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Africa-wide Rice Agronomy Task Force

Africa Rice Center (AfricaRice) – Annual Report 2012

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Citation

Africa Rice Center (AfricaRice). 2013. Africa Rice Center (AfricaRice) Annual Report 2012: Africa-wide rice agronomy task force. Cotonou, Benin: 100 pp.

ISBN:

Print 978-92-9113-370-3

PDF 978-92-9113-371-0

Writing and editing:

Green Ink (www.greenink.co.uk)

Printing:

Pragati Offset Pvt Ltd, Hyderabad, India

Photo credits:

All pictures are by staff members of Africa Rice Center (AfricaRice), and networks and consortia convened by the Center.

Research in brief

Working with farmers to improve water control in inland valleys

AfricaRice has adopted a simple and participatory approach called 'sawah system development' (SSD) to develop inland-valley lowlands for rice. SSD has been used experimentally in Togo with support from various donors since 2004. Under the auspices of the Japan-funded project 'Sawah, Market Access and Rice Technologies for Inland Valleys' (SMART-IV), in 2009 AfricaRice expanded the work to Benin. There have been promising results in both countries.

'Sawah' is a Malayo-Indonesian word for a leveled and bunded rice field that has a water inlet and a water outlet. Because level and bunded fields are easier to work, farmers are able to:

- Improve land preparation and transplanting
- Reduce water run-off and loss of fertilizer
- Maintain a water layer in the field to help control weeds.

Water control is vitally important for raising lowland rice yields

Sawah systems are well known in Asia, where they produce higher yields than lowland rice fields with less water control.

AfricaRice land-development specialist Worou Soklou uses SSD to develop an inland-valley lowland in just 2–3 months. Sawah is not necessarily about building irrigation infrastructure, rather it is about improving water control in a rainfed environment.

"The important players in SSD are the farmers," explains Worou. "We tell them about the approach and how it might improve their rice production and consequently their livelihoods. If they don't 'buy into' it and take ownership of the whole developmental process, we can't continue!"

"Before we get to the field, we have to be sure to select suitable inland valleys that have appropriate hydrology and land-quality characteristics, for guaranteed ongoing supply of water and good soil fertility," explains AfricaRice remote-sensing and geographic information systems (GIS) specialist Sander Zwart.

Firstly, inland valleys are mapped at national scales. This is done using Digital Elevation Models derived from satellite remote sensing. Then spatial analysis is performed on maps of soils, climate and socio-economic parameters (such as accessibility, population density and distance to markets) to assess the potential for inland-valley development. The new map resulting from this process depicts the areas that provide the basic conditions for successful development.

Two critical elements in the process are farmer organization and land tenure aspects. Based on previous experiences, AfricaRice advocates an organization where farmers develop and expand a site as a group, but thereafter cultivate their own rice fields within the system. In each site AfricaRice tries to negotiate long-term tenure agreements with the land owners to provide a sustainable environment for investments. Once an inland valley is identified as suitable for sawah development, the farmers who work there are brought together and told about SSD. It is made clear

that, if they take it on, they will do most of the work. If they want to go ahead with SSD, they are organized and trained accordingly. First, they take on the role of surveyors, simply because they know their lands better than anyone else.

The farmers provide the researchers with information on the inland valley's soil, the behavior of crops in the field, and — most importantly — information that enables the researcher to determine the drainage axis of the inland valley and site the main canals and bunds appropriately according to the topology. Then the area is cleared of trees, shrubs and grass, although cash-crop trees, such as coconut palms, may be left in place.

The locations of the various elements, including drainage axes, bunds and irrigation canals, are marked with colored posts (or pegs) to guide producers in their construction. Once the posts are in place and the meaning of the colors explained to the farmers, the farmers develop the site with a minimum of supervision from technicians.

One project site in Benin, Zoungo in the commune of Ouinhi, was confirmed as meeting the SSD selection criteria in May 2012. Fieldwork began in June 2012. The rice crop was established in July–August using variety NERICA-L 20 (developed by AfricaRice), and rice was harvested in November–December.

"The project in Zoungo started with about 15 producers on less than 3 hectares, but aroused a lot of interest, soon growing to 62 farmers — in all, 12 hectares were developed in less than 3 months," says Worou. SSD at Zoungo, with minimal fertilizer, yielded 4–5 tonnes of rice per hectare in a rainfed system where average yields traditionally fluctuate between 800 and 900 kg/ha and rarely reach 2 t/ha without development. Worou thinks that yields of 6 t/ha, and even more, could have been achieved if producers had used the recommended doses of fertilizers.

Come harvest day, all the producers were very happy. Aboko Daniel, a rice farmer and president of the rice farmers' association of Zoungo, said, "with support from AfricaRice, we are highly motivated. We have had technicians supervise us in the development work. We have used only our hoes and machetes. Since we have been cultivating rice, we have never harvested such a vast quantity."

Fadonougbo Dominique, another rice producer, is equally satisfied: "I am very pleased with this technology because we did not know before how to construct bunds to retain water in the plots and drain it when it is in excess, or how to properly apply inputs in the plots. We have learned all these things this year. And this was very good. I gained 400,000 CFA [francs] last year [2011]. With what we have achieved with the project, I will gain at least a million CFA. I am very happy."

Comlan Célestin Danvi, director of the Rural Engineering division of the Ministry of Agriculture, the national coordinating institute of the project in Benin, says, "SSD is a technique that allows small producers to alleviate hunger, and ward off food insecurity. Yields are very attractive. This cheap approach gives yields close to those achieved in systems with full water control, which cost several million CFA per hectare."

According to Worou, the lesson to be learned from this approach is that, with very limited means, it is possible to bring lot of change in rural areas of Benin and Togo.

The results achieved were not obtained without difficulty, however. Judicaël Babadoudou, in charge of development activities in the commune of Ouinhi, said that a lot of patience and perseverance was needed to convince producers about the approach because producers have their own technique for producing rice. The project's national coordinator for Benin, Felix Gbaguidi, indicated that he also had to encourage producers to join the initiative because they were used to ready-made or 'turnkey' projects from the various partners intervening in rural areas.

In 2012, a total of 30.7 ha was developed across 12 sites in the two countries, involving 269 farmers (of

which 92 were women). Average yields at these newly developed sites ranged between 2 and 5 t/ha (*see* Table 1 for details).

"This year [2013], in the site of Zoungo, the farmers are expanding their site impressively — without any outside support!" enthuses Zwart. "We suspect adoption rate will be high, because the methodology is low-cost and easy to learn. In all 2012 sites in Benin, except one, the farmers have decided to continue and to expand their rice cultivation area."

"AfricaRice has selected SSD as one of the key technologies that will be scaled out in the rice sector development hubs that focus on lowland rice," says AfricaRice director of research for development Marco Wopereis. "I am glad to see that the work we started with Worou in 2004 in Togo is beginning to show real impact. We are preparing an instruction video and manual that will be distributed among the members of the Agronomy Task Force. Furthermore we are continuing to train NGOs, extension services and leading farmers in the use of this technology. In the second phase of the SMART-IV project we will expand to Sierra Leone and Liberia, two countries with a high potential for development of rice-based systems in inland valleys."

Judging by appearances

Rice is severely constrained by various abiotic and biotic factors. In West Africa, drought is one of the most important abiotic stresses. Research has demonstrated the severe impact of dry periods on the yield of rice genotypes — especially when it occurs during the reproductive phase of the crop. In plant breeding, laboratory, pot and field screening are used to identify drought-tolerance traits that can be incorporated into high-yielding genotypes using conventional and biotechnological tools.

During the 1980s and 1990s, much of AfricaRice's drought-tolerance breeding focused on determining

Table 1. Sawah system development in 2012 in Benin and Togo

Site	Area (ha)	Average yield (t/ha)	No. farmers involved		
			Male	Female	Total
Zoungo	11.6	4	46	15	61
Agosou	5.7	5	16	8	24
Kpakapza	1.8	3	9	7	16
Todjotin	1.4	2	9	7	16
Korobororou	0.7	—	30	0	30
Total Benin	**21.2**		**110**	**37**	**147**
Tutu	2.0	3	11	6	17
Sodo	2.0	3.5	8	7	15
Bémé2	1.7	2.5	12	10	22
Tchanganidè	0.9	5	7	8	15
Kawa	0.8	5	14	8	22
Gnatre	0.8	5	13	3	16
Atchangbadè	1.3	4	9	6	15
Total Togo	**9.5**		**74**	**48**	**122**