50,000 FARMERS IN 13 COUNTRIES
RESULTS FROM SCALING UP
THE SYSTEM OF RICE INTENSIFICATION
IN WEST AFRICA
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)

Suggested Citation: Styger E, Traoré G. 2018. 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 Project Summary Report, 2014-2016, West Africa Agriculture Productivity Program (WAAPP). The West and Central Africa Council for Agricultural Research and Development (CORAF/WECARD), Dakar, Senegal.

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.

Publication design: Shannon Williamson, shannonwilliamson.net
Editing: Edward Baxter, Ithaca, New York
Photos: SRI-WAAPP project participants
Cover: SRI field in Côte d’Ivoire
Back cover: SRI farmers in Guinea
Available online at: https://sriwestafrica.org

© 2018 The West and Central Africa Council for Agricultural Research and Development
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of Tables</td>
<td>2</td>
</tr>
<tr>
<td>List of Figures</td>
<td>2</td>
</tr>
<tr>
<td>List of Success Stories</td>
<td>5</td>
</tr>
<tr>
<td>Acronyms</td>
<td>6</td>
</tr>
<tr>
<td>Preface</td>
<td>8</td>
</tr>
<tr>
<td>Acknowledgments</td>
<td>10</td>
</tr>
<tr>
<td>Executive Summary</td>
<td>11</td>
</tr>
<tr>
<td>1. Introduction</td>
<td>13</td>
</tr>
<tr>
<td>2. Country Reports</td>
<td>19</td>
</tr>
<tr>
<td>Benin</td>
<td>20</td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>26</td>
</tr>
<tr>
<td>Côte d’Ivoire</td>
<td>32</td>
</tr>
<tr>
<td>The Gambia</td>
<td>38</td>
</tr>
<tr>
<td>Ghana</td>
<td>44</td>
</tr>
<tr>
<td>Guinea</td>
<td>50</td>
</tr>
<tr>
<td>Liberia</td>
<td>56</td>
</tr>
<tr>
<td>Mali</td>
<td>62</td>
</tr>
<tr>
<td>Niger</td>
<td>68</td>
</tr>
<tr>
<td>Nigeria</td>
<td>72</td>
</tr>
<tr>
<td>Senegal</td>
<td>76</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>82</td>
</tr>
<tr>
<td>Togo</td>
<td>88</td>
</tr>
<tr>
<td>3. Results from the Regional Coordination of SRI-WAAPP</td>
<td>95</td>
</tr>
<tr>
<td>4. Regional Achievements</td>
<td>103</td>
</tr>
<tr>
<td>5. Outlook and recommendations</td>
<td>111</td>
</tr>
<tr>
<td>References</td>
<td>113</td>
</tr>
<tr>
<td>Appendix 1: Organizations trained by the regional USAID-funded project Expanded Agribusiness and Trade Promotion (E-ATP) in 2011 and 2012</td>
<td>113</td>
</tr>
<tr>
<td>Appendix 2: SRI-WAAPP Project Logframe</td>
<td>114</td>
</tr>
<tr>
<td>Appendix 3: Project Beneficiaries for SRI-WAAPP by June 2016</td>
<td>115</td>
</tr>
</tbody>
</table>
Improving and Scaling up SRI in West 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

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

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

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

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

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

Table 7: Number of SRI sites, number of SRI farmers and SRI area for all 13 countries, by June 2016

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

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

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

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

Table 12: People trained by SRI-WAAPP in 13 countries by June 2016

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

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)

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

Figure 9: Number of SRI farmers (men and women) in Benin; at the beginning

Figure 10: Yield comparison (t/ha) between SRI and conventional rice production

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

Figure 12: SRI site map for Burkina Faso at beginning of project (right, Kama site is encircled), in 2015 (left) and by June 2016 (right, all sites)

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)

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

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

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

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 (on left, provided by CNRA), and map with SRI sites (on right), Côte d'Ivoire, June 2016

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

Figure 21: First SRI site in The Gambia

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

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

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

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

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

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

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

Figure 29: SRI site locations by January 2014

Figure 30: Mapped SRI Sites for Guinea, June 2016

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

LIST OF TABLES

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

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

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

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

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

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

Table 7: Number of SRI sites, number of SRI farmers and SRI area for all 13 countries, by June 2016

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

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

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

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

Table 12: People trained by SRI-WAAPP in 13 countries by June 2016

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

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)
LIST OF SUCCESS STORIES

SRI farmer Oussmane Adam, Garou Village, Benin .................................................. 24
SRI Champion Pierre Belem, Burkina Faso ................................................................. 30
SRI Champion Marcel Yao Kouakou, Côte d’Ivoire .................................................. 35
Kinsa Sidibeh – SRI farmer leader and innovator, The Gambia ............................... 42
SRI Farmer Champion Iedjirou Zakaria, Ghana ......................................................... 48
Compost making in association with SRI trainings, Guinea ................................ 54
President Ellen Johnson Sirleaf launches SRI-WAAPP project in Liberia .......... 60
Farmer Innovation - System of Wheat Intensification in Timbuktu, Mali .......... 66
Restoring soils and improving rice yields in Niger’s irrigation perimeters ....... 70
Muhammad Adamu - “SRI Champion of Nigeria” .................................................. 74
How Thierno Oumar Sy, was convinced about SRI, Senegal ............................... 80
Skepticism gives way to surprise, Sierra Leone ....................................................... 86
New income from SRI helps a family to start a business in Togo .................... 92

Figure 52: Variety test with conventional and SRI production method with six varieties (4 improved, 2 traditional) in 2013/2014 (t/ha) ........................................... 52
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 Liberia ................................................................. 56
Figure 54: SRI-WAAPP field sites, Liberia, June 2016 ............................................. 57
Figure 55: Yield comparison between conventional and SRI production in rainfed lowland systems in 8 districts of River Gee, Grand Gedeh and Nimba County in Liberia, 2014/2015 ................................................................. 58
Figure 56: 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 ................................................................. 88
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 Senegal ................................................................. 85
Figure 58: SRI sites before SRI-WAAPP started in January 2014 (by GRAPHE) ....... 89
Figure 59: Intervention zones for ONG GRAPHE and ETD and mapped SRI-WAAPP project sites, June 2016 ............... 89
Figure 60: Intervention zones for ONG GRAPHE and ETD and mapped SRI-WAAPP project sites, June 2016 ............... 89
Figure 61: Intervention zones for ONG GRAPHE and ETD and mapped SRI-WAAPP project sites, June 2016 ............... 89
Figure 50: Yield comparison (t/ha) for SRI and conventional rice production in rainfed lowland systems in 13 districts in Sierra Leone, 2015/2016 ................................................................. 84
Figure 51: 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 ................................................................. 85
Figure 52: 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 ................................................................. 88
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 Senegal ................................................................. 85
Figure 54: 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 ................................................................. 88
Figure 55: 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 ................................................................. 85
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
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 listed 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. Niyiолосua Lamien and Dr. Ousmane Ndiaye, and the national/ regional 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 or 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

SRI-WAAPP

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 (CN-SRI), 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 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.
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 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. The 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*

<table>
<thead>
<tr>
<th>Country</th>
<th>2010 Production</th>
<th>2010 Consumption</th>
<th>2010 Imports</th>
<th>2010 Population</th>
<th>Per Capita</th>
<th>% Self-Sufficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paddy (t)</td>
<td>Milled (t)</td>
<td>Milled (t)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benin</td>
<td>124,000</td>
<td>79,734</td>
<td>414,583</td>
<td>325,846</td>
<td>9.31</td>
<td>44</td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>270,658</td>
<td>173,221</td>
<td>410,726</td>
<td>237,304</td>
<td>15.63</td>
<td>26.3</td>
</tr>
<tr>
<td>Côte d’Ivoire</td>
<td>1,206,153</td>
<td>750,876</td>
<td>1,619,785</td>
<td>839,509</td>
<td>20.13</td>
<td>80</td>
</tr>
<tr>
<td>The Gambia</td>
<td>99,890</td>
<td>62,931</td>
<td>202,275</td>
<td>128,344</td>
<td>1.09</td>
<td>119</td>
</tr>
<tr>
<td>Ghana</td>
<td>491,803</td>
<td>309,100</td>
<td>629,835</td>
<td>320,143</td>
<td>24.32</td>
<td>26</td>
</tr>
<tr>
<td>Guinea</td>
<td>1,498,362</td>
<td>944,344</td>
<td>1,182,356</td>
<td>238,010</td>
<td>11.01</td>
<td>107</td>
</tr>
<tr>
<td>Liberia</td>
<td>206,000</td>
<td>185,527</td>
<td>294,003</td>
<td>3.96</td>
<td>122</td>
<td>39</td>
</tr>
<tr>
<td>Mali</td>
<td>3,305,612</td>
<td>1,452,536</td>
<td>1,510,130</td>
<td>57,394</td>
<td>15.17</td>
<td>100</td>
</tr>
<tr>
<td>Niger</td>
<td>103,125</td>
<td>68,000</td>
<td>311,000</td>
<td>240,000</td>
<td>16.29</td>
<td>19</td>
</tr>
<tr>
<td>Nigeria</td>
<td>4,472,530</td>
<td>2,817,688</td>
<td>4,700,447</td>
<td>1,882,759</td>
<td>155.42</td>
<td>29</td>
</tr>
<tr>
<td>Senegal</td>
<td>804,043</td>
<td>385,547</td>
<td>1,087,245</td>
<td>706,858</td>
<td>12.96</td>
<td>84</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>1,026,871</td>
<td>646,803</td>
<td>750,301</td>
<td>103,498</td>
<td>5.78</td>
<td>130</td>
</tr>
<tr>
<td>Togo</td>
<td>110,109</td>
<td>69,369</td>
<td>145,184</td>
<td>70,705</td>
<td>6.39</td>
<td>22</td>
</tr>
</tbody>
</table>

Total/Average | 12,610,411 | 7,948,296 | 13,439,900 | 5,491,606 | 302.26 | 44 | 59 |

* 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).
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 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 (IPCC, 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 – recognizes 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 fewer purchased agro-chemical inputs. At the same time, SRI rice fields adapt better to climate change and give 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 Magarac. 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 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, which for SRI was initially developed, include:

**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 2010/2011 by 4-14%.

However, 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 2010/2011 by 4-14%.

**Table 1:**

<table>
<thead>
<tr>
<th>Country</th>
<th>Production (t)</th>
<th>Consumption (t)</th>
<th>Production (t)</th>
<th>Consumption (t)</th>
<th>Production (t)</th>
<th>Consumption (t)</th>
<th>Production (t)</th>
<th>Consumption (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benin</td>
<td>1,165,626</td>
<td>746,641</td>
<td>1,165,626</td>
<td>746,641</td>
<td>1,165,626</td>
<td>746,641</td>
<td>1,165,626</td>
<td>746,641</td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>1,110,771</td>
<td>739,693</td>
<td>1,110,771</td>
<td>739,693</td>
<td>1,110,771</td>
<td>739,693</td>
<td>1,110,771</td>
<td>739,693</td>
</tr>
<tr>
<td>Côte d’Ivoire</td>
<td>4,558,034</td>
<td>2,917,142</td>
<td>4,558,034</td>
<td>2,917,142</td>
<td>4,558,034</td>
<td>2,917,142</td>
<td>4,558,034</td>
<td>2,917,142</td>
</tr>
<tr>
<td>The Gambia</td>
<td>518,854</td>
<td>332,067</td>
<td>518,854</td>
<td>332,067</td>
<td>518,854</td>
<td>332,067</td>
<td>518,854</td>
<td>332,067</td>
</tr>
<tr>
<td>Ghana</td>
<td>1,777,312</td>
<td>1,354,309</td>
<td>1,777,312</td>
<td>1,354,309</td>
<td>1,777,312</td>
<td>1,354,309</td>
<td>1,777,312</td>
<td>1,354,309</td>
</tr>
<tr>
<td>Liberia</td>
<td>1,073,958</td>
<td>687,359</td>
<td>1,073,958</td>
<td>687,359</td>
<td>1,073,958</td>
<td>687,359</td>
<td>1,073,958</td>
<td>687,359</td>
</tr>
<tr>
<td>Niger</td>
<td>926,303</td>
<td>592,892</td>
<td>926,303</td>
<td>592,892</td>
<td>926,303</td>
<td>592,892</td>
<td>926,303</td>
<td>592,892</td>
</tr>
<tr>
<td>Nigeria</td>
<td>13,236,536</td>
<td>8,456,239</td>
<td>13,236,536</td>
<td>8,456,239</td>
<td>13,236,536</td>
<td>8,456,239</td>
<td>13,236,536</td>
<td>8,456,239</td>
</tr>
<tr>
<td>Senegal</td>
<td>1,059,480</td>
<td>658,067</td>
<td>1,059,480</td>
<td>658,067</td>
<td>1,059,480</td>
<td>658,067</td>
<td>1,059,480</td>
<td>658,067</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>2,111,327</td>
<td>1,351,249</td>
<td>2,111,327</td>
<td>1,351,249</td>
<td>2,111,327</td>
<td>1,351,249</td>
<td>2,111,327</td>
<td>1,351,249</td>
</tr>
<tr>
<td>Togo</td>
<td>438,370</td>
<td>280,557</td>
<td>438,370</td>
<td>280,557</td>
<td>438,370</td>
<td>280,557</td>
<td>438,370</td>
<td>280,557</td>
</tr>
</tbody>
</table>

Total production: 7,384,763
Total consumption: 4,054,249
Total imported: 0
Total self-sufficiency: 74%

* 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)
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-5.5t/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 Africa-care 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 (ICEM) project, the Syngen Foundation, and the World Bank-funded Project Fostering Agricultural Productivity (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. 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 Benin, Burkina-Faso, Côte d’Ivoire, Mali, Niger, and Senegal visited rice growers in the Senegal 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, CDRAF/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 CDRAF/WECARD, WAAPP-Burkina, Cornell University, and Oxfam America, brought together representatives from the 13 WAAPP countries to discuss the potential for SRI. They unani mously 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 CDRAF/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-countries 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 Africa-Rice Intensification International Network (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).

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.

---

### Table: Institutional Arrangement of SRI-WAAPP

<table>
<thead>
<tr>
<th>Level</th>
<th>Funding and Institutional Partners</th>
<th>SRI-WAAPP Project Implementing Entities</th>
<th>Technical Partners and Beneficiaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional</td>
<td>CORAF/WECARD / Regional WAAPP</td>
<td>Regional Coordination Office (CNS-Riz, MAE)</td>
<td>Cornell University and others</td>
</tr>
<tr>
<td>National</td>
<td>National WAAPPs</td>
<td>National Local Institutions (13 countries)</td>
<td>Champions and Technicians</td>
</tr>
<tr>
<td>Local</td>
<td>National WAAPPs</td>
<td>Rice Innovation Platforms</td>
<td>SRI Farmers and Rice Value Chain Actors</td>
</tr>
</tbody>
</table>

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://sriafricqueouest.org.
Benin reached 19% rice self-sufficiency in 2012. In the National Rice Development Strategy (NRDS) 2010-2015, Benin targeted a production of 385,000 tons of milled rice (equal to 600,000 tons of paddy) by 2015, which would correspond to 68% self-sufficiency in that year. By 2016-2017, production had 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 2016/2017, 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).

**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 CARD-ER. 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 were 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 5000 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 shown 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.
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 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 also trained 150 seed producers at the SAIN farm through the NGOs DEDRAS and DeDESC, and disseminated throughout the entire country.

Result: the number of SRI farmers increased from 3,600 (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.
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.

Increasing and Scaling up SRI in West Africa

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 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 motorbike and some goats.” He also can pay the school fees for his 7 children, diversify the family diet, and repay loans.

SRI Publications from Benin


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 2025, 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 3 t/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.

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)
cess, 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.

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 of 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.
**SRI CHAMPION PIERRE BELEM, BURKINA FASO**

Pierre Belem, who holds the title of Knight of the Burkinese Order of Mont, 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 project, supported by the local organizations Ingalan, Na Pam Beogo, the Center Region from 2013-2016. It involved training more than 200 farmers in Banfora, Cascades Region and rice perimeters, training more than 4,330 farmers in SRI in their fields. 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.

Higher yields under both establishment methods. SRI transplanted rice yielded 5.95 t/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.
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 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.

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 10 t/ha per year for two cycles. From 2008 to 2018, it is planned that the area devoted to raised rice will increase by 60% to reach 1.3 million hectares, and yields of raised rice will increase from 0.8 to 2 t/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 5 t/ha, from 23,000 ha to 75,000 ha. (Figure 16)
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.

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."

CÔTE D’IVOIRE

conventional method, a 26% increase. In Yamoussoukro (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 4.1 t/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 appreciate 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."

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

<table>
<thead>
<tr>
<th>Short name</th>
<th>Name</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRCA/WAAPP</td>
<td>Fonds Interprofessionnel pour la Recherche et le Conseil Agricoles/West Africa Agriculture Productivity Program</td>
<td>Government, SRI-WAAPP Coordination</td>
</tr>
<tr>
<td>CNRA</td>
<td>Centre National de Recherche Agronomique</td>
<td>Government Research, SRI focal institution</td>
</tr>
<tr>
<td>ONDR</td>
<td>L’Office national du développement de la riziculture</td>
<td>Government Extension</td>
</tr>
<tr>
<td>ANARIZ-CI</td>
<td>Association Nationale des Riziculteurs de Côte d’Ivoire</td>
<td>Government</td>
</tr>
<tr>
<td>Abidjan.net</td>
<td>La Diplomatique d’Abidjan</td>
<td>Farmer organization</td>
</tr>
<tr>
<td>Fraternité Matin</td>
<td>Carnet d’Adresses</td>
<td>Media</td>
</tr>
<tr>
<td>Carnet d’Adresses</td>
<td>Carnet d’Adresses</td>
<td>Media</td>
</tr>
</tbody>
</table>

Institutions involved with SRI

<table>
<thead>
<tr>
<th>Short name</th>
<th>Name</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRCA/WAAPP</td>
<td>Fonds Interprofessionnel pour la Recherche et le Conseil Agricoles/West Africa Agriculture Productivity Program</td>
<td>Government, SRI-WAAPP Coordination</td>
</tr>
<tr>
<td>CNRA</td>
<td>Centre National de Recherche Agronomique</td>
<td>Government Research, SRI focal institution</td>
</tr>
<tr>
<td>ONDR</td>
<td>L’Office national du développement de la riziculture</td>
<td>Government Extension</td>
</tr>
<tr>
<td>ANARIZ-CI</td>
<td>Association Nationale des Riziculteurs de Côte d’Ivoire</td>
<td>Government</td>
</tr>
<tr>
<td>Abidjan.net</td>
<td>La Diplomatique d’Abidjan</td>
<td>Farmer organization</td>
</tr>
<tr>
<td>Fraternité Matin</td>
<td>Carnet d’Adresses</td>
<td>Media</td>
</tr>
<tr>
<td>Carnet d’Adresses</td>
<td>Carnet d’Adresses</td>
<td>Media</td>
</tr>
</tbody>
</table>

SRI Publications


CÔTE D’IVOIRE

Improving and Scaling up SRI in West Africa

Country Reports
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).

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, floodplains 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)

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, floodplains 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)

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

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.
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

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Sukuta</th>
<th>Kayai</th>
<th>Wassu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of plots</td>
<td>14</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Area under SRI (ha)</td>
<td>6.2</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>Rice system where SRI is introduced</td>
<td>Tidal irrigation</td>
<td>Tidal irrigation</td>
<td>Tidal irrigation</td>
</tr>
<tr>
<td>Average yield SRI (t/ha)</td>
<td>4.35</td>
<td>5.45</td>
<td>5.5</td>
</tr>
<tr>
<td>Average yield non-SRI</td>
<td>2.3</td>
<td>2.3</td>
<td>2.1</td>
</tr>
<tr>
<td>Challenges for SRI farmers</td>
<td>Water control</td>
<td>Water control</td>
<td>Water control</td>
</tr>
<tr>
<td>Average production cost ($/Ha)</td>
<td>SRI: $636.25</td>
<td>SRI: $636.25</td>
<td>SRI: $636.25</td>
</tr>
<tr>
<td>Average revenue ($/Ha)</td>
<td>SRI: $973.25</td>
<td>SRI: $1,380.25</td>
<td>SRI: $1,398.75</td>
</tr>
</tbody>
</table>

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.

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

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Touba Demba Sama</th>
<th>Sambel Kunda</th>
<th>Village</th>
<th>Wellingara and Saruja</th>
<th>Kenewa Samba Sire</th>
<th>Tabanani</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of plots</td>
<td>31</td>
<td>16</td>
<td>3</td>
<td>18</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Area under SRI (ha)</td>
<td>7.1</td>
<td>3.2</td>
<td>1</td>
<td>7.9</td>
<td>6.2</td>
<td></td>
</tr>
<tr>
<td>Rice system where SRI is introduced</td>
<td>Tidal irrigation</td>
<td>Tidal irrigation</td>
<td>Tidal irrigation</td>
<td>Tidal irrigation</td>
<td>Pump irrigation</td>
<td></td>
</tr>
<tr>
<td>Average yield SRI (t/ha)</td>
<td>4.4</td>
<td>4.2</td>
<td>3.8</td>
<td>2.9</td>
<td>3.4</td>
<td></td>
</tr>
<tr>
<td>Average yield non-SRI (t/ha)</td>
<td>1.8</td>
<td>1.9</td>
<td>2</td>
<td>2</td>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td>Average revenue ($/Ha)</td>
<td>SRI: $973.25</td>
<td>SRI: $1,380.25</td>
<td>SRI: $1,398.75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-SRI</td>
<td>$616.25</td>
<td>$616.25</td>
<td>$616.25</td>
<td>$616.25</td>
<td>$616.25</td>
<td></td>
</tr>
</tbody>
</table>

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 Sapr 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.
**THE GAMBIA**

**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, 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.

**SRI-WAAPPP project coordinators and collaborators**

<table>
<thead>
<tr>
<th>Short name</th>
<th>Name</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAAPP-Gambia</td>
<td>West Africa Agricultural Productivity Program</td>
<td>Government, SRI-WAAPPP Coordination</td>
</tr>
<tr>
<td>NARI</td>
<td>The Gambia National Agricultural Research Institute</td>
<td>Government Research, SRI focal institution</td>
</tr>
<tr>
<td>DOA - Gambia</td>
<td>Department of Agriculture – The Gambia</td>
<td>Government</td>
</tr>
<tr>
<td>NWWA</td>
<td>Gambia National Women Farmers Association</td>
<td>Farmer organization</td>
</tr>
<tr>
<td>NYSS</td>
<td>National Youth Service Scheme</td>
<td>Civil Society</td>
</tr>
<tr>
<td>Peace Corps Gambia</td>
<td>Peace Corps</td>
<td>USA Government</td>
</tr>
</tbody>
</table>

**Institutions involved with SRI**

- **SRI Publications**
  - 2 Videos from project activities, WAAPP-Gambia, 2015

---

**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

---

**THE GAMBIA**

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

Participants of the national training of SRI trainers in Sapu, the Gambia, in December 2015
Improving and Scaling up SRI in West Africa

Country Reports

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

In 2010, rice consumption in Ghana was 26 kg 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.

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 (GRIIB), 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 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.
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 partners were: AMSIG Resources, AgKten-sion Africa Ltd, JICA, ICOUR, Quality rice development Project (QRDP), Navrongo IP, Golingo 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.

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

<table>
<thead>
<tr>
<th>Parameters</th>
<th>2015 Target</th>
<th>Achievements</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Regions</td>
<td>5</td>
<td>28</td>
<td>33</td>
</tr>
<tr>
<td>Number of districts</td>
<td>28</td>
<td>33</td>
<td>61</td>
</tr>
<tr>
<td>Number of communities</td>
<td>28</td>
<td>33</td>
<td>61</td>
</tr>
<tr>
<td>Implementation partners</td>
<td>10</td>
<td>12</td>
<td>22</td>
</tr>
<tr>
<td>Number of SRI champions</td>
<td>20</td>
<td>23</td>
<td>43</td>
</tr>
<tr>
<td>Number of Demonstrations</td>
<td>50</td>
<td>46</td>
<td>96</td>
</tr>
<tr>
<td>Total number of trained farmers</td>
<td>2500</td>
<td>2235</td>
<td>4735</td>
</tr>
<tr>
<td>Potential number of adopters</td>
<td>10,000</td>
<td>8350</td>
<td>18,350</td>
</tr>
<tr>
<td>% women involved in SRI activities</td>
<td>30%</td>
<td>32% (2560)</td>
<td>43% (7675)</td>
</tr>
<tr>
<td>Awareness creation through radio/TV</td>
<td>5</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>Number of exchange visits</td>
<td>4</td>
<td>7</td>
<td>11</td>
</tr>
</tbody>
</table>

---

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

SRI FARMER CHAMPION
IDDRISU ZAKARIA

Iddrisu 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 Publications


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,

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

<table>
<thead>
<tr>
<th>Yearly per capita consumption (kg)</th>
<th>107</th>
<th>132.9</th>
<th>162.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production paddy (t)</td>
<td>1,498,962</td>
<td>2,165,625</td>
<td>3,327,119</td>
</tr>
<tr>
<td>Production milled (t)</td>
<td>944,346</td>
<td>1,386,000</td>
<td>2,129,356</td>
</tr>
<tr>
<td>Consumption milled (t)</td>
<td>1,182,356</td>
<td>2,086,000</td>
<td>2,129,356</td>
</tr>
<tr>
<td>Imported milled (t)</td>
<td>238,010</td>
<td>706,000</td>
<td>0</td>
</tr>
</tbody>
</table>

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 2.3 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 equalled 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). 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. 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.

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 weeder 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, Kankan and Faranah 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.
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.

Institutions involved with SRI

<table>
<thead>
<tr>
<th>Short name</th>
<th>Name</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAAPP-Guinea</td>
<td>West Africa Agricultural Productivity Program</td>
<td>Government, SRI-WAAPP Coordination</td>
</tr>
<tr>
<td>IRAG</td>
<td>Institut de Recherche Agronomique de Guinée</td>
<td>Government Research, SRI focal institution</td>
</tr>
<tr>
<td>AEMIP</td>
<td>Agriculture Education and Market Improvement Program</td>
<td>Development Project</td>
</tr>
<tr>
<td>ANPFOCA</td>
<td>Agence Nationale de la Promotion Rurale et du Conseil Agricole</td>
<td>Government, Extension</td>
</tr>
<tr>
<td>FOP-BG</td>
<td>Fédération des organisation paysannes de la basse guinée</td>
<td>Farmer organization</td>
</tr>
<tr>
<td>FUPFRHOZ</td>
<td>Fédération des Unions des Producteurs de Riz de la Haute Guinée</td>
<td>Farmer organization</td>
</tr>
<tr>
<td>IBT</td>
<td>Institut Biblique de Telekoro</td>
<td>Education</td>
</tr>
<tr>
<td>ISAV</td>
<td>Institut Supérieur Agronomique et Vétérinaire de Faranah</td>
<td>Governmental, Education, Research</td>
</tr>
<tr>
<td>Peace Corps</td>
<td>Peace Corps</td>
<td>Governmental, International, USA</td>
</tr>
<tr>
<td>PNAAFA</td>
<td>Programme National d’Appui aux Acteurs des Filières Agricoles</td>
<td>Government</td>
</tr>
<tr>
<td>PUAPA2</td>
<td>Projet d’Appui à la Productivité Agricole</td>
<td>International NGO</td>
</tr>
<tr>
<td>Winrock International</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Compost Making in Association with SRI Trainings

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

Unused cow manure piles – a source for compost

Household waste and biomass from surrounding vegetation are mixed up and composted
**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 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 Weltungerhielie, 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.

The project worked only on the rainy 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 5.63 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 Weltungerhielfe introduced SRI to another 142 farmers in Grand Gedeht.

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.

**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**

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)

**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**

**Figure 34: SRI-WAAPP field sites, Liberia, June 2016**

(circled site is the first SRI site in Liberia, Paynesville, Monrovia planted in 2012/2013)

**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 2 t/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 0.9 t/ha to 2 t/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 c/ha to 6 c/ha.

**Figure 34: SRI-WAAPP field sites, Liberia, June 2016**

(circled site is the first SRI site in Liberia, Paynesville, Monrovia planted in 2012/2013)
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 rototillers 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.

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 Montserrat counties will be sold on the Liberian market with the slogan “Love Liberian Rice”.

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
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.

Institutions involved with SRI

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

SRI Publications


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 | 20 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 Toll 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
Improving and Scaling up SRI in West Africa

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 2025, 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.

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 glaber-rimal) 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)

Rice 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 Syn- genta 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.

Use of SRI continued to expand. During 2010-2012, rice farmer organizations from the Office du Niger region and from San (APRASO) led initiatives for widespread farmer adoption of SRI in their irrigation schemes. In 2011-2012, SRI champion Hamidou Guindo through the local association Sa Sahel introduced 450 farmers in Douentza to SRI, and the World Bank project PAPAM started funding SRI initia- tives 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, Neya 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, Niger, 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. Approximately 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.

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...
trains, 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

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

SRI-WAAPPP project coordinators and collaborators

<table>
<thead>
<tr>
<th>Short name</th>
<th>Name</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAAPP-Mali</td>
<td>West Africa Agricultural Productivity Program</td>
<td>Government, SRI-WAAPPP Coordination</td>
</tr>
<tr>
<td>DNA</td>
<td>Direction Nationale de l’Agriculture (DNA)</td>
<td>Government, SRI-focal institution</td>
</tr>
<tr>
<td>Africare</td>
<td>Africa</td>
<td>International NGO, USA</td>
</tr>
<tr>
<td>ARBRAO</td>
<td>Association des Raticulaires de la Plaine Aménagée du Sankaracoro</td>
<td>Rice farmer organization</td>
</tr>
<tr>
<td>Care Mali</td>
<td>Care Mali</td>
<td>International NGO</td>
</tr>
<tr>
<td>CNRA - Mali</td>
<td>Comité National de la Recherche Agricole</td>
<td>Government, Research</td>
</tr>
<tr>
<td>CNS-Riz</td>
<td>National Center of Specialization in Rice</td>
<td>Government, Research</td>
</tr>
<tr>
<td>DRA</td>
<td>Direction Regionale de l’Agriculture</td>
<td>Government, Research</td>
</tr>
<tr>
<td>FIBANI</td>
<td>Fibani project - Swiss Contact</td>
<td>Development project, funded by Switzerland</td>
</tr>
<tr>
<td>Foundation Syngenta</td>
<td>Syngenta Foundation</td>
<td>International NGO</td>
</tr>
<tr>
<td>IER</td>
<td>L’Institut d’Economie Rurale</td>
<td>Government, Research</td>
</tr>
<tr>
<td>IFDC</td>
<td>International Fertilizer Development Centre</td>
<td>Government, Research</td>
</tr>
<tr>
<td>ICEM</td>
<td>Initiatives Intégrées pour la Croissance Économique au Mali</td>
<td>Development Project, funded by USAID</td>
</tr>
<tr>
<td>MalialActu.net</td>
<td>MalialActu.net</td>
<td>Media</td>
</tr>
<tr>
<td>Notre Printemps</td>
<td>Notre Printemps</td>
<td>Media</td>
</tr>
<tr>
<td>Nyeta Conseils</td>
<td>Nyeta Conseils</td>
<td>National NGO</td>
</tr>
<tr>
<td>ODRS</td>
<td>Office de Développement Rural de Selingué</td>
<td>Government</td>
</tr>
<tr>
<td>Office du Niger</td>
<td>Office du Niger</td>
<td>Government</td>
</tr>
<tr>
<td>ORTM</td>
<td>ORTM - Mali</td>
<td>National Radio</td>
</tr>
<tr>
<td>PASSIP/GIZ</td>
<td>Programme d’Appui au Sous-Secteur de l’Irrigation de Proximité</td>
<td>Development Project, funded by Germany</td>
</tr>
</tbody>
</table>

Institutions involved with SRI

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direction Nationale de l’Agriculture</td>
<td>Government, SRI-WAAPPP Coordination</td>
</tr>
<tr>
<td>Office du Niger</td>
<td>Government, SRI-WAAPPP Coordination</td>
</tr>
<tr>
<td>ORTM</td>
<td>Development Project, funded by Germany</td>
</tr>
<tr>
<td>PASSIP/GIZ</td>
<td>Development Project, funded by Germany</td>
</tr>
</tbody>
</table>

SRI Publications


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 15,000 tons to 320,000 tons, 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.

Niger does not have a NDRS document per se, but in a document called État 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 10 t/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 Gambian is among the lowest rates in the region (Figure 41). 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 in increasingly express interest in SRI training.

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, Dosso 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.

Average SRI yield from the three irrigated sites was 8.2 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 8 t/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.

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

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

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

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
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 5-7 t/ha using SRI.

### SRI Publications

  - INRAN, ONAHA, CNRA, WAAPP.


- **Video:** SRI Niger entretien avec un cultivateur pilote du SRI au zone irrigué à Sébéri (français / djerma) 13:17 min [https://www.youtube.com/watch?v=RulEw-1lwOg&feature=youtu.be&list=PLcOqPrem95SmRhZ2Zha-2b6;EEIG1TV](https://www.youtube.com/watch?v=RulEw-1lwOg&feature=youtu.be&list=PLcOqPrem95SmRhZ2Zha-2b6;EEIG1TV)

### Institutions involved with SRI

**Short name** | **Type** | **Name**
--- | --- | ---
WAAPP-Niger | Government, SRI-WAAPPP Coordination | West Africa Agricultural Productivity Program
INRAN | Government, Research | Institut National de la Recherche Agronomique du Niger (INRAN)
Afrique | Government, SRI focal institution | Afrique - Niger
AGHYMET | Research Institute | Centre régional AGHYMET
CNRA | Research Institute | Conseil national de Recherche Agronomique
FUCOPRI | Farmers Organization | Fédération des Unions des Consommateurs des Producteur de riz du Niger
MINAAG | Governmental | Ministère de l’Agriculture - Niger
MORIBEN | Governmental | Fédération des Unions des Groupement Payvans du Niger
ONAHA | Governmental | Office National des Amanagements Hydro-Agricoles

### Institutions involved with SRI

**Focal Institution for SRI**
- Institut National de la Recherche Agronomique du Niger (INRAN)

**National SRI facilitator**
- Adamou Haougui

**WAAPP coordinator**
- Mariama Alêtein Seydou

**WAAPP deputy coordinator**
- Hamidou Souleye

**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-WAAPPP Coordination
INRAN | Institut National de la Recherche Agronomique du Niger | Government, Research
Afrique | Afrique - Niger | Government, SRI focal institution
AGHYMET | Centre régional AGHYMET | Research Institute
CNRA | Conseil national de Recherche Agronomique | Research Institute
FUCOPRI | Fédération des Unions des Consommateurs des Producteur de riz du Niger | Farmers Organization
MINAAG | Ministère de l’Agriculture - Niger | Governmental
MORIBEN | Fédération des Unions des Groupement Payvans du Niger | Governmental
ONAHA | Office National des Amanagements Hydro-Agricoles | Governmental

### Institutions involved with SRI

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


**Video:** SRI Niger entretien avec un cultivateur pilote du SRI au zone irrigué à Sébéri (français / djerma) 13:17 min [https://www.youtube.com/watch?v=RulEw-1lwOg&feature=youtu.be&list=PLcOqPrem95SmRhZ2Zha-2b6;EEIG1TV](https://www.youtube.com/watch?v=RulEw-1lwOg&feature=youtu.be&list=PLcOqPrem95SmRhZ2Zha-2b6;EEIG1TV)
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.

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, trainers 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.

**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 weeder 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. Economic calculations done 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 weeder 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 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)

**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

---

**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

**Figure 46:** Yield comparison (t/ha) between SRI and conventional rice production in lowland and irrigated systems in three States of Nigeria (2014/2015)
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 343 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.

Muhammad 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 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 343 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.

Muhammad 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 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 343 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.

Muhammad 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 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 343 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.

Muhammad 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 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 343 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.

Muhammad 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 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 343 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.

Muhammad 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 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 343 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.

Muhammad 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 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 343 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.

Muhammad 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!
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 1.05 million tons of milled rice. Nevertheless, rice production more than doubled from 2012 to 2017, a considerable increase.

In the year 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 200,000 tons, as production reached only 680,000 tons. Nevertheless, rice production more than doubled from 2012 to 2017, a considerable increase.

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 1.05 million tons of milled rice. Nevertheless, rice production more than doubled from 2012 to 2017, a considerable increase.

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 1.05 million tons of milled rice. Nevertheless, rice production more than doubled from 2012 to 2017, a considerable increase.

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 1.05 million tons of milled rice. Nevertheless, rice production more than doubled from 2012 to 2017, a considerable increase.
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 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)
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.
Improving and Scaling up SRI in West Africa

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, meaning that 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%.

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 Billabonds and 1% for Riverain grasslands. The NRD5 (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)

SIERRA LEONE

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 farmers technique.

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

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 Weltungerhilfe 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, dry and hard soil in dry season with grassland coverage.
- SRI practice: 30-42 days of age, randomly spaced, no fertilization.
**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.

Unused cow manure piles – a source for compost
Household waste and biomass from surrounding vegetation are mixed up and composted

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

Institutions involved with SRI

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

SRI-WAAPP project coordinators and collaborators
Focal Institution for SRI: Sierra Leone Research Institute (SLARI)
National SRI facilitator: Samuel Harding
Previous WAAPP coordinator: Peter Kaindaneh
Previous WAAPP M&E officer: Kepfi Lakoh
SIERRA LEONE

SRI Champions: Daniel Santigie Fornah, Edward S.A. Kargbo, Gerald Aruna, Daniel Saidu, Margaret Abu

Country Reports
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)

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 5.82 t/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. 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 2.7 t/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 prefectures, and ETD covered the 13 prefectures 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 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.
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.

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 Mycorrhiza fungus to composting materials, decomposition rate accelerates and composts can be ready for use within one month.

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

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

“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.

“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.

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

SRI Publications


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.

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.
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).

**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 weed management, 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.

(For 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 33,154 people had been trained in the SRI methodology through the SRI-WAAPP project, including 1832 agricultural technicians.
Improving and Scaling up SRI in West Africa

The project (August 2014), Côte d’Ivoire (February, 2015), Senegal (February, 2014), Benin (February 2014), Togo (March and August 2014), Ghana. Support visits were made to: Liberia (December 2013 and March 2014), 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 ArcTable 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.

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 DEDESC 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 Tchoucou communities in Benin. They also set up 12 demonstration plots and participated in farmer exchange visits between the two communities, 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 Miel et des Organisations Paysannes et des Produc-}

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 weeder, 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 weeder, 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 above), the RCU developed adaptive manual templates (in both long and short formats, available on project website) for country teams to identify and describe many local conditions and rice systems. Following publication of the regional SRI manual in 2014 (see above), the RCU developed a 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 weeder, 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 above), the RCU developed adaptive manual templates (in both long and short formats, available on project website) for country teams to identify and describe 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** - 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=PLoOqsnw690m5mKjaste82wHyBByj6oPSGcJ

- **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.

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
- United Nations Climate Change Conference for the 23rd session of the Conference of the Parties, or COP23, in Bonn, Germany, 2017

**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.
4. REGIONAL ACHIEVEMENTS

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

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

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

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

Gaoussou Traoré, Abdoulaye Touré, Jean-Claude Balket 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

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

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.

![Figure 62: SRI sites in West Africa before the start of the SRI-WAAPP project in January 2014](image)

![Figure 63: 1088 SRI-WAAPP sites in 13 West African countries, June 2016 (not including SRI sites of partner organizations)](image)
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.

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

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. Rainfed 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 trials 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 292 for irrigated rice. Yields have increased significantly.

**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.
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: 56% higher in the 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 increases 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

<table>
<thead>
<tr>
<th>SRI WAAPP Rice system</th>
<th>2015/2016 Area (ha)</th>
<th>Yield Difference SRI to Conv (t/ha)</th>
<th>Additional tons produced with SRI</th>
<th>Additional value milled rice (USD) (500 USD/ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigated (40%)</td>
<td>5,578</td>
<td>2.37</td>
<td>13,219</td>
<td>10,066,452</td>
</tr>
<tr>
<td>Lowland (60%)</td>
<td>8,366</td>
<td>2.18</td>
<td>18,239</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>13,944</td>
<td></td>
<td>31,458</td>
<td></td>
</tr>
<tr>
<td>Total Paddy (t)</td>
<td></td>
<td></td>
<td>31,458</td>
<td></td>
</tr>
<tr>
<td>Total Milled (t) (64% of paddy)</td>
<td></td>
<td></td>
<td>20,113</td>
<td></td>
</tr>
<tr>
<td>Additional value milled rice (USD)</td>
<td>(500 USD/ton)</td>
<td></td>
<td></td>
<td>10,066,452</td>
</tr>
</tbody>
</table>
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.

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)

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Source</th>
<th>Yield t/ha</th>
<th>Production paddy t</th>
<th>Production milled t</th>
<th>Consumed index mundi milled t</th>
<th>Imported (Surplus) milled t</th>
<th>Value Import (Value Surplus) USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>Index mundi statistics</td>
<td>2.12</td>
<td>15,470,291</td>
<td>9,905,000</td>
<td>18,225,000</td>
<td>8,320,000</td>
<td>4,160,000,000</td>
</tr>
<tr>
<td>Scenario 1</td>
<td>100% Conv WAAPP</td>
<td>1.47</td>
<td>18,001,360</td>
<td>11,520,870</td>
<td>18,225,000</td>
<td>6,704,130</td>
<td>3,352,064,800</td>
</tr>
<tr>
<td>Scenario 2</td>
<td>100% SRI WAAPP</td>
<td>4.10</td>
<td>29,880,800</td>
<td>19,123,712</td>
<td>18,225,000</td>
<td>(898,712)</td>
<td>(449,356,000)</td>
</tr>
</tbody>
</table>

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 Mundii online database) rice self-sufficiency would already have been achieved with a 5% surplus (29.88 million tons of paddy produced compared to 26.48 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.

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:

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 practices, (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.

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 CECOPR/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.

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.

This 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.

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. Improved monitoring 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.

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 platform 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.

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.

REFERENCES

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
   • Vreedelieden Country Office NGO
   • Union Nationale des Riziculteurs du Bénin
   • Three Centres Régionaux de Production Agricole
   • Three agricultural chambers of Benin
   • Perimètres Rizicoles de Malmalieve, Ségbana, and Karimama

2. Burkina Faso: all Farmer organizations
   • Comité interprofessionnel du riz du Burkina (CIR-B)
   • Union Nationale des Producteurs de Riz du Burkina
   • Maitrise d’Ouvrage de Bâpè (MOB)
   • Autorité de la Mis en Oeuvre de Vallée de Sourou
   • Union des groupements des Producteurs de Riz de Bâpè
   • Union des Producteurs de Riz de la Vallée de Souro (UPRVIS)
   • Union des Cooperatives Rizicoles de Bama
   • Union des Producteurs de Riz de la Sissili (UPRS)
   • Société des Cooperatives Agricoles de Banfora (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 (AMIG)

4. Nigeria
   • World Bank-financed Commercial Agricultural Development Project
   • Green Sahel and Rural Development Initiatives (GSRD)
   • Rice Farmers Associations of Nigeria (RFAN)
   • 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 (SASED)
   • Coopérative Entente Doualou
   • Africains/Project de Promotion et de Diversification de l’Agriculture dans les Régions de Kaolack, Kaffrine, Kédougou, and Tambacounda (PRODIKA)
   • Coopératives des Unions Agricoles de Podor

6. Togo
   • NGO Entreprises Territoires et Développement (ETD)
   • NGO Groupe Chezien de Recherche-actions pour la Promotion Humaine (GARHPE)
   • NGO International Fertilizer Development Centre (FOC-Togo)
   • NGO Recherche, Appui, Formation aux Initiatives d’Auto-Développement
   • Institut Togolais de Recherche Agronomique
   • Institut de Corneli Agricole Togolais.


Index Mondi Online Database, at indemundi.com; accessed in September and October, 2017.


**SRI-WAAPP Project Logframe**

**General Objective**

Food security improved in West Africa

**Specific Objective**

<table>
<thead>
<tr>
<th>Indicators</th>
<th>SO1: Rice productivity and competitiveness improved in targeted areas (disaggregated by country)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SO2: % change in income (cost and benefit) per ton and area of production (disaggregated by country and cropping systems)</td>
</tr>
</tbody>
</table>

**Results**

<table>
<thead>
<tr>
<th>Indicators</th>
<th>R1: Human and institutional capacities of stakeholders in the SRI value chain in West Africa strengthened</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R2: Appropriate innovations (equipment and/or best practices) developed and scaled up, in West Africa</td>
</tr>
<tr>
<td></td>
<td>R3: SRI stakeholders' demand for knowledge and decision-making options facilitated and met</td>
</tr>
<tr>
<td></td>
<td>R4: Efficient mechanisms and tools of coordination, management, and M&amp;E of the project established</td>
</tr>
</tbody>
</table>

**Appendix 3**

**Project Beneficiaries for SRI-WAAPP by June 2016**

<table>
<thead>
<tr>
<th>Country</th>
<th>Direct Beneficiaries</th>
<th>Indirect Beneficiaries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td>Benin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burkina Faso</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Côte d'Ivoire</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Gambia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ghana</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guinea</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liberia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mali</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Niger</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nigeria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senegal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sierra Leone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Togo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Appendices**

115
Improving and Scaling up the System of Rice Intensification in West Africa (SRI-WAAPP), 2014-2016

© 2018 The West and Central Africa Council for Agricultural Research and Development
CORAF/WECARD (www.coraf.org)