatick and to unseasonal flooding in some lowlands of Kaolack and Kaffrine. During the growing season, four guided field visits were held for 289 participants.

National facilitator Abdoulaye Sy organized additional trainings in March 2015, mostly for ANCAR field agents outside of the project zone in Toubacouta and in Ziguinchor. The

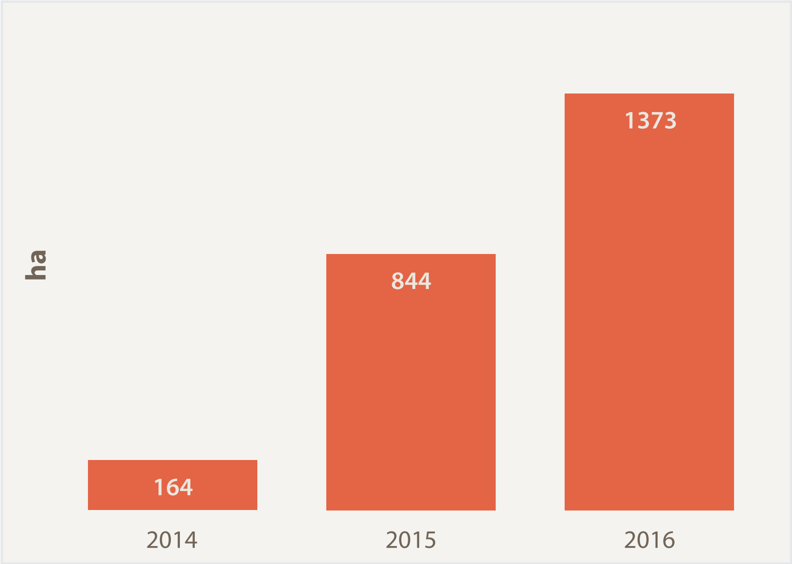


Figure 51: SRI area (ha) in Senegal: before, during and at the end of the project

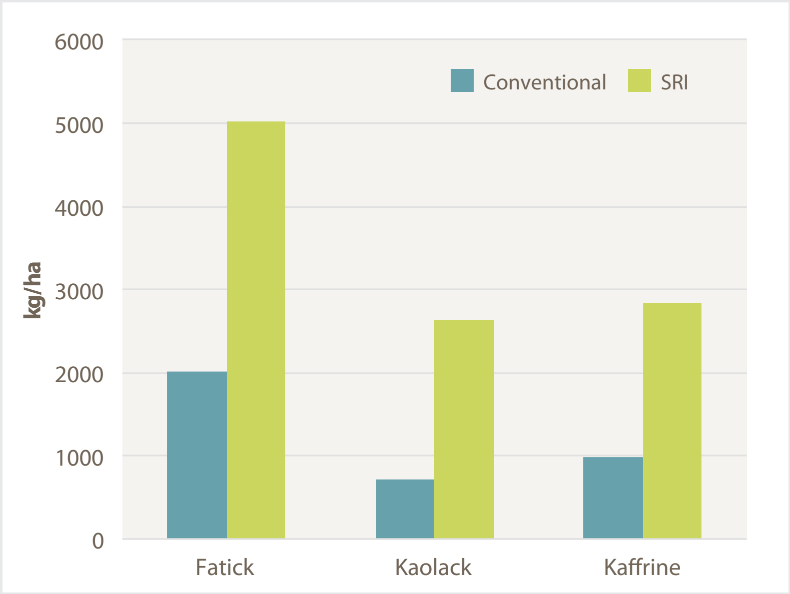


Figure 52: Yield comparison (kg/ha) for SRI and conventional rainfed rice production in three regions of Senegal (2015/2016)

national facilitator also holds a national SRI meeting each December for all SRI stakeholders and interested partners. Because use of SRI is expanding quickly and is implemented by a number of organizations, such national meetings have become critical to share information and to help coordinate the scaling-up process. Estimated SRI area for all known SRI interventions in country had increased substantially during the project implementation period 2014-2016, as is shown in Figure 51.

In the Fatick, Kaolack and Kaffrine regions, yields for SRI were 2.5 to 3.6 times higher compared to conventional practices, on average reaching 3.5 t/ha under SRI compared to 1.24 t/ha under conventional practice (Figure 52). This is proportionally a very large increase, higher than what can generally be expected from areas with more water availability for crops.

CONSTRAINTS AND RECOMMENDATIONS

Implementation of SRI in the non-improved lowlands was constrained by the impossibility of water control, as plots were not leveled and were exposed to sudden flooding after heavy rainfall. The delayed onset of the rainy season further complicated the set-up of demonstration plots. The country team recommends creating bunds along contour lines as well as leveling the plots for better water management.

Farmers found it difficult to adapt to SRI practices for plot preparation and transplanting as they are also busy at the beginning of the rainy season with planting many other crops. Forming groups to help each other for transplanting was proposed as a possible solution. Focusing on SRI for seed and cash crop production will make it more profitable for farmers to switch. The country team also proposes improvements in data collection and field evaluations, and to hold yearly national meetings for review, planning, and better coordination.

SRI FIELD RESISTS LODGING

The two photos show a comparison between a conventional field (left) that was flattened during a strong wind compared to the SRI field (right) that didn't fall over or lodge. The variety used in both fields is BG90.2.

(SRI-WAAPP project area; 2015/2016)

Conventional plot after a storm

SRI plot after a storm

HOW THIERNO OUMAR SY WAS CONVINCED ABOUT SRI

Thierno Oumar Sy, from the village of Woudourou in Matam, has been a rice farmer all his life. When he first learned about SRI, he was very surprised to be told that only 6-10 kg seeds are needed to plant one hectare of rice. He went home, divided one kilogram of seed evenly into 10 parts, and counted the number of grains in one part. He also calculated how many planting hills would be needed to fit his rice parcel at a spacing of 25cm x 25cm. From his calculations, he quickly realized that it would indeed be possible to reduce the quantity of seeds as claimed. Without ever even having seen a SRI plot, Thierno became the first SRI farmer in Matam. Today, he goes from village to village to train farmers on SRI and explain to them why the rice farmers of Matam should adopt SRI.

SRI-WAAPPP project coordinators and collaborators

Focal Institution for SRI	Agence Nationale de Conseil Agricole et Rural (ANCAR)
National SRI facilitator	Abdoulaye Sy
WAAPP coordinator	Mariètou Diawara
Previous WAAPP coordinator	Oumar Sene
Previous WAAPP technical officer:	Gueye Mour
WAAPP M&E officer	Diagne Rouguillatou Ndir
SRI Champions	Samba Thiaw, Mamadou Ciré Sall, Arona Diédhiou

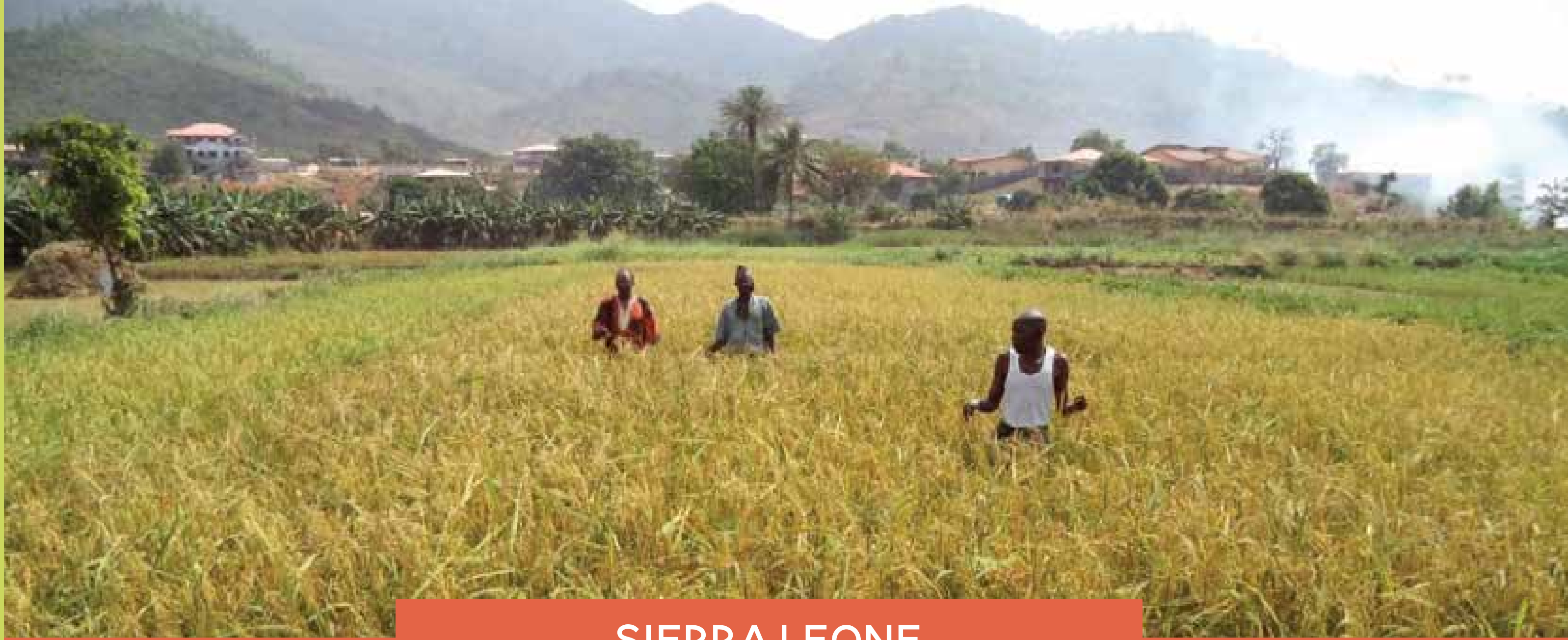
Institutions involved with SRI

Short name	Name	Type
WAAPP-Senegal	West Africa Agricultural Productivity Program	Government, SRI-WAAPP Coordination
ANCAR	Agence National de Conseil Agricole et Rural	Government, Extension, SRI focal institution
Entente Diouloulou	Entente des Groupements Associés de Diouloulou	Farmer organization
GIPD	Le Programme sous régional de formation participative en Gestion Intégrée de la Production et des Déprédateurs	Development Project
IED Afrique	Innovations Environnement Développement	International NGO
Le Quotidien (Sénégal)	Le Quotidien (Sénégal)	Media
Le Soleil Online	Le Soleil Online	Media
MAER	Ministre de l'Agriculture et de l'Equipement Rural	Government
PADAER	Projet d'Appui au Développement Agricole et à l'Entreprenariat Rural	Development Project
PAPSEN	Programme d'Appui au Programme National d'Investissement de l'Agriculture du Senegal	Development Project
Peace Corps Senegal	Peace Corps Senegal	Governmental (International)
PRODAM	Projet de développement agricole de Matam	Development Project
SAED	Société Nationale d'Aménagement et d'Exploitation des Terres du Delta, du Fleuve Sénégal et des Vallées du Fleuve Sénégal et de la Falémé	Parastatal
Senegal News	Senegal News	Media
Symbiose	Symbiose - Senegal	National NGO
UCTF	L'Unité de Coordination Technique et Fiduciaire	Local NGO

SRI Publications

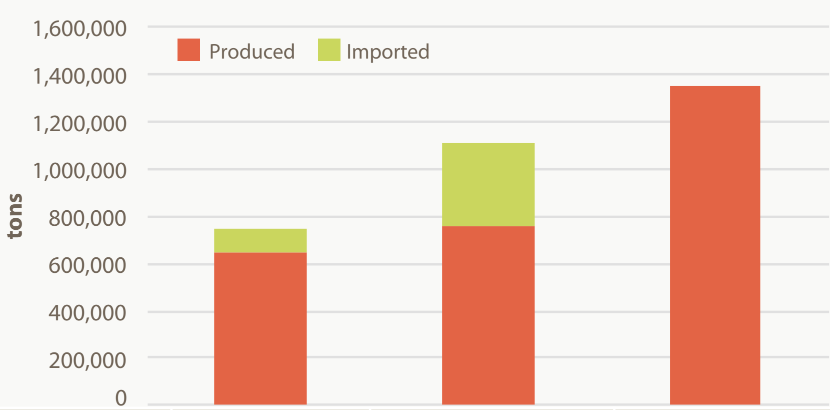
Baseline Study: Lo M. 2016. Etude de Capitalisation sur le Système de Riziculture Intensive au Sénégal. PPAAO-Senegal, 109p.

Technical annual report: Rapport Annuel d'Avancement du Projet No26/DGE- SRI-WAAPP 3 –FNRAA, Diffusion a grande échelle du Système de Riziculture Intensive (SRI) dans les zones de riziculture pluviale du Bassin Arachidier Sud; ANCAR/BAS 2015; Rapport Décembre 2015.



SIERRA LEONE

At 130 kg/year, Sierra Leone has one of the highest per capita rice consumption rates in West Africa. In 2010, its production of 1.03 million tons of paddy corresponded to 86% self-sufficiency. But since that time, consumption has increased faster than production, widening the gap between them. For the 2016/2017 season, production reached 756,000 million tons of milled rice and imports were at 350,000 tons, thus the self-sufficiency rate declined to 68%.



	2010	2016/2017	2025 estimated
Self-sufficiency rate (%)	86	68	100
Population (million)	5.78	6.73	7.87
Yearly per capita consumption (kg)	130	164	172
Production paddy (t)	1,026,671	1,181,250	2,111,327
Production milled (t)	646,803	756,000	1,351,249
Consumption milled (t)	750,301	1,106,000	1,351,249
Imported milled (t)	103,498	350,000	0

Data: Compiled by authors from FAO online database, Index Mundi online database, Fofana et al (2014)

Figure 53: Rice consumption, as a composite of production and imports, self-sufficiency rate, population and per capita rice consumption for 2010, 2016/2017 and predicted for 2025 for the country of Sierra Leone

Most rice is cultivated in the uplands at 55% of the rice-growing area, followed by 26% for inland valley swamps, 11 % for mangrove swamps, 8% for Bolilands and 1% for Riverain grasslands. The NRDS (2007) originally targeted self-sufficiency by 2013, and when not achieved again in a second attempt by 2018. The strategy focused on both raising overall productivity and to increase the area under cultivation in the inland valley swamps or lowlands, where there is much underutilized capacity. To reach self-sufficiency by 2025 would require to produce 2.11 million tons of paddy, an increase of 80% over the 2016/2017 production. (Figure 53)

SRI ACTIVITIES PRIOR TO SRI-WAAPP

The first SRI trials were carried out in 2001 by the World Vision research coordinator after he learned about it during a visit to Madagascar. Eight farmer groups, each with 20 members, established demonstration plots on inland valley swamps (IVS) in southeastern Sierra Leone, obtaining yields of 5.3 t/ha using SRI compared to 2.5 t/ha with farmer techniques.

In 2002, Gerald Aruna, Country Director for the Italian NGO ENGIM International, learned about SRI from reading a publica-

[1] Bolilands are seasonal swamps, flooded in rainy season, dry and hard soils in dry season with grassland coverage

tion about it. He decided to undertake his own SRI trials, and the results were convincing enough that Mr Aruna has continued to work with SRI ever since. He developed a SRI training manual for facilitators and provided technical support to a number of institutions such as Catholic Relief Services (CRS) and the Center for the Coordination of Youth Activity (CCYA) in the Bombali District. Under ENGIM, he integrated SRI with vegetable production systems and provided technical support for a SRI project in Kailahun and Koinadugu Districts.

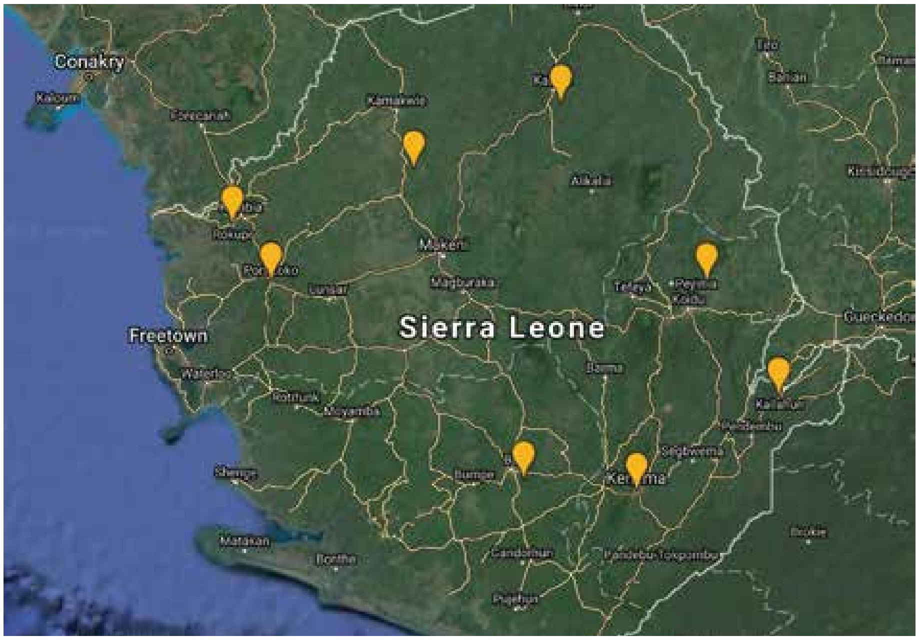


Figure 54: Approximate SRI locations before the project started (above) and SRI-WAAPP Sites in Sierra Leone, June 2016 (below)

In 2008, the Sierra Leone Research Institute (SLARI) at Rokupr led trials in the Kambia District to compare SRI with both recommended research practices and with farmer practices. The results found that SRI created a higher net return: 16% higher than recommended research practice and 52% higher than farmers method.

In 2012, the West African Rice Company (WARC) carried out some SRI trials at Bo in southeastern Sierra Leone with 10 farmers; yields averaged 6.9 t/ha. The following year, in 2013, the NGO Welthungerhilfe worked with 30 farmers who doubled yields using SRI, from 1.9 t/ha to 3.8 t/ha.

In summary, there were several experiences with SRI in different parts of Sierra Leone over the 12 years prior to the SRI-WAAPP project, but there was little coordination or exchange among them. The approximate SRI locations are shown in Figure 54.

SRI-WAAPP PROJECT RESULTS

SRI-WAAPP project activities began in 2013, earlier than in many other countries, as WAAPP funding was available and the project team was motivated to get started. All project interventions focused on rainfed lowland rice systems. During the first year, the national facilitator and his colleagues designed an initial comparison trial with 50 farmers in five districts. Building on the results from the trial, the project then worked with 320 farmers in the second year, and introduced SRI to all 13 rice -producing districts out of 14 districts and to 26 out of the 149 chiefdoms (20%) during the third year (Figure 54).

The initial comparison trial was set up with 50 farmers in the five districts of Kambia, Port Loko, Bo, Kenema and Western Urban (10 farmers/district). The trials compared three treatments:

- **Farmers practice:** 3-4 seedlings/hill at 30-42 days of age, randomly spaced, no fertilization

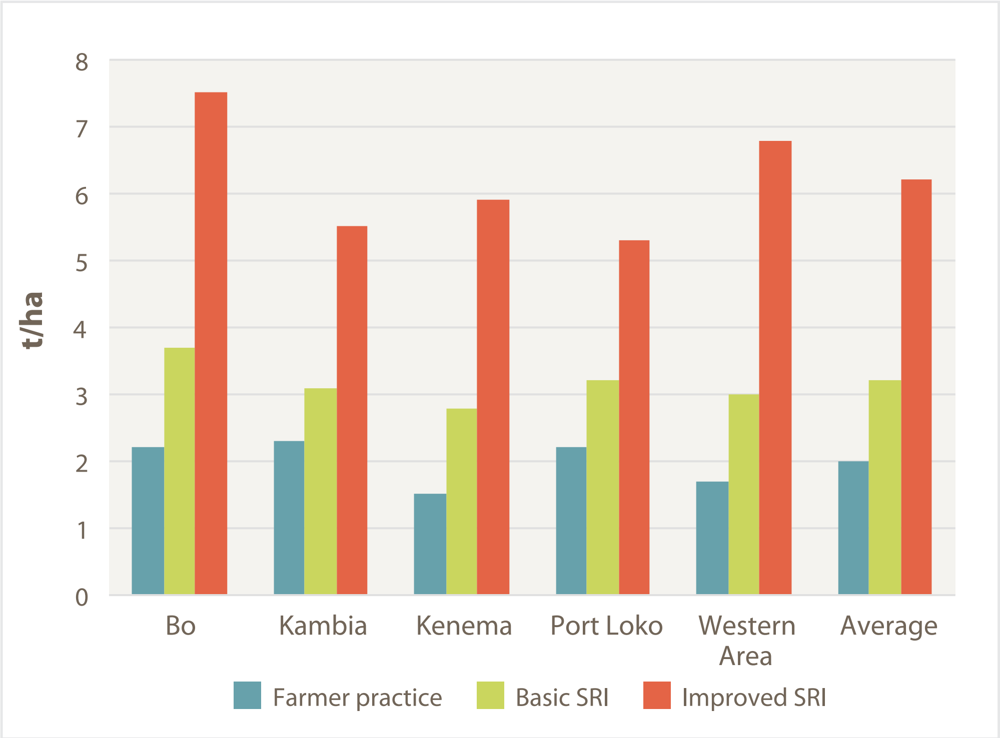


Figure 55: Yield comparison (t/ha) of three treatments in rainfed lowland rice systems in five districts of Sierra Leone, 2013/2014

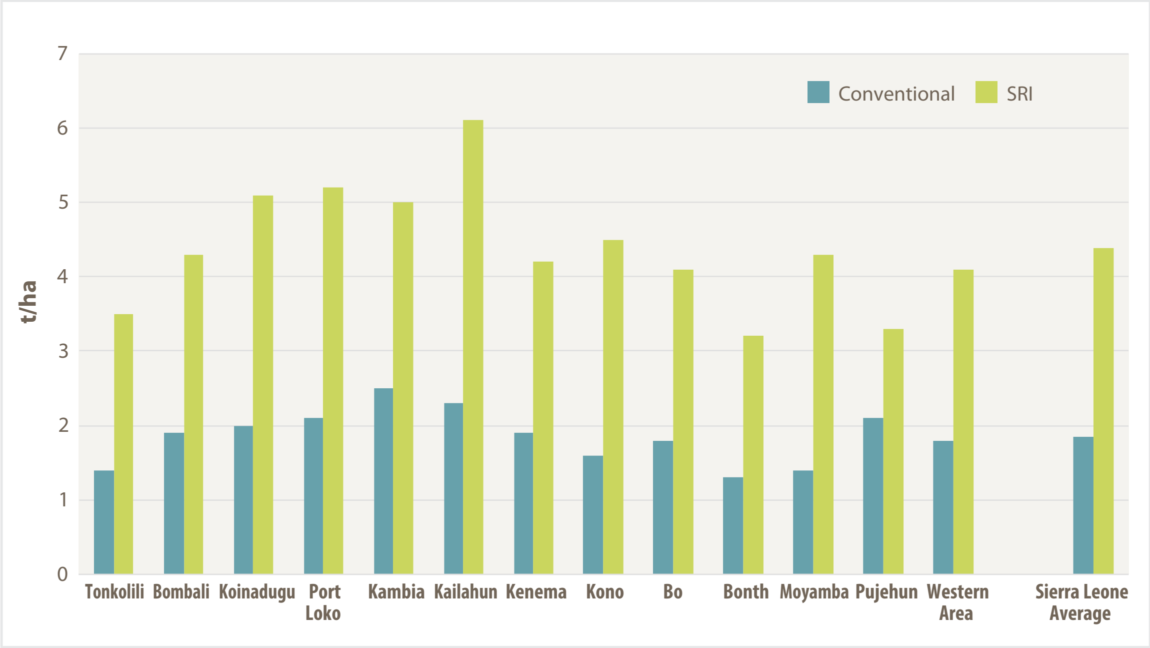


Figure 56: Yield comparison (t/ha) for SRI and conventional rice production in rainfed lowland systems in 13 districts in Sierra Leone, 2015/2016

- **Basic SRI method:** 1 seedling/hill at 12 days old, at 25cm x 25cm spacing, with effort to prevent flooding of parcels, even if full water control was not possible, no fertilization
- **Improved SRI method:** 1 seedling/hill at 12 days old, at 25cm x 25cm spacing, with effort to prevent flooding of parcels, even if full water control was not possible, fertilization with 10 t/ha of palm kernel cake, incorporated into soil two weeks before transplanting.

Results: Farmer practice yields were at 2 t/ha, basic SRI practice yields were at 3.2 t/ha, and improved SRI practice yields were at 6.2 t/ha (Figure 55). The addition of palm kernel cake to the SRI plot almost doubled the yield compared to the basic SRI practice without fertilization. This trial clearly demonstrated the value of adding organic matter to the soil, something farmers had not done previously.

For the second year, 2014/2015, the project expanded its outreach to 54 villages, where 80 farmers (30 women) set up SRI plots, obtaining SRI yields of 6.2 t/ha compared to 2 t/ha for farmer practice. ENGIM, Welthungerhilfe and WARC worked with 240 SRI farmers in eight additional villages, where yields averaged 4.5 t/ha for SRI compared to 2.5 t/ha for farmer practice. Overall, a total of 320 SRI farmers (134 women) cultivated 14.2 hectares of SRI rice.

For the third year, 2015/2016, the project expanded to all 13 rice-growing districts, where a total of 11,330 farmers planted SRI rice on 1446 hectares. Average yields for SRI were 4.38 t/ha compared to 1.85 t/ha with farmer practice (Figure 56). Average income increased by 23% across all locations.

Farmers across the country are becoming more aware of SRI, and further adoption can be expected given the yield and income increases. However, farmers find it a challenge to use the SRI method on their entire rice-growing area because the cropping calendar under SRI requires farmers to schedule labor in an unaccustomed way. It is important to assist farmers with labor saving equipment and with good training to increase their efficiency. Other constraints such as water control and weed control are very similar to those experienced by SRI farmers in neighboring countries.

Quote from Adekalie Kamara, SRI farmer in Sierra Leone:

"With this SRI system, I do not need to bring my wife and children to weed the farm, and it gives me hope of a good reward for my hard work. With such a high productivity, it might very well take me out of poverty. It also gives my children enough time to concentrate on their studies."

SKEPTICISM GIVES WAY TO SURPRISE

Students at the St Joseph Vocational Institute in Lunsar in the Portloko District take classes in sustainable agriculture and SRI Champion Gerald Aruna from the NGO ENGIM came to teach them about SRI. One student, Fatama Kamara, was very skeptical when they set up a SRI demonstration plot. She could not believe that young and small seedlings planted with wide spacing would be able to produce much. But when she saw that after 3 months the plants had developed more than 40 tillers, she wanted to take part in the harvest herself. After cutting the plants and weighing them, she was very surprised to see the amount of rice harvested from such a small field, which corresponded to 4.5 t/ha. She admired the length of the panicles and the fullness and heaviness of the grains. She became enthusiastic about SRI, and planned to return home after her studies to teach the SRI methodology to her family and neighbors, so that they can move away from low-yielding conventional methods.

SRI-WAAPPP project coordinators and collaborators

Focal Institution for SRI	Sierra Leone Research Institute (SLARI)
National SRI facilitator	Samuel Harding
WAAPP coordinator	Sulaiman S. Sesay
Previous WAAPP coordinator	Peter Kaindaneh
WAAPP M&E officer	Kepifri Lakkoh
Previous WAAPP M&E officer	Shiek Ahmed Tejan Rogers
SRI Champions	Daniel Santigie Fornah, Edward S.A. Kargbo, Gerald Aruna, Daniel Saidu, Margeret Abu

Institutions involved with SRI

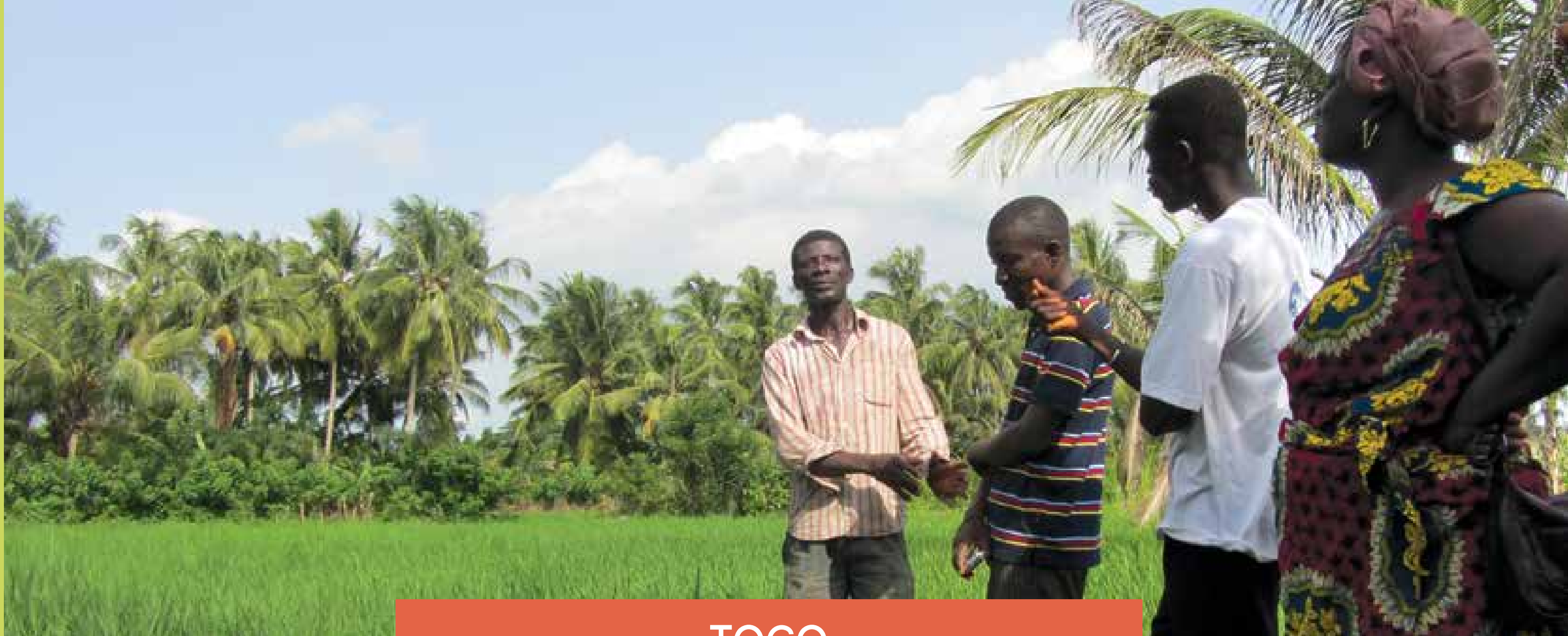
Short name	Name	Type
WAAPP-Sierra Leone	West Africa Agricultural Productivity Program	Government, SRI-WAAPP Coordination
SLARI	Sierra Leone Agricultural Research Institute	Government, Research, SRI focal institution
Awoko.org	Awoko Newspaper	Media
BRAC	BRAC	international NGO, Bangladesh
CARE	CARE	International NGO
CRS	Catholic Relief Services	International NGO, USA
CTF	Cotton Tree Foundation	International NGO, Trinidad
ENGIM	Ente Nazionale Giuseppini del Murialdo	International NGO, Italy
RARC	Rokupr Agricultural Research Centre	Research Institute
WARC	West Africa Rice Company	Private Enterprise
Welthungerhilfe	Welthungerhilfe	International NGO, Germany

SRI Publications

Baseline Study: Aruna G, Lakoh KA, Saidu D, Harding SS. 2016. Baseline Study Report. SRI-WAAPP, Sierra Leone, 47p.

Scientific journal article: Harding SS, Mahmood N, JMK, Chernnor Sullay K and A Toure. 2017. Assessing the Suitability and Profitability of the System of Rice Intensification (SRI) methodology under farmers' circumstance in Sierra Leone. *Agronomie Africaine Sp* 29 (1): 41-52.

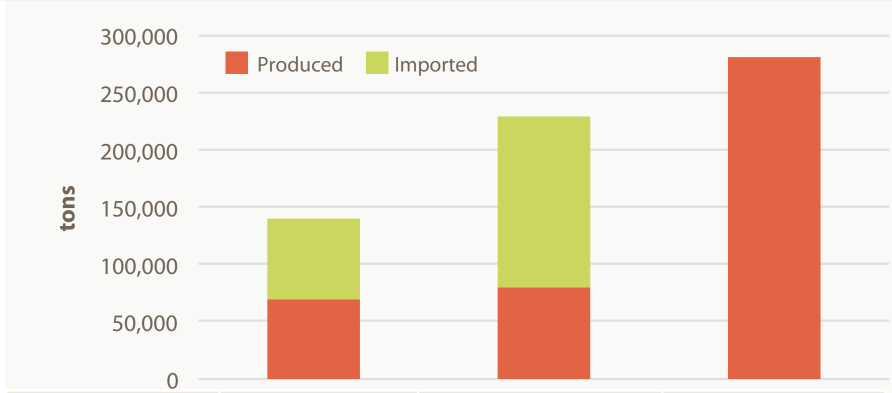
World Bank Blog: Agricultural Program Helps Rice Crops and Food Security Grow in Sierra Leone, June 2014



TOGO

Togo achieved 49% self-sufficiency in 2010, but this had declined to 35% by 2016/2017 despite a 14% production increase since 2010. Due to both increased population and increasing per capita consumption, rice imports increased by 64% from 2010 to 2016/2017.

In Togo, the rainfed lowland system occupies 55% of the rice-growing area, followed by the irrigated system at 26%, and upland systems at 19%. The lowlands account for 60% of national production, irrigated perimeters 30%, and uplands 10%. The NRDS for Togo (2009) planned an increase in the rice-growing area by 80% (covering all three major systems) from 2008 to 2018, and to increase national average yields from 2.34 t/ha to 3.5 t/ha. To reach self-sufficiency by 2025, the 2016/2017 production must increase by 3.5 times to attain 438,370 tons of paddy. (Figure 57)



	2010	2016/2017	2025 estimated
Self-sufficiency rate (%)	49	35	100
Population (million)	6.39	7.69	9.35
Yearly per capita consumption (kg)	22	30	30
Production paddy (t)	110,109	125,000	438,370
Production milled (t)	69,369	80,000	280,557
Consumption milled (t)	140,164	230,000	280,557
Imported milled (t)	70,795	150,000	0

Data: Compiled by authors from FAO online database, Index Mundi online database, Fofana et al (2014)

Figure 57: Rice consumption, as a composite of production and imports, self-sufficiency rate, population and per capita rice consumption for 2010, 2016/2017 and predicted for 2025 for the country of Togo

SRI ACTIVITIES PRIOR TO SRI-WAAPP

The first SRI plots were installed during the 2011/2012 agriculture campaign by the NGO GRAPHE, working with 60 farmers in four villages on improved lowland plots with partial water control. Total SRI area was 11 ha and average yields with SRI reached 5.82t/ha compared to 3.15 t/ha with conventional production.

In 2012/2013, the regional project E-ATP organized a national Training of Trainers workshop with 35 participants (of whom 20% were women), from five different organizations (list in Appendix 1). Following the workshop, farmers from 80 farmer organizations were trained at 40 locations in the Maritime Region and Plateau Centrale. 295 farmers planted rice using SRI on a total of 37.6 ha. Average SRI yields were 6.06 t/ha compared to 2.7t /ha for the comparison plots. The organizations trained by E-ATP and active with SRI continued their outreach in 2013, which increased to 90 farmer organizations representing 1500 farmers. **648 SRI farmers** planted SRI rice on 93 hectares and obtained yields of 6.6 t/ha using SRI, compared to 2.9 t/ha with conventional farming. SRI Sites prior to SRI-WAAPP are shown in Figure 58.

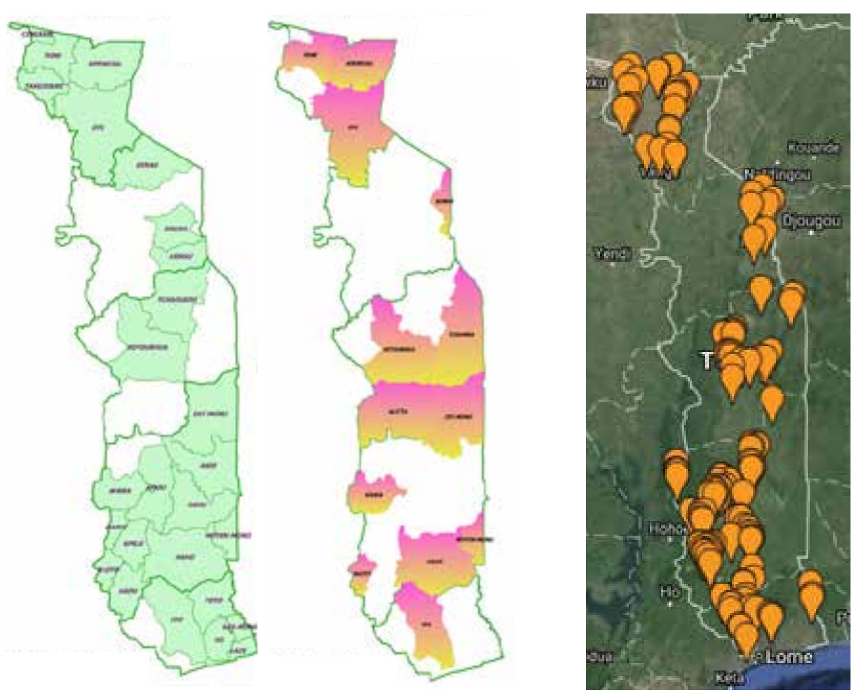
SRI-WAAPP PROJECT RESULTS

The SRI-WAAPP project was implemented by a consortium of four organizations: two government institutions, one for agriculture extension (ICAT) and one for research (ITRA); and two NGOs, GRAPHE and ETD. GRAPHE and ETD worked directly with the producers, while ICAT was in charge of national facilitation and coordination, and supported ETD and GRAPHE in their extension activities. ITRA provided research support.

The project zones and sites were determined according to the where GRAPHE and ETD were already established, and by adding more locations to attain an even coverage of SRI introduction across the country. Both GRAPHE and ETD intervened in all five regions: Maritime, Plateaux, Centrale, Kara and Savanne. GRAPHE worked in 21 préfectures, and ETD covered the 13 préfectures where it had established relationships with 13 producer and service provider organizations, called ESOPs *(Entreprises service et organisation des producteurs)*. In total, the project worked in 25 of 30 prefectures (Figure 59).

During the first year of the project, 96 farmer field school plots were set up on a total of 78 hectares in 96 villages across all five regions. The strategy focused on i) maximizing geographic coverage and ii) working through farmer organizations with 1245 members in this first year. 53 technicians and 96 farmers were trained in SRI techniques, and were then responsible for looking after the demonstration plots. Average yields for the first year were 1.6 t/ha for conventional plots and 4.5 t/ha for the SRI plots.

Figure 58: SRI sites before SRI-WAAPP started in January 2014 (by GRAPHE)



GRAPHE SRI Intervention zones ETD SRI intervention zones All SRI-WAAPP sites

Figure 59: Intervention zones for ONG GRAPHE and ETD and mapped SRI-WAAPP project sites, June 2016

The approach in the second year was to build up the technical capacity throughout the country. The project team first trained 80 technicians and researchers (of whom seven were women), followed by large-scale training for 1502 farmers (of whom 602 were women) in all parts of the country during June and July 2015.

During this second season, 2202 farmers in 117 villages grew SRI rice on 195 hectares. The average yield for 64 sampled comparison trials was 2.36 t/ha for the conventional method and 4.54 t/ha for SRI. The yield comparisons for each of the regions is shown in Figure 60.

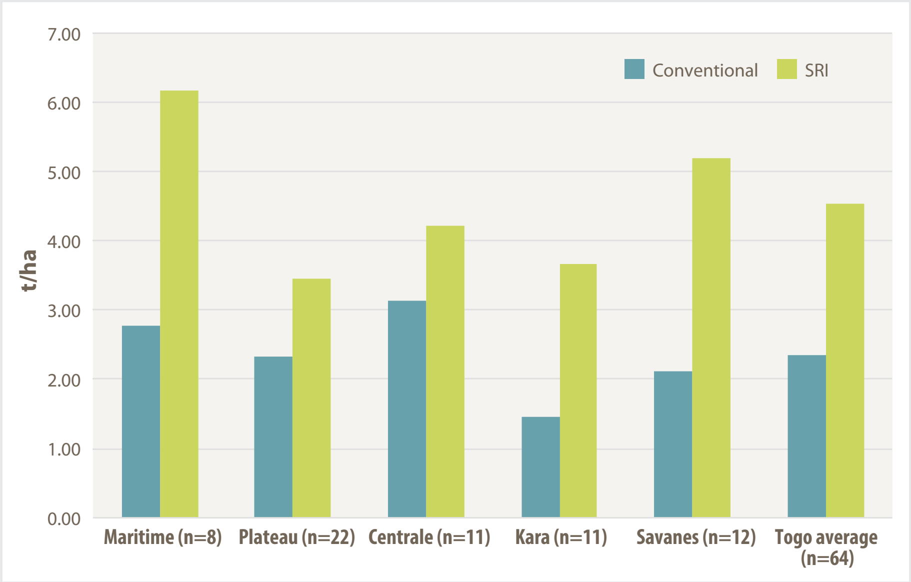


Figure 60: Conventional and SRI yields (t/ha) for five regions in Togo, 2015/2016

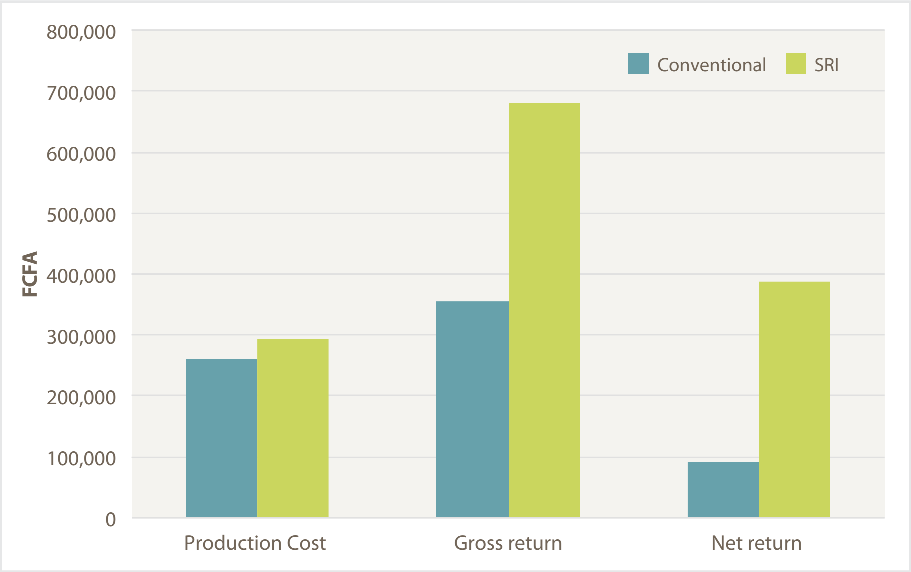


Figure 61: Production cost, gross and net return (in FCFA/ha) of conventional and SRI rice production (n=64) in Togo, 2015/2016

Economic analysis of data from the 64 locations indicates slightly higher production costs for SRI at 293,838 CFA/ha compared to conventional practices at 261,547 CFA/ha, but due to the increased yields, and given a value of 150 CFA/kg paddy, the net return for the SRI plots were four times higher than the return from conventional methods: SRI 387,850 CFA/ha for SRI compared to 92,838 CFA/ha for conventional methods, or 776 USD/ha versus 186 USD/ha respectively (Figure 61).

The details for the five regions are presented in Table 9.

The project estimates that it introduced SRI to 10,607 producers (1245 in 2014, and 9362 in 2015), of whom 4072 were women, in the 25 prefectures of 30 prefectures.

CONSTRAINTS AND RECOMMENDATIONS

Rice production is of low priority for many Togolese farmers because they cultivate many other crops, and rice tends to be more costly and complicated for them to produce. In some regions, farmers also face insecure land tenure. But interest from farmers is growing due to the considerable yield increases using SRI. Other constraints are similar to those found in neighboring countries and can be addressed using similar measures: assist farmers to access equipment and tools, train farmers in composting and other techniques to increase organic matter applications to soil, and improve water management in lowland areas by channeling water flow and bunding rice fields.

Innovation for quick composting: In 2015 and 2016, the project team collaborated with the *Association pour la Gestion Intégrée et Durable de l'Environnement (AGIDE)*, to train 3279 farmers (of which 1330 women) in a quick composting method. By adding the Mycotri fungus to composting materials, decomposition rate accelerates and composts can be ready for use within one month.

Table 9: Production cost, gross return and net returns (in FCFA/ha) for conventional method and SRI in the five regions of Togo, 2015/2016

Regions	Conventional Cost	Conventional Gross return --- in FCFA/ha ---	Conventional Net return	SRI Cost	SRI Gross return --- in FCFA/ha ---	SRI Net return
Maritime	354,578	417,150	62,573	484,080	926,250	442,170
Plateaux	215,534	350,325	134,791	243,026	518,611	275,585
Centrale	277,432	468,845	191,413	305,603	634,268	328,665
Kara	210,096	218,850	8,754	203,955	550,909	346,955
Savanes	250,093	316,750	66,657	232,525	778,400	545,875
Average	261,547	354,384	92,838	293,838	681,688	387,850

In Memoriam Gedeon Kodjo Tchimenou (1965-2015), one of the first and most dedicated SRI champions in Togo, who trained over 100 technicians and 2000 farmers in SRI.

NEW INCOME FROM SRI HELPS A FAMILY TO START A BUSINESS

Madame Cecile Kodja, from Asshoun village in the Maritime region of Togo, tried SRI for the first time on a small plot of 0.15 hectares, and obtained a net profit of 60,000 CFA (120 USD). "This was the first time I obtained such a profit from my rice field – never seen before." She invested the money into a small business to process oil palm, and she was not only able to produce oil but also used the residues for cooking fuel. Before, she had to cut down trees for cooking fuel, and is happy to know that she now helps to preserve them instead.

"The yields I obtained with SRI impressed my husband, and he is very happy that I earn some money and can help take care of the family. It has really improved my relationship with everyone in the family. The money I make buys clothes for my children."

"SRI has brought a smile to our faces and happiness to the entire family."

SRI-WAAPPP project coordinators and collaborators

Focal Institution for SRI	Institut de Conseil Agricole Togolais (ICAT),
National SRI facilitator	Dadjo Baguilima
Previous SRI facilitator	Kokou Megnini Opekou
WAAPP coordinator	Assimiou Adou Rahim Alimi
WAAPP M&E officer	Dahouda Djele
SRI Champions	Jean Apedoh, Ablede Komlan, Komla Homenya Egle, Kwami K Tchansi

Institutions involved with SRI

Short name	Name	Type
WAAPP-Togo	West Africa Agricultural Productivity Program	Government, SRI-WAAPP Coordination
ICAT	Institut de Conseil d'Appui Technique	Government, Extension, SRI focal institution,
ITRA	Institute Togolais de Recherché Agronomique	National Research Institute, Ministry of Agriculture, SRI-WAAPP consortium
GRAPHE	Groupe Chrétien de Recherche-Actions pour la Promotion Humaine	National NGO, SRI-WAAPP consortium
ETD	Entreprises Territoires et Développement	National NGO, SRI-WAAPP consortium
CECODRI	CECODRI	National NGO
ESOP	Entreprises et services d'organisation des producteurs	Private Enterprise
IFDC-Togo	International Fertilizer Development Centre	International NGO
Le Temps (Togo)	Le Temps (Togo)	Media
MVCP	Mission des Volontaires Contre la Pauvreté	International NGO, Switzerland
PADAT	Projet d'Appui au Développement Agricole du Togo	Government, IFAD
PADES	Programme d'Aides pour le Développement Economique et Social	National NGO
PARTAM	Projet d'Aménagement et de Réhabilitation des Terres Agricoles de la Zone de Mission de Tové	Government
PBVM	Projet d'Aménagement hydro de la Basse Vallée du fleuve Mono	Government
PDPR-K	Projet de Développement pour la Production Rizicole dans la Région de la Kara	Government
PDRi-Mo	Projet de Développement Rural intégré de la Plaine de Mô	Government
Peace Corps	Peace Corps	Government, International, USA
PNIASA	Programme Nationale d'Investissement Agricole et de Securite Alimentaire	Government
Raphia	NGO Raphia	National NGO
Savoir News	Savoir News	Media
UAR	UAR	Private Enterprise
VAPE Riz	VAPE Riz	Private Enterprise

SRI Publications

Baseline Study: PPAAO. 2015. Etude de référence de l'opération pilote de mise en œuvre du Système de riziculture intensif (SRI) au Togo, PPAAO, PNIASA, Lomé, Togo, 52p.

Technical Report: GRAPHE, 2016. Success story: le SRI au Togo. 3p.

Technical Report: GRAPHE, 2015. Percée du SRI à Tantigou Barrage, success story, 1p.

Technical Report: GRAPHE, 2014. SRI est en mouvement dans la vallée du zio au Togo : les riziculteurs en visite d'étude du SRI à Kovié et Ativimé, Field Visit Report, 4p.

Scientific article: Egle KH, Barage M, Apedoh KA. 2017. Contribution du Système de Riziculture Intensive (SRI) à la durabilité des exploitations agricole du Sud du Togo. Journal of Universities and international development cooperation. Number 1: 282-291.

Master thesis: Egle KH. 2016. Contribution du Système de Riziculture Intensive (SRI) à la durabilité des exploitations agricole du Sud du Togo. Mémoire de fin de formation du Master 2 Sécurité Alimentaire et Durabilité Environnemental, Université Abdou Moumouni de Niambey/GRED, 65p.

3. REGIONAL COORDINATION ACCOMPLISHMENTS

The SRI-WAAPP project, covering all 13 ECOWAS countries, was the largest regional SRI project ever undertaken anywhere in the world. While operations were run independently in each of the 13 countries, the regional coordination unit (RCU) set up and coordinated a regional platform for technical advice, consultation and communication for the scaling up of SRI in West Africa. The RCU was composed of the CNS-Riz from Mali and SRI-Rice from Cornell University.

There were a number of advantages to this integrated regional approach for scaling-up SRI in West Africa:

- At the outset of the project, there were very different levels of SRI knowledge and experience across the West African countries. In some there was no experience with SRI, in others only localized experiences, and in a few SRI was known and used extensively. A regional approach facilitated the exchange of expertise between countries with varied levels of SRI experience.
- Climate and agro-ecological zones run in latitudinal bands across West Africa, crossing several countries. For example, northern Togo is more similar to northern Benin than to southern Togo. A regional approach allows stakeholders to communicate directly across borders. Experiences from the same agro-ecological zone can be easily shared, even if originating in different countries. This is important for the dissemination of locally adapted SRI practices, as these innovations can be relevant well beyond one country's borders.
- Culture and language often cross national borders. Knowledge gained in one country can be easily shared with those in a neighboring country, especially as there is often relatively free movement across borders. To cite one example, highly-experienced trainers from Mali were well-suited to train their fellow farmers in Niger, as they spoke the same language and grew rice in very similar environments.
- Under the *Regional Rice Offensive*, West African governments share the same objective: to reach rice self-sufficiency by 2025.

SCALING-UP PROCESS FOR SRI IN WEST AFRICA ADOPTED BY SRI-WAAPP

Because climate zones and rice systems in West Africa are highly diverse, the strategy for scaling-up SRI must allow a wide variety of stakeholders from all countries to easily participate in the process and efficiently achieve results. The scaling-up process can be broken down into different, successive stages. Each stage builds on the previous one, representing a longer-term continuum that will go beyond the first phase of the SRI-WAAPP project.

1 **Develop a common understanding about SRI**

- Strengthen the capacity of those implementing the project in the 13 countries
- Develop and share in-depth technical materials on SRI

2 **Harmonize the implementation approach – build a community of practice**

- Work through existing institutions and mechanisms
- Create an open platform to facilitate communication and exchange, inviting interested parties to participate
- Develop project implementation approaches and plans in a participatory manner
- Create opportunities for face-to-face exchanges and team-building through regional meetings and field visits

3 **Work with farmers to implement SRI - monitor, analyze and communicate field results**

- Field test SRI and monitor field performance
- Adapt SRI practices to local conditions, experiment and innovate
- Aggregate country data at regional level, establish databases and map activities
- Support new ideas and country-driven regional initiatives
- Address common constraints at regional level: e.g., access to mechanization
- Create a regional web-based communication platform

4 **Promote large-scale change**

- Publicize results from integrated regional data analysis
- Engage in dialogue with national and regional policy-makers
- Increase international advocacy

The 1st phase of SRI-WAAPP laid the groundwork for the scaling-up process, beginning with stages one and two then moving on to stages three and four. In the second phase of the project, most activities will focus on stages three and four. Regional achievements are discussed below, grouped under these four stages, and detailing results as specified in the project log frame (see Appendix 2).

1 DEVELOP A COMMON UNDERSTANDING ABOUT SRI

Given the diverse rice production conditions in the region, it was important to develop a common understanding and use consistent terminology about the System of Rice Intensification. To this effect, the RCU developed a conceptual framework and in-depth technical materials on SRI, and then focused on strengthening the capacity of people implementing the project. All materials were approved by the country teams following in-depth discussion.

To effectively apply the SRI methodology, the RCU developed a **conceptual framework**, based on four SRI principles. These remain the same across all climate zones and rice systems, although specific practices can be adapted to local conditions so long as they respect these principles (see chapter 1). These principles were the basis for a **comprehensive SRI technical manual** in both French (63 pages) and English (56 pages) providing i) a detailed introduction to SRI, ii) step-by-step guidelines to set up field comparison trials, and iii) technical details for each step of implementation and crop management. Detailed **data collection guidelines** and sets of **data collection sheets** were developed for use with the manual. Participants in regional and national training sessions received **technical handouts** and **PowerPoint presentations** to use for training others. Finally, the RCU drew up a **curated list of 117 resources** about SRI production methods and specific topics such as compost production and weeder design, available on the project website (see https://sriwestafrica.org/resources).

A primary focus was to **strengthen the capacity of the scientists, extension staff, farmers, SRI champions, and others who were to implement the project.** Scientists planned and set up comparison trials and SRI adaptation research; extension staff worked with farmers to adapt SRI practices to local conditions; and farmers, SRI champions and representatives of rice farmer organizations used SRI in their own fields, trained and advised farmers, and worked to spread the adaptation of SRI. Two **regional week-long Training of Trainers** workshops were held in Kpalimé, Togo, in August 2014, one held in English language for trainees from Anglophone countries, and the other in French for trainees from Francophone countries. A total of 51 participants from 12 countries, including national facilitators and SRI champions, attended the workshops. (The national team of Sierra Leone was unable to participate due to Ebola outbreak travel restrictions.) Upon their return home, the trainees organized **follow-up in-country training sessions**, where national teams of trainers were instructed in training their own farming communities. The regional coordination team also conducted six national SRI training sessions in collaboration with the national WAAPP offices and the national SRI facilitators. These were held in Liberia (December 2013, March 2014), Côte d'Ivoire (February 2015), Senegal (February and March 2015), and The Gambia (December 2015). In total, the regional coordination team trained 321 trainers, who in turn trained other trainers and farmers. By June 2016, a total of **33,514 people had been trained** in the SRI methodology through the SRI-WAAPP project, including **1032 agricultural technicians.**

2 HARMONIZE THE IMPLEMENTATION APPROACH AND BUILD A COMMUNITY OF PRACTICE

It is important to develop an implementation approach that is easy for countries to adopt, that reinforces already existing institutions rather than attempting to build new ones, that is light and flexible in its set up yet can achieve the expected results and outcomes. The national WAAPP offices, well established in each country, were responsible for program coordination, funding, and monitoring and evaluation of project activities. The national SRI focal point institutions, national facilitators, and SRI champions were already leading rice innovation in their countries and were committed to scaling-up SRI. National facilitators and SRI Champions were not limited to working only with SRI-WAAPP but also mobilized other projects and stakeholders to join the effort. This platform was to be open and inviting, favoring exchange and mutual support among interested parties, be it in project design, training, monitoring SRI field trials, or evaluating field experiences.

The RCU worked to encourage cross-border personal interactions through **regional workshops** and through **country support visits,** not only for planning and reviewing, but to create a **regional community of practice on SRI.** As human and institutional capacity is strengthened, it is important that those involved know each other personally to better reinforce their common effort to scale-up SRI.

The RCU organized **regional yearly planning and review workshops** to bring together national SRI facilitators, SRI champions, WAAPP monitoring and evaluation officers, WAAPP coordinators – if available - and the regional coordination unit team. The first workshop was held in Porto Novo (February 2014), followed by Abidjan (February 2015), Dakar (December 2015) and lastly in Bamako (June 2016). Participants shared each country's activities and accomplishments so that teams could learn from others' experiences, discussed pertinent technical and operational issues, reviewed monitoring and evaluation plans, and planned for the following year. Workshops also included training sessions and time for strategic reflection.

In addition to the yearly workshops, the RCU (CNS-RIZ and SRI-Rice) made **10 country support** visits **to strengthen and support national teams** with training, technical advice, field visits to learn from the farmers, and meetings with technical and financial partners. Support visits were made to: Liberia (December 2013 and March 2014), Benin (February 2014), Togo (March and August 2014), Ghana (August 2014), Côte d'Ivoire (February, 2015), Senegal (February, March 2015, and March 2016), and The Gambia (December 2015).

The project **monitoring and evaluation (M&E) system** was designed by the RCU working with M&E experts and officers from the national WAAPP programs. Project personnel at all levels, including national facilitators and SRI champions, were trained in the M&E system and data collection methodology, and were encouraged to learn the Geographic Information System (GIS) software ArcGIS Online and its associated mobile data collection platform, Survey 123. Each country program had an on-line account with ESRI (Environmental Systems Research Institute) to use its ArcGIS Online software for data collection, visualization and analysis. All M&E tools are available on the project website, including the M&E manual, baseline study guidelines, data collection guidelines, and forms. WAAPP M&E officers and national facilitators analyzed the data from their own countries, while the RCU put together regional data summaries, graphs and maps. Three regional M&E workshops (Lomé, April 2014; Cotonou, May 2015; and Dakar, August 2015), covered baseline study methodology, development and review of M&E plans, and trained participants to use the mobile and online M&E tools for data collection. Staff in each country completed a **baseline study** on SRI, and an independent consulting firm undertook an **external evaluation study** in early 2016 for Benin, Ghana, Mali, and Senegal.

To better track stakeholders and participating organizations, the RCU used the Airtable software platform to develop an **online, shareable database**, allowing for real-time sharing, and embedding specific "views" of the data within websites. Access to view or edit information is controlled at different levels for different users. Viewers can see publicly available information about the project, but not private information such as personal phone numbers or email addresses. As of June 2016, the database contained information about 324 people, 175 organizations, and 316 documents.

3 WORK WITH FARMERS TO IMPLEMENT SRI, THEN MONITOR, ANALYZE AND COMMUNICATE FIELD RESULTS

Having ensured that stakeholders share a common understanding about SRI and a common implementation approach, the following phase concerned **SRI field implementation**, including monitoring, analysis, and assessing successes and constraints. At the beginning of the project, the **country teams set up comparison trials** to evaluate the SRI method side-by-side with the common rice production method (conventional method) at each given location. Crop performance was monitored and measured the same way across the region, based on uniform data collection methodology under the project M&E system. The results are presented in the country chapters. The same data collection methodology made it possible for the RCU to **aggregate data at the regional level** (results in chapter 4).

Activity mapping was used for both M&E, and to facilitate information-sharing across the region. Geo-tagging field sites and associated data allowed stakeholders to quickly see the geographic distribution of project activities, to categorize them by rice production system, yield, or other agronomic aspects, and identify sites sharing common climatic or agronomic conditions. The RCU created a **regional SRI site database** with more than 1,100 entries, integrated into multiple GIS and mapping platforms, including ArcGIS, CartoDB, and Google Maps. Individual country maps and a fully interactive regional overview map with links to site data are available on the project website.

The RCU **encouraged and supported two regional initiatives** from the project country teams.

- ***First Sub-Regional Anglophone SRI Exchange Meeting in Monrovia:*** The Liberia national SRI focal point institution CHAP (NGO Community of Hope Agriculture Project), with support from WAAPP Liberia and the RCU, organized a sub-regional Anglophone SRI exchange meeting from 22-24 June 2015 in Monrovia. The SRI-WAAPP country teams from The Gambia, Sierra Leone, and Ghana came to learn about the Liberian experience in implementing the project, focusing on CHAP's unique and successful outreach approach to mobilize partnerships, create public awareness, and collaborate with farmers to scale-up SRI.
- ***Youth-led multi-country project for adoption and extension of SRI in Benin, Burkina Faso, Niger and Togo.*** The NGO DéDESC from Benin, led by youth SRI champion Lionel Ayedegue, developed a multi-country project to facilitate the dissemination of SRI in Benin, Togo, Burkina Faso and Niger. The project invited two youth leaders (one woman and one man) each from Burkina Faso, Niger, and Togo to take part in training 100 farmers (40 women) in the Bembereke and Tchaourou communes in Benin. They also set up 12 demonstration plots and participated in farmer exchange visits between the two communes, reaching 500 farmers in total. Upon returning to their own countries, the young leaders trained farmers and set up demonstration plots during the 2015/2016 growing season. The project was supported by the RCU and Benin's ProCAD program (Programme Cadre pour la Diversification Agricole).

In 2015, the **RCU partnered with the West Africa Rice Producer Organization** *(Cadre Régional de Concertation des Organisations des Producteurs de Riz, du Réseau des Organisations Paysannes et des Producteurs de l'Afrique de l'Ouest*, or CRCOPR/ROPPA) for a monitoring tour to learn about the large-scale SRI achievements in Mali, inviting two farmers (one woman and one man) from each of the 13 project countries. At the end of the week, the CRCOPR/ROPPA members recommended scaling up SRI across the region in a more coordinated way. They also committed to set a good example and lead the adoption of SRI in their own countries.

One of the main project strategies was to directly work with **SRI farmer champions**, identified by their leadership in adopting SRI and training farmers in their own communities. Champions participated in all regional workshops and trainings. They were given a special role in training farmers and provided inputs for project planning and evaluation. Their contributions to SRI-WAAPP were critical for its success. Their role should be enlarged for the second phase.

Insufficient **access to SRI equipment** like weeders, direct seeders and transplanters was identified as a common constraint at the regional yearly planning and review workshops in Porto Novo (2014) and again in Abidjan (2015). In 2015, the RCU was able to source **two new weeder prototypes from India**: The Mandava weeder -- a light weeder for irrigated conditions -- and an upland weeder, for use in drier soils and also for other crops. The SOCAFON center in Niono, Mali reverse engineered the two prototypes and manufactured several of the weeders, which were then sent to the other 12 countries for testing and to be manufactured locally. SOCAFON also developed a **direct seeder** adapted for the lower planting densities using SRI methods, which drops fewer seeds and at a wider spacing than conventional line seeding. Several of these SRI direct seeders were manufactured and sent to each of the project countries in 2016. As regards transplanters, no suitable models have been identified to date, but the search should continue during the second SRI-WAAPP phase. There are indications that SRI innovators in Latin America, especially Colombia, may be a good source of suitable equipment.

Comparison trials between the SRI method and the conventional method showed improved performance in all 13 countries (see country chapters). The next phase is to **adapt SRI practices to the many local conditions and rice systems**. Following publication of the regional SRI manual in 2014 (see above), the RCU developed **adaptive manual templates** (in both long and short formats, available on project website) for country teams to identify and describe the best SRI practices for defined local conditions. Information from the templates serves as the basis for technical manuals specific to defined agro-ecosystems and rice systems, which can be translated to local languages. Development of these **location-specific SRI manuals** began only at the end of the first phase of SRI-WAAPP and will be further developed during the second phase.

To make it easy for stakeholders to interact and share what they learn, the RCU established and maintained a **regional web-based communication platform**, composed of a website, a Facebook group, YouTube channel, and other online resources.

- **SRI-WAAPP Project Website** –This website, available in both English (sriwestafrica.org) and French (sriafriqueouest.org), serves both internal and external audiences. For project participants and stakeholders, there is a resource library, collection of project documents and a record of project outputs. The general public can find a summary of project information, a specific page for each country listing pertinent information and resources, and contact information for the regional coordination unit. As of June 2016 the sites were averaging 535 views per month from all over the world.
- **West Africa Facebook Group** – A forum connecting SRI practitioners, researchers, project managers, technicians and the curious from across West Africa and other parts of the world. This group was set up following recommendations from the Kpalimé Training of Trainers workshop. As of June 2016 there were 811 members, which had increased to 2142 members as of January 2018. facebook.com/groups/sriwestafrica.
- **SRI in West Africa YouTube Channel** is a collection of SRI-related videos from the 13 participating countries. There were a total of 61 videos by January 2018. These videos include SRI television spots produced by national WAAPP structures, field interviews, and short documentaries. The playlist, maintained by SRI-Rice at Cornell University, is available at: https://www.youtube.com/playlist?list=PLoOqsnw69SmRp-wl6uxT0-2if-6oPSGcCJ
- **Integration with the SRI-Rice website** (http://sririce.org) at Cornell University, where SRI-related knowledge, information and research from 58 countries is collected and available to all, including from the 13 SRI-WAAPP countries. News from the region is regularly included in the monthly global SRI newsletter, accessible at https://www.scoop.it/t/system-of-rice-intensification-sri
- **SRI-WAAPP produced two short documentary videos (13 minutes each)** to publicize project achievements from all 13 participating countries. The first video emphasizes institutional collaboration during the project and the second showcases success stories from all 13 countries. The videos are available in both French and in English.

4 PROMOTE LARGE-SCALE CHANGE

As SRI data from the 13 countries accumulates over several years, **integrated regional data analysis** becomes possible, including data visualization through mapping. These analyses can provide important information to rice sector program developers, donors, investors, and perhaps most importantly to policy-makers. Analysis will become especially important during the second phase of the project.

In addition to the on-line communication platform (described above), **personal outreach and advocacy** will gain in importance, both to i) inform the public about the progress on climate-smart rice production in West Africa, and ii) to mobilize more support to mainstream SRI and take it to scale in the region.

To this end, the regional coordination team gave **14 presentations about the SRI-WAAPP project at international events:**

- 3rd Africa Rice Congress in Yaoundé, Cameroon, 2013
- 4th International Rice Congress in Bangkok, Thailand, 2014
- CORAF Agricultural Science week in Niamey, Niger, 2014
- Building Alliances around SRI and Agro-Ecology Workshop, Bangkok, Thailand, 2014
- SRI Equipment Innovation Workshops, Bangkok, Thailand, 2014
- ECOWAS meeting in Dakar, Senegal, 2015,
- Lower Mekong River Basin SRI project (SRI-LMB) Conference in Siem Reap, Cambodia, 2015
- World Bank Headquarters in Washington DC, USA, 2015
- Oxfam America offices in Washington DC, USA, 2015
- Four presentations at Cornell University: i) SRI-Rice seminar 2015, ii) Cornell Geospatial Forum 2015, and iii) African Institute for Development Seminar Series in 2016, iv) Knowledge Matters Fellowship Presentation, Vice Provost Office, in 2017, Ithaca, New York, USA
- United Nations Climate Change Conference for the 23rd session of the Conference of the Parties, or COP23, in Bonn, Germany, 2017.

REGIONAL COORDINATION UNIT MEMBERS, DIRECTORS AND MANAGERS AT CORAF/WECARD AND THE WORLD BANK FOR SRI-WAAPP

REGIONAL COORDINATION UNIT

Coordinator, CNS-Riz/IER Mali	Gaoussou Traore
Senior Researcher, CNS-Riz/IER Mali	Minamba Bagayoko
Coordinator Assistant	Saly Dembele
Technical Lead, Cornell University	Erika Styger
Communication Specialist, Cornell	Devon Jenkins
M&E, Cornell University	Tom Archibald

CORAF / WECARD

Director Research and Innovation	Youssouf Camara
Director Finance and Administration	Safouratou Adaripare
Program Manager SRI-WAAPP	Ousmane Ndoye
Coordinator WAAPP-CORAF/WECARD	Niéyidouba Lamien
M&E WAAPP-CORAF/WECARD	Patrice Leumeni
Accountant CORAF/WECARD	Monique Ngom

THE WORLD BANK

Task Team Leader WAAPP	Abdoulaye Touré
Task Team Leader Assistant WAAPP	Sossena Tassew

Gaoussou Traoré, Abdoulaye Touré, Jean-Claude Balcet and Erika Styger (from left to right) met at the World Bank in Washington DC in March 2013 to discuss the design of the SRI-WAAPP project

4. REGIONAL ACHIEVEMENTS

INCREASED RATE OF SRI ADOPTION IN WEST AFRICA

At the beginning of the SRI-WAAPP project, the regional coordination unit (RCU) categorized the 13 countries based on the level of adoption of SRI. Below is a summary showing the evolution of country-level SRI adoption for the region (Table 10).

Table 10: SRI adoption levels at the time of the Ouagadougou workshop in 2012, at project start in 2014 and project end in 2016 for all 13 participating countries

Country	Ouagadougou Workshop Jul-12	Project Start Jan-14	Project End Jul-16
Benin	Moderate adoption in local areas	Moderate adoption in many areas	Widespread moderate adoption
Burkina Faso	Proven, but very little adoption	Moderate adoption in local areas	Moderate adoption in many areas
Côte d'Ivoire	No SRI	Proven, but very little adoption	Moderate adoption in many areas
The Gambia	Proven, but very little adoption	Proven, but very little adoption	Moderate adoption in local areas
Ghana	Moderate adoption in local areas	Moderate adoption in many areas	Widespread moderate adoption
Guinea	Proven, but very little adoption	Proven, but very little adoption	Moderate adoption in local areas
Liberia	No SRI	Proven, but very little adoption	Moderate adoption in local areas
Mali	Widespread moderate adoption	Widespread moderate adoption	Widespread moderate adoption; SRI present most rice growing areas of the country
Niger	No SRI	Proven, but very little adoption	Moderate adoption in local areas
Nigeria	Proven, but very little adoption	Moderate adoption in local areas	Moderate adoption in local areas
Senegal	Moderate adoption in local areas	Moderate adoption in many areas	Widespread moderate adoption
Sierra Leone	Moderate adoption in local areas	Moderate adoption in local areas	Moderate adoption in many areas
Togo	Moderate adoption in local areas	Moderate adoption in local areas	Widespread moderate adoption

When the Ouagadougou workshop -- the first regional meeting where stakeholders came together to begin development of the SRI-WAAPP project – was held in 2012, there had not yet been any experience with SRI in three countries (Côte d'Ivoire, Liberia and Niger). In the others -- except for Mali where there was more widespread adoption – there had been some positive initial experiences and adoption, but only on a small, local scale. We estimate that at this time there were about 2,500 SRI farmers in West Africa. This number grew quickly over the next two years, most importantly due to WAAPP support for SRI and regional training workshops in Benin, Burkina Faso, Ghana, Nigeria, Senegal and Togo given by the USAID regional E-ATP project. When SRI-WAAPP began in January 2014, we estimate the number of SRI farmers had increased to 16,200. By the end of the project in June 2016, the number of SRI farmers had risen to 50,048 (Table 11). Overall adoption levels in most countries were still moderate, but geographic coverage in most countries was fairly widespread.

At the beginning of the SRI-WAAPP project, most SRI sites were in Mali and a good number of sites were also known in Benin, Ghana, Senegal, Sierra Leone, and Togo. Only a few were found in Burkina Faso, the Gambia, Guinea and Nigeria. As detailed in the country chapters, WAAPP installed additional SRI sites during 2013 in Côte d'Ivoire, Guinea, Liberia and Sierra Leone before the project officially started in January 2014. The map below shows the baseline situation without the WAAPP sites (Figure 62).

As the national WAAPP project funding cycles did not always overlap with the SRI-WAAPP project period, not all countries were able to benefit from a full three years of WAAPP funding. Note as well that the SRI-WAAPP project was operational only from January 2014 to June 2016, covering only two main rainy seasons, 2014/2015 and 2015/2016, a very short time for a scaling-up process. However, in five countries – Côte d'Ivoire, The Gambia, Guinea, Liberia, and Sierra Leone -- availability of national WAAPP funds in 2013 enabled SRI activities to begin even before the project officially started in January 2014.

Despite the many constraints, the results have exceeded expectations. As explained in Chapter 1, the implementation approach was determined by participatory planning in each country. In most countries, SRI-WAAPP teams opted to first i) develop a pool of solid trainers who would then train an expanded number of farmers, ii) undertake well-designed farmer field trials in different agro-ecological zones, to be monitored by the national research institutes (e.g. Burkina Faso, Côte d'Ivoire, Guinea, Sierra Leone), and iii) organize field exchange visits to increase exposure and raise awareness about SRI. During the second and third years, the national teams in most SRI-WAAPP countries created centers for SRI introduction in most rice-growing areas, from where the methodology could be scaled out. This approach was most pronounced in Benin, Burkina Faso, Côte d'Ivoire, Ghana, Guinea, Mali, Sierra Leone, and Togo. At the same time, development organizations and projects in those same rice-producing areas were mobilized to help advance the SRI methodology.

Consequently, over two to three years, a very wide and well-distributed network of SRI sites emerged across West Africa (Figure 63, Table 11), the number of institutions involved rose sharply (Figure 64), and collected yield data from 733 sites confirmed that rice production significantly increased using the SRI methodology across different climate and agro-ecological zones, in both irrigated and rainfed rice production systems (Figures 66 and 67). The SRI-WAAPP project has established a firm technical basis for implementing SRI in West Africa and at the same time has created a large and active constituency for it. This lays a solid groundwork to go to scale and create large-scale impact. More details on the various parameters are presented below, including some scenarios for scaling-up up SRI.

By June 2016, **1,088 SRI-WAAPP sites** had been geo-tagged. At these sites, **50,048 farmers** - of whom 33% were women – were growing **rice using SRI on 13,944 hectares** across the 13 countries. Details for each country are listed in Table 11 and the site locations are shown in Figure 63.

Adoption of SRI is very likely more widespread than reported here, as the many sites not directly associated with SRI-WAAPP may not have been inventoried. For example, the mapped sites in Senegal include only the SRI-WAAPP sites in central Senegal. SRI sites in the Senegal River Valley or in Southern Senegal are not included. As the number of stakeholders and their SRI activities are rapidly increasing, national SRI surveys would be necessary to get a more accurate picture. Nonetheless, these figures provide a fairly accurate insight about the extent to which the project was able to reach the farming communities.

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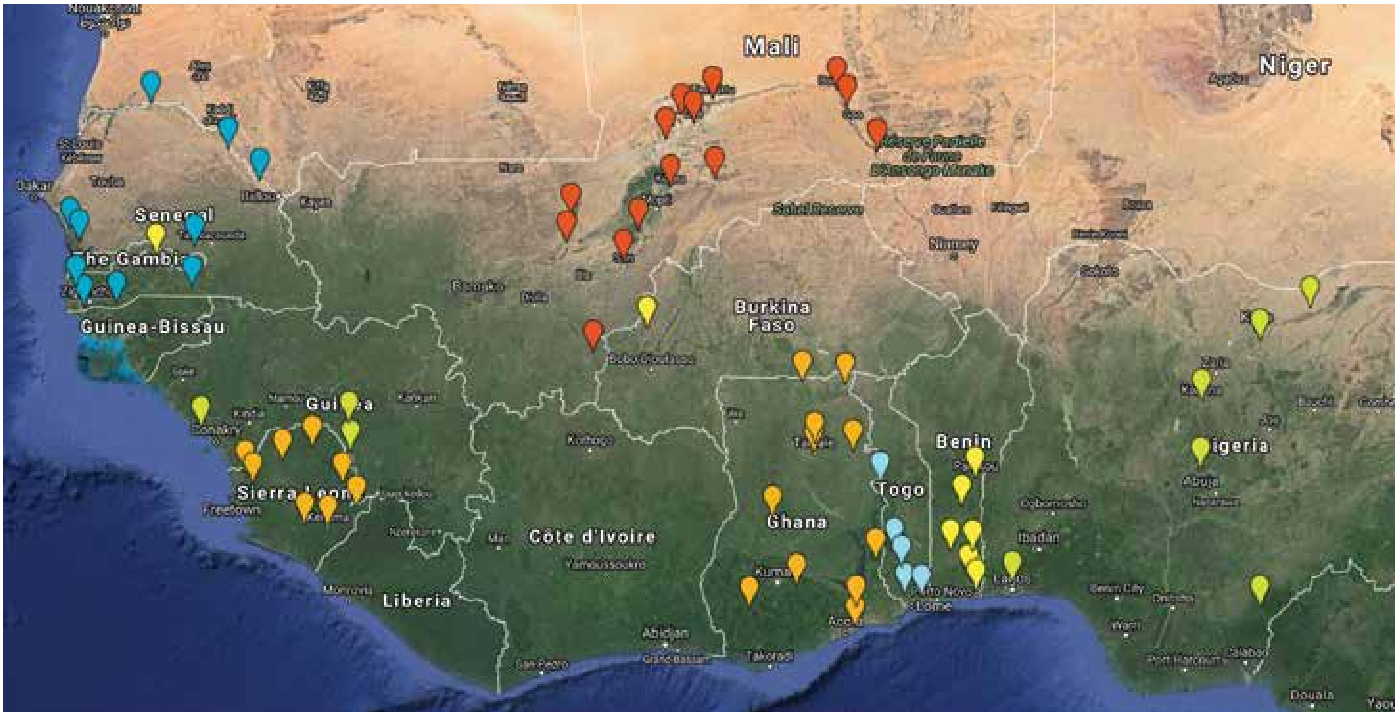

Figure 62: SRI sites in West Africa before the start of the SRI-WAAPP project in January 2014

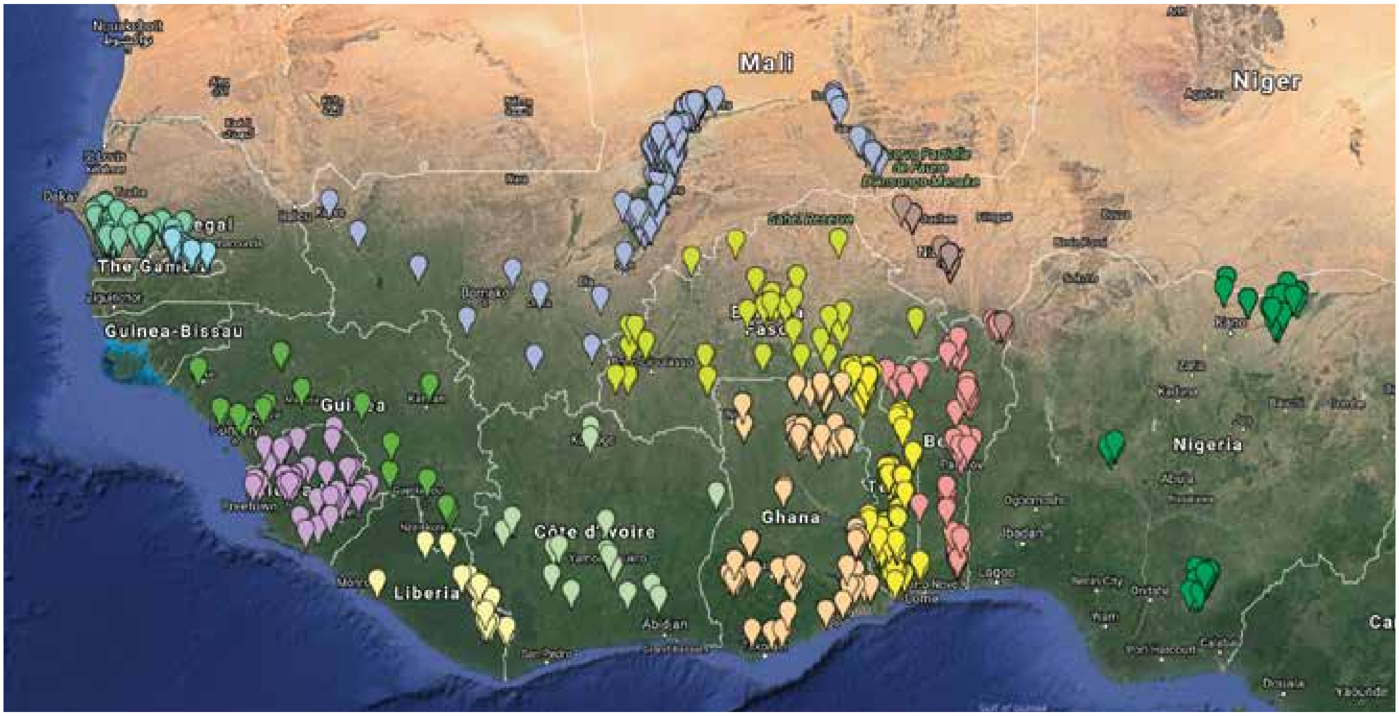

Figure 63: 1088 SRI-WAAP sites in 13 West African countries, June 2016 (not including SRI sites of partner organizations)

Massive SRI training efforts in each country helped make this widespread adoption possible. In total **33,514 people were trained**, including 1032 technicians who then went on to train others (Table 12).

Table 11: Number of SRI sites, number of SRI farmers and SRI area for all 13 countries, by June 2016.

Country	SRI Sites or Villages	SRI Farmers	SRI Area
	Number	Number	ha
Benin	62	9,960	7,788
Burkina Faso	69	104	39
Côte d'Ivoire	18	113	24
The Gambia	125	414	147
Ghana	110	4,155	***750***
Guinea	23	504	380
Liberia	19	180	17
Mali	275	15,807	3,051
Niger	6	15	8
Nigeria	45	128	65
Senegal	176	5,136	34
Sierra Leone	43	11,330	1,446
Togo	117	2,202	195
Total	**1,088**	**50,048**	**13,944**

Table 12: Number of SRI sites, number of SRI farmers and SRI area for all 13 countries, by June 2016.

Country	People trained			Technicians trained
	Men	Women	Total	Included in the total
	Number	Number	Number	Number
Benin	m**	m	**9,960**	***300****
Burkina Faso	m	m	**596**	39
Côte d'Ivoire	208	41	**254**	28
The Gambia	196	210	**406**	***50***
Ghana	1342	893	**2,235**	45
Guinea	m	m	**158**	62
Liberia	198	240	**438**	***50***
Mali	m	m	**1,014**	52
Niger	51	2	**53**	***20***
Nigeria	611	138	**749**	18
Senegal	1623	2967	**4,590**	35
Sierra Leone	m	m	**11,330**	***200***
Togo	1065	666	**1,731**	133
Total			**33,514**	**1,032**

* Numbers in *italic* are estimates

** m = missing data

HIGH NUMBER OF PROJECT BENEFICIARIES

The country teams also monitored the number of **direct and indirect beneficiaries** from the project. Direct beneficiaries were those who i) received training, ii) participated in exchange visits and workshops, or iii) were assisted by the project to implement SRI in their fields. There were 61,250 direct beneficiaries, of whom 35% were women. Indirect beneficiaries were those who learned about SRI and the project, either from neighbors, fellow farmers, word-of-mouth, radio, TV or newspapers. There were an estimated 695,000 indirect beneficiaries. Thus a total of more than 750,000 people in West Africa benefited either directly or indirectly from the project. Reported details for each country are found in Appendix 3.

CREATING AND STRENGTHENING INSTITUTIONAL PARTNERSHIPS

Creation of partnerships and inter-institutional collaboration surged over the life of the project. By June 2016, a total of **215 institutions had participated in SRI activities** in the sub-region compared to 49 prior to January 2014, an increase of 339% (Figure 64). In 2016, government organizations (research, extension, government-led development projects) were most numerous at 91, followed by 45 international organizations (NGOs, foundations, bilateral projects), 40 national civil society organizations (farmers' organizations, national NGOs), 31 media organizations, and eight private sector organizations.

It is noteworthy that the number of institutions involved with SRI increased substantially in all countries, as shown in Figure 65. A well-balanced mix of organizations indicates that familiarity with SRI has been well established throughout West Africa, and creates a stable basis for large-scale implementation.

REMARKABLE INCREASE IN RICE YIELDS AND FARMER INCOME IN THE PROJECT AREA ACROSS WEST AFRICA

Yield results: SRI was implemented in both **irrigated and rainfed lowland systems** at 40% and 60% of the sites respectively. Rain-fed lowland sites were found in eleven of the 13 countries. Only in Côte d'Ivoire and The Gambia did the project work exclusively in irrigated systems. In Benin, Burkina Faso, Ghana, Mali, Niger, and Nigeria there was work with both systems, and in Guinea, Liberia, Senegal, Sierra Leone and Togo the focus was entirely on rainfed lowland systems.

Comparison trails of SRI practices and the usual local rice production practices were carried out in all 13 countries, across agro-ecological zones, and during both project years (2014/2015 and 2015/2016). **Yields from these trials** were evaluated at 733 sites: 441 for rainfed lowland rice and

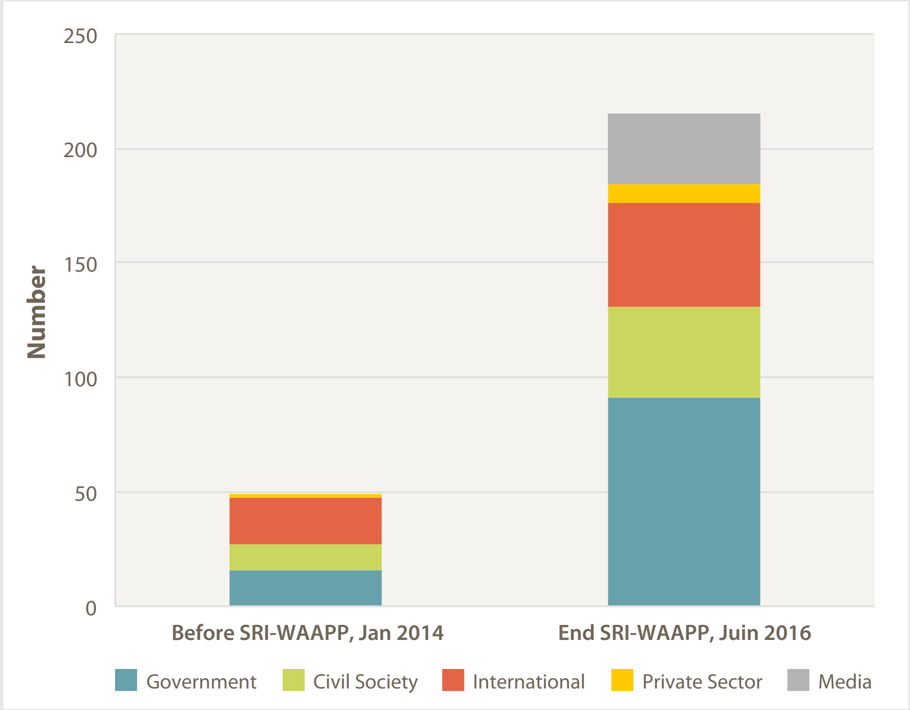

Figure 64: Number and type of institutions active with SRI in West Africa; at the beginning and end of the SRI-WAAPP project

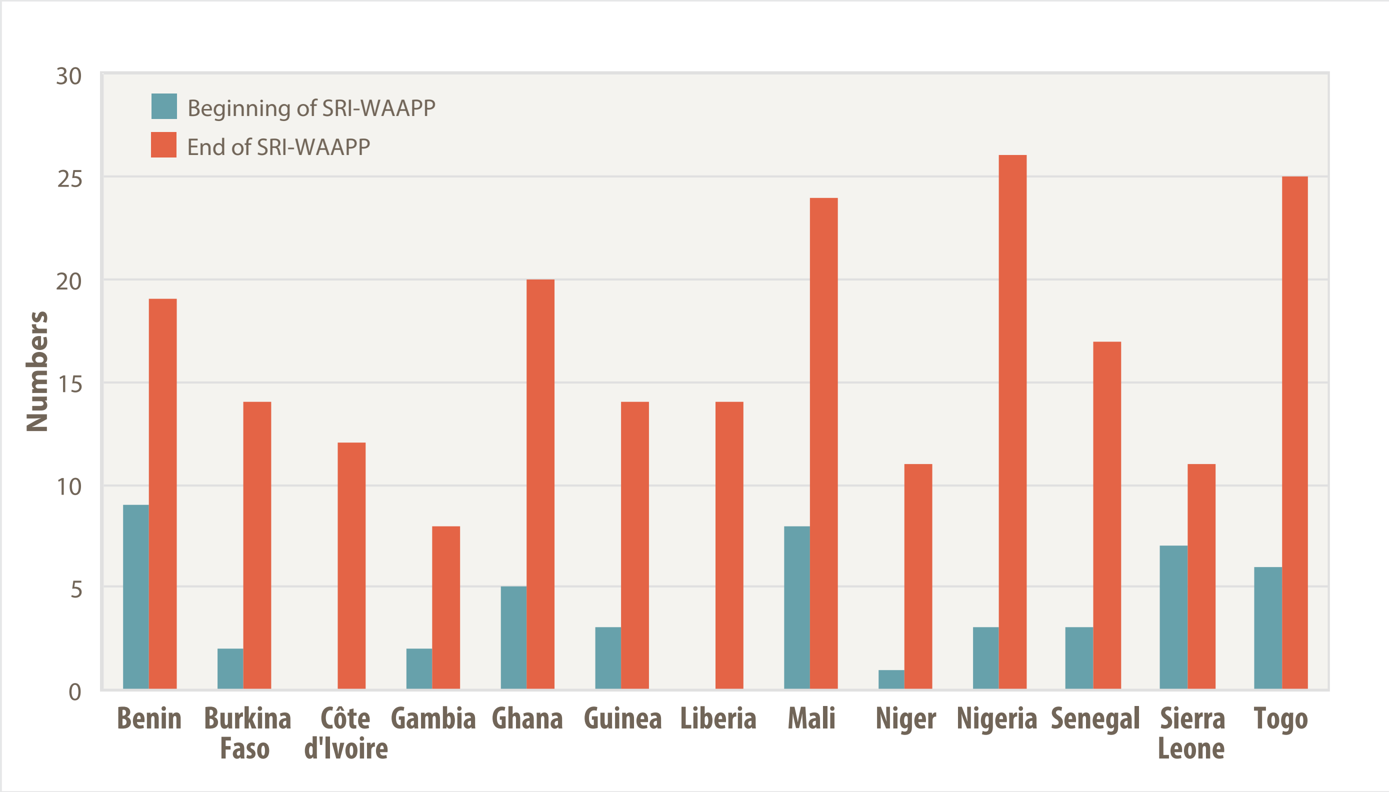

Figure 65: Number of institutions active with SRI at the beginning of SRI-WAAPP (January 2014) and at the end (June 2016) for each of the 13 countries

292 for irrigated rice. Average SRI yield across all sites for **irrigated rice** was **6.6 t/ha compared to 4.23 t/ha** for conventionally grown rice. For **rainfed lowland systems**, SRI yields averaged **4.71 t/ha compared to 2.53 t/ha** for conventional rice. Details for each of the countries are shown in the Figures 66 and 67.

With SRI, yields were significantly higher in all countries and under both rice production systems: 56% higher in the irrigated systems and 86% higher in the rainfed lowland systems. Although SRI was originally conceived for irrigated rice, country teams and farmers across the region have successfully adapted SRI practices to rainfed conditions, where perfect water control is not possible. Some country teams are adapting SRI practices to rainfed upland conditions and to mangrove rice production systems.

In 2016, the US consulting firm Associates for International Management Services (AIMS) undertook an independent evaluation of SRI-WAAPP project results in five countries: Benin, Ghana, Mali, Senegal and Togo. Their field study found that with SRI, yields increased by 54% for irrigated systems, and by 65% for rainfed lowland systems. These findings are fairly congruent with the project results. Additionally, the study evaluated rainfed upland systems, finding that with SRI, yields increased by 153% compared to conventional practices. The average increase in farmer income over all cropping systems with SRI was 41%. (AIMS, 2016).

Given that most rice in West Africa is produced under rainfed conditions, these results indicate that there is a large potential for increasing productivity in rainfed rice systems. This runs counter to the conventional wisdom that productivity increase should come from irrigated rice production systems, which are very costly to develop and maintain. The demonstrated increase in rainfed system productivity using SRI adds a new, previously unconsidered option for policy makers and governments to achieve rice self-sufficiency by 2025.

HIGH ECONOMIC IMPACT IN THE 13 COUNTRIES

What was the value of the additional rice produced at the project sites? Based on the total SRI area of 13,944 hectares in 2015/2016 and the yield differences between the SRI fields and conventional fields, **the *additional* quantity of rice produced because farmers used SRI** during the 2015/2016 growing season alone is estimated at 31,458 tons of paddy, or **20,113 tons of milled rice**, valued at **10.07 million US dollars** (see Table 13 for calculations)

Table 13: Additional rice production and value of SRI compared to conventional rice production on SRI-WAAPP sites during the 2015/2016 cropping season

SRI WAAPP Rice system	2015/2016 Area (ha)	Yield Difference SRI to Conv (t/ha)	Additional tons produced with SRI
Irrigated (40%)	5,578	2.37	13,219
Lowland (60%)	8,366	2.18	18,239
Total	13,944		31,458
Total Paddy (t)			31,458
Total Milled (t) (64% of paddy)			20,133
Additional value milled rice (USD) (500 USD/ton)			10,066,452

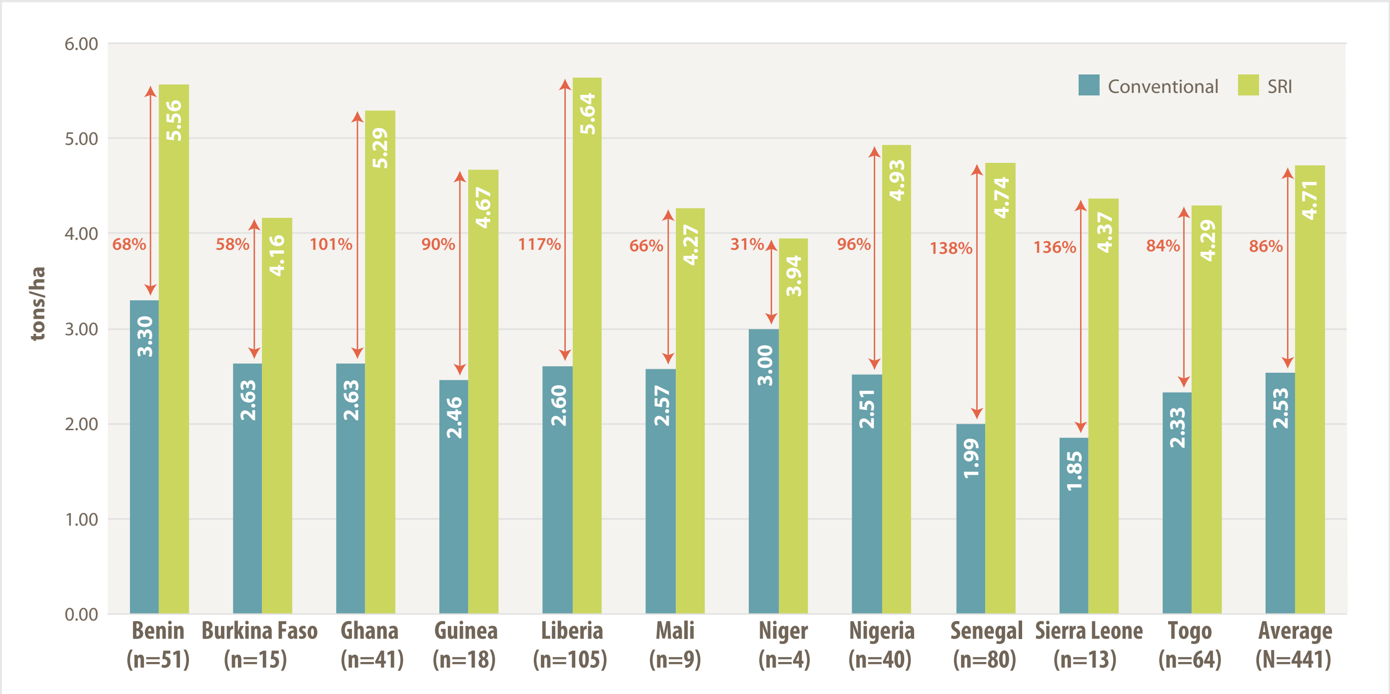

Figure 66: Yield comparison (t/ha) for SRI and conventional lowland rice production systems in 11 countries (2-year averages 2014/2015 and 2015/2016, N=441)

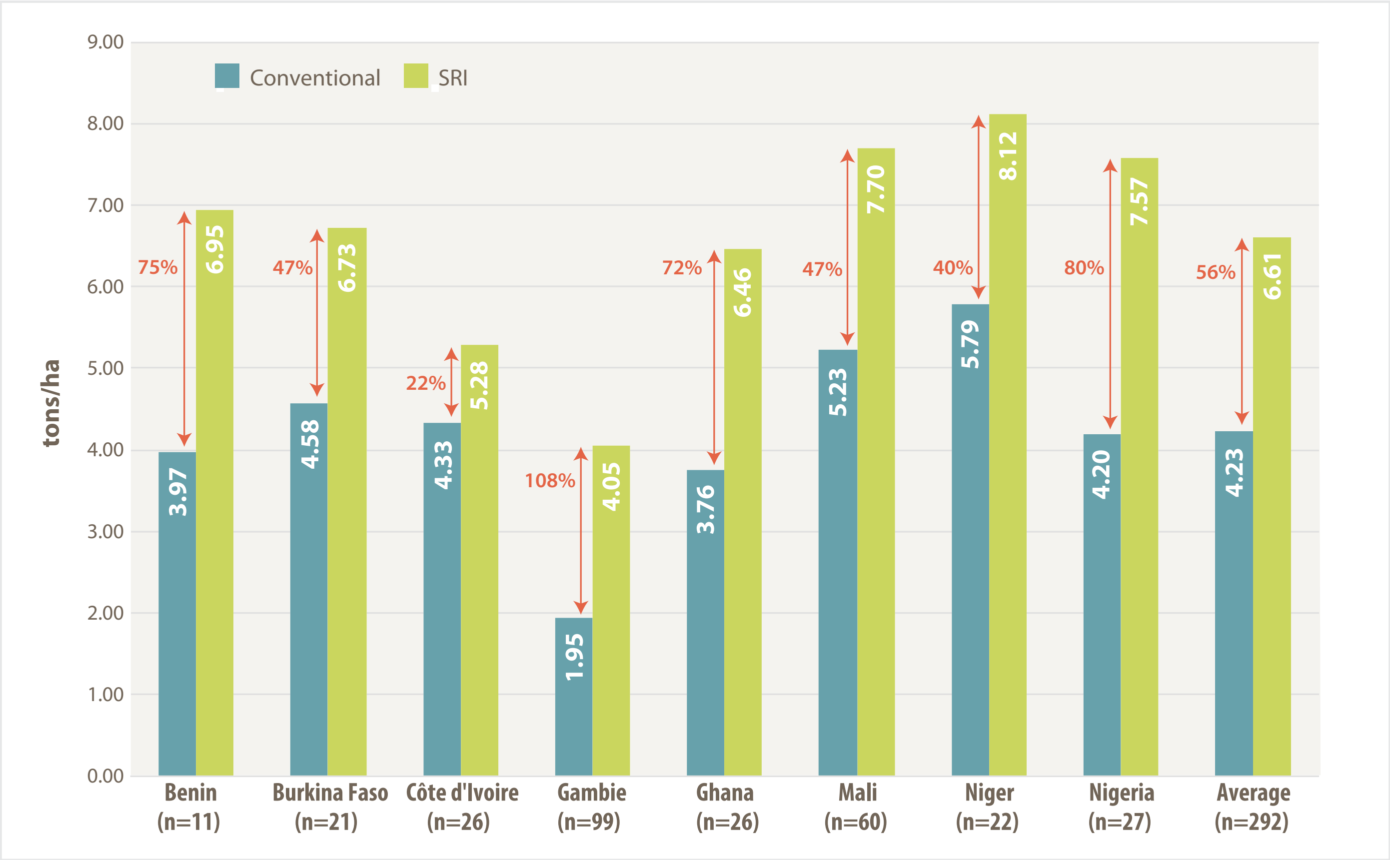

Figure 67: Yield comparison (t/ha) for SRI and conventional irrigated rice production systems in 8 countries (2-year averages 2014/2015 and 2015/2016, N=292)

SCALING-UP SRI IN THE SECOND PHASE OF SRI-WAAPP

Overall, results have been impressive, but the slightly more than 50,000 SRI farmers who took part in the project represent only 1.1% of the total number of rice farmers in West Africa. If SRI is to make a real contribution to rice self-sufficiency in West Africa, many more farmers must adopt it. How many farmers must be reached before we reach the "tipping point" where SRI becomes the standard for rice cultivation in West Africa? A possible target – that SRI-WAAPP could consider in the second phase -- might be a farmer adoption rate of 33%. This would reach 1.5 million rice farmers growing rice on 2.43 million hectares.

If 100% of rice farmers in West Africa had used SRI in 2017 on the 7.29 million hectares used for rice that year (Index Mundi online database) rice self-sufficiency would already have been achieved with a 5% surplus (29.88 million tons of paddy produced compared to 28.48 million tons consumed), rather than the 54% it was in reality. Rice imports to the region would have fallen to almost nothing, saving the region 4.16 billion USD in foreign exchange for 2017 alone (Table 14).

For West Africa to reach self-sufficiency in rice by 2025, assuming average yields of 4.1 t/ha (as achieved with SRI), total rice area will need to increase by 26% from 7.29 million ha (2017 baseline) to 9.17 million ha for a total production of 37.58 million tons of paddy. By contrast, assuming average yields of 2.47 t/ha (as achieved by conventional methods under SRI-WAAPP), total rice area will need to increase by 109 % from 7.29 million ha (2017 baseline) to 15.21 million ha to reach the same result. The gap increases even more if we calculate assuming an average yield of 2.12 t/ha (2017 index mundi database). This would require a 146 % increase in rice area to a total of 17.9 million ha.

Table 14: Scenarios of rice production and imports for 2016/2017 for the 13 WAAPP countries, for conventional and SRI production achieved during the project and compared to data from statistics (calculations are based on a rice area of 7.29 million ha in 2016/2017, index mundi database)

2016/2017 Scenario	Source	Yield t/ha	Production paddy t	Production milled t	Consumed index mundi milled t	Imported (Surplus) milled t	Value Import (Value Surplus) USD
Baseline	**Index mundi statistics**	**2.12**	**15,470,291**	**9,905,000**	**18,225,000**	**8,320,000**	**4,160,000,000**
Scenario 1	100% Conv WAAPP	2.47	18,001,360	11,520,870	18,225,000	6,704,130	3,352,064,800
Scenario 2	100% SRI WAAPP	4.10	29,880,800	19,123,712	18,225,000	(-898,712)	(-449,356,000)

5. OUTLOOK AND RECOMMENDATIONS

Results from all across West Africa, spanning several years, confirm that SRI farmers have increased their yields and incomes, while using less water, seeds and agro-chemicals. Thus interest in SRI is growing in West Africa. There are a number of implications for the scaling-up process and the follow-up to the first phase of SRI-WAAPP:

1 EXPAND NATIONAL AND REGIONAL COORDINATION

With a growing number of partners and activities, it will take more effort to keep track of them. The of national and regional coordination should be strengthened in order to better i) build up the national and regional community of SRI practice, ii) assist partners with training, technical assistance and monitoring of their activities, iii) organize exchange visits and other national and regional encounters, and iv) participate in rice sector meetings and engage in policy dialogue.

To achieve this, it is recommended to reinforce the operational and institutional mechanisms put in place during SRI-WAAPP, which have proven to be flexible and effective, especially the national focal institutions and national facilitators. At the regional level, coordination could be improved by creating a regional "SRI Hub" to be housed at CNS-Riz, which would provide training, technical assistance and research support. Continued collaboration with Cornell University will support the SRI-Hub and assist with regional coordination.

2 LET FARMERS AND FARMER ORGANIZATIONS TAKE THE LEAD

SRI-WAAPP mobilized many institutions to become involved with SRI. Most importantly, it brought various governmental institutions to accept and endorse SRI as a promising alternative to conventional rice production. International multi- and bi-lateral projects and NGOs have also played a critical role in introducing SRI to many locations across the 13 countries. To create a large-scale impact, the next step will be to shift more support and decision-making authority directly to farmer organizations and SRI champions. The consultation process that SRI-WAAPP has already begun with West Africa Rice Producer Organization CRCOPR/ROPPA *(Cadre Régional de Concertation des Organisations des Producteurs de Riz, du Réseau des Organisations Paysannes et des Producteurs de l'Afrique de l'Ouest)* is a step in this direction. Additionally, the focus on gender and youth, already begun under SRI-WAAPP, should continue in order to spur the growth in SRI uptake and adoption.

3 REFINE AND ASSURE QUALITY OF TECHNICAL TRAINING

Full benefit from the SRI methodology is possible only when farmers adopt SRI crop management practices well-adapted to the local environment. Although a farmer might at first be happy with a 20% yield increase, if he or she can achieve yield increases of 50% or higher with good training, the value will be obvious.

Thus it is vital to maintain high standards for quality training and seek constant improvement. Building on the technical training materials already developed during SRI-WAAPP, the next step is the **development of off-the-shelf SRI training courses and curricula** specific to rice systems and climate zones, targeting both those new to SRI and experienced SRI practitioners. These materials should integrate innovations and associated best practices and be periodically updated as practices evolve. To complement the improved training materials, a program for **certification of trainers** would create a pool of professional SRI trainers to maintain high technical standards. Both training course development and the certification program would be best managed from the CNS-Riz SRI-Hub in collaboration with the national SRI programs.

4 EMPHASIZE ADAPTATION AND INNOVATION

Successful expansion of SRI will depend on adapting SRI practices to local environments. The next phase should focus on continuing **innovation** to reinforce **adapted technical guidelines** by encouraging farmers and technicians to experiment and researchers to carry out trials and studies.

Requests for help to reduce labor and production costs using adapted tools and equipment are most frequently heard across the region. Other constraints concern organic matter management and associated nutrient management, weed management, and optimizing water management in different rice systems. Innovation should be nurtured and encouraged. Technical constraints will be addressed as they arise. Regional coordination will be essential to enhance learning and to speed up solution-finding. The next phase might include such measures as prizes for best innovations and innovation fairs, open to farmers, technicians and researchers.

5 REINFORCE AND IMPROVE THE SRI MONITORING SYSTEM

Under SRI-WAAPP, all country teams used the standardized data collection methodology developed under the project. Consistent reporting permits reliable data aggregation at both the national and regional level, allowing for the kind of analysis and visualization presented in this report. But this was just a start. These tools should be more widely shared, especially through partner organizations, and people trained to use them. The greater quantity of high-quality data generated will require an improved on-line database that can automatically compute parameters and indicators (such as yield averages), and create data summaries, maps and graphs through an interactive website. Data collection, data cleaning and database entry can be managed by the national SRI focal institutions, with support from the regional team. Improved monitoring will better track the progress of SRI across the region, identify gaps and constraints in SRI implementation, foster collaboration, and inform rice sector program developers, donors, and policy-makers.

6 EXPAND THE COMMUNICATION PLATFORM

Effective communication is vital to achieving the goal of scaling-up SRI. SRI-WAAPP successfully set up a regional web-based communication platform, but this would need to be expanded. Communication and advocacy should more actively support the country programs and inform external audiences. Rigorous data analysis combined with anecdotal country success stories are tools that will make it possible to effectively engage with policy-makers at the national and regional levels. Communication specialists can reinforce the national focal offices and CNS-Riz in this task.

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APPENDIX I

Organizations trained by the regional USAID-funded project Expanded Agribusiness and Trade Promotion (E-ATP) in 2011 and 2012

1. **Benin**
   - Conseil de concertation des riziculteurs du Bénin (CCR-B),
   - Entreprises Territoires et Développement (ETD) and its Entreprises de Services aux Organisations des Producteurs (ESOP-Bénin)
   - IFDC-Benin
   - Vredeseilanden Country Office NGO
   - Union Nationale des Riziculteurs du Bénin
   - Three Centres Régionals de Production Agricole
   - three agricultural chambers of Benin
   - Périmètres Rizicoles de Malanville, Ségbana, et Karimama
2. **Burkina Faso: all Farmer organizations**
   - Comité interprofessionnel du riz du Burkina (CIR-B)
   - Union Nationale des Producteurs de Riz du Burkina
   - Maîtrise d'Ouvrage de Bagré (MOB)
   - Autorité de la Mise en Oeuvre de Vallée de Sourou
   - Union des groupements des Producteurs de Riz de Bagré
   - Union des Producteurs de Riz de la Vallée de Sourou (UPRVS)
   - Union des Coopératives Rizicoles de Bama
   - Union des Producteurs de Riz de la Sissili (UPRS)
   - Société des Coopératives Agricoles de Banzon (SCAB)
3. **Ghana**
   - Ghana Rice Inter-Professional Body (GRIB)
   - Agriculture Development and Value Chain Enhancement (ADVANCE) project
   - International Fertilizer Development Centre (IFDC)
   - Catholic Relief Services (CRS)
   - Ghana Commercial Agriculture Project (AMSIG)
4. **Nigeria**
   - World Bank-financed Commercial Agricultural Development Project
   - Green Sahel and Rural Development Initiatives (GSARDI)
   - Rice Farmers Associations of Nigeria (RIFAN)
   - Jigawa State Agricultural Development Association.
5. **Senegal**
   - Agence Nationale de Conseil Agricole et Rural (ANCAR)
   - Groupement d'Action pour le Développement Communautaire
   - Coordination des Organisations Professionnelles et Rurales du Département de Bignona
   - Société Nationale d'Aménagement et d'Exploitation des Terres du Delta du Fleuve Sénégal (SAED)
   - Coopérative Entente Diouloulou
   - Africare/Projet de Promotion et de Diversification de l'Agriculture dans les Régions de Kaolack, Kaffrine, Kédougou, et Tambacounda (PRODIAKT)
   - Coopératives des Unions Agricoles de Podor
6. **Togo**
   - NGO Entreprises Territoires et Développement (ETD)
   - NGO Groupe Chrétien de Recherche-Actions pour la Promotion Humaine (GRAPHE)
   - NGO International Fertilizer Development Centre (IFDC-Togo)
   - NGO Recherche, Appui, Formation aux Initiatives d'Auto-Développement
   - Institut Togolais de Recherche Agronomique
   - Institut de Conseil Agricole Togolais.

APPENDIX 2

SRI-WAAPP Project Logframe

General Objective Food security improved in West Africa	
Specific Objective	**Indicators**
SO: Rice productivity and competitiveness improved in targeted areas	**SO1:** % change in rice yields per hectare for SRI fields in targeted areas (disaggregated by country)
	SO2: % change in income (cost and benefit) per ton and area of production (disaggregated by country and cropping systems)
Results	**Indicators**
R1. Human and institutional capacities of stakeholders in the SRI value chain in West Africa strengthened	**1.1** Number of SRI stakeholders (individuals) in the rice value chain trained by 2016 (disaggregated by country, category of stakeholder, theme of training, and gender)
	1.2 Number of institutions that increase their capacity to scale up SRI by 2016 (disaggregated by country)
R2. Appropriate innovations (equipment and/or best practices) for SRI developed, adopted and scaled up, in West Africa	**2.1** Number of SRI innovations (equipment and/or best practices) disseminated in each ecozone and rice system by 2016
	2.2 Number of SRI innovations (equipment and/or best practices) developed
	2.3 Percentage of rice farmers practicing SRI in targeted areas in each country, differentiated by baseline status
	2.4 Area under cultivation using SRI
R3. SRI stakeholders' demand for knowledge and decision-making options facilitated and met	**3.1** Number of functioning innovation platforms (IPs)
	3.2 Number of SRI knowledge products specific to each ecozone and rice system produced and shared with stakeholders along the SRI value chain by 2016
R4. Efficient mechanisms and tools of coordination, management, and M&E of the project established	**4.1** Number of coordination meetings
	4.2 Number of reports submitted in a timely fashion (in compliance with established procedures)
	4.3 Disbursement rate of the project
	4.4 The system for data sharing among different levels is functional (y/n)

APPENDIX 3

Project Beneficiaries for SRI-WAAPP by June 2016

Country	Direct Beneficiaries				Indirect Beneficiaries		
	Men	Women	Total	Women	Men	Women %	Total
Benin	9,560	2,300	11,860	19	476,000	119,000	595,000
Burkina Faso	616	69	685	10	620	70	690
Côte d'Ivoire	79	16	95	17	25	5	30
The Gambia	186	228	414	55	289	267	556
Ghana	1,342	893	2,235	40	9,975	7,675	17,650
Guinea	973	282	1,255	22	2,855	1,220	4,075
Liberia	30	150	180	83	1,775	1,955	3,730
Mali	11,602	4,205	15,807	27	46,644	12,955	59,599
Niger	66	2	68	3	2,420	101	2,521
Nigeria	55	15	70	21	596	83	679
Senegal	1,623	2,967	4,590	65	0	0	0
Sierra Leone	6,345	4,985	11,330	44	0	0	0
Togo	7,735	4,926	12,661	39	6,535	4,072	10,607
Total	**40,212**	**21,038**	**61,250**	**34**	**547,734**	**147,403**	**695,137**

Country	Total Beneficiaries (Direct and Indirect)			
	Men	Women	Total	Women %
Benin	485,560	121,300	606,860	20
Burkina Faso	1,236	139	1,375	10
Côte d'Ivoire	104	21	125	17
The Gambia	475	495	970	51
Ghana	11,317	8,568	19,885	43
Guinea	3,828	1,502	5,330	28
Liberia	1,805	2,105	3,910	54
Mali	58,246	17,160	75,406	23
Niger	2,486	103	2,589	4
Nigeria	651	98	749	13
Senegal	1,623	2,967	4,590	65
Sierra Leone	6,345	4,985	11,330	44
Togo	14,270	8,998	23,268	39
Total	**587,946**	**168,441**	**756,387**	**32**

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