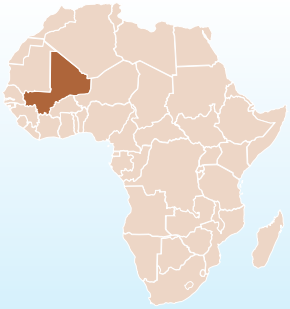
SYSTEM OF RICE INTENSIFICATION (SRI) IN MALI



Location: Timbuktu Region, Mali

Northern Mali's Timbuktu region is one of the most food insecure regions in the Sahelian nation. Agriculture depends on the floodwaters of the Niger River and highly variable rainfall that averages less than 200 mm per year. Annual rice yields average less than one ton per hectare, and irrigated rice yields average four tons per hectare. Using the System of Rice Intensification (SRI), which requires wider spacing, transplants, and organic amendment such as manure or compost, the NGO Africare and local farmers have obtained yields as high as nine tons per hectare—more than twice the conventional irrigated rice in the area. Overall revenue from rice produced using SRI earned farmers double that of conventional irrigated rice.

CHALLENGE

Communities located along the Niger River have very little rainfall—averaging only 150 to 200 mm annually (averages in coastal countries in West Africa are about 1600 mm[1]). Moreover, high climatic variability can significantly raise or lower these levels. Because rice and other crop production depends primarily on the recessional floodwater of the Niger and its branches, food security suffers dramatically in dry years. Annual rice yields under this recessional production system average less than one ton per hectare. In contrast, controlled irrigation systems—where water is pumped or diverted via canals into a paddy—produce considerably higher yields—an average of four tons per hectare.

Africare has been active in the Timbuktu region since 1997. Working with villages in the *cercles* (or districts) of Goundam and Diré, the NGO has helped develop village-based, small-scale irrigation schemes, or *Perimètres Irrigués Villageois* (PIVs) of about 35 hectares, each irrigated with a small diesel-powered pump. Because the area is shared by as many as 100 farmers, each household on average has access to only a third of a hectare (0.83 acres) on which to produce rice under controlled irrigation conditions. With this small share of the PIV, most farmers also rely on recessional production. Still, boosting yields on these small, irrigated parcels enables the farmers of Goundam and Diré to create a food security buffer in dry years.

RESPONSE

In 2007, Africare launched the Timbuktu Food Security Initiative.[2] The NGO's agronomist, a government agronomist and several village-based field agents worked with local rice producers to launch a farmer-led pilot project evaluating SRI in two villages.

Originally developed in Madagascar in the early 1980s, SRI is an impressive production system, with farmers in the Southern African country regularly attaining yields of 7 to 15 tons per hectare —a significant increase from the national average of two tons per hectare. In the past 30 years, the system has been adopted by over 20,000 Madagascar farmers and has spread to more than two-dozen countries in Asia, Africa and Latin America.[3]

SRI follows several key principles, which were upheld in Mali. Rice seedlings grown in nursery beds are transplanted earlier than usual—at one to two weeks old. Single seedlings are planted in straight lines, spaced at 25 cm x 25 cm, slightly farther apart than in conventional production, and only one seedling is planted per pocket. As a result, plant density averages 160,000 plants per hectare, much lower than conventional planting.

The wider spacing helps reduce competition for sunlight and nutrients and leads to the increased development of shoots on the rice plant. While plant density is far lower, the density of productive shoots is far greater. Under wider spacing, more panicles (buds or flowers) tend to develop on each shoot with each developing more grains than rice grown at higher density spacing. Rice fields are irrigated only intermittently, keeping soils moist, but well drained. As a result, overall water use is greatly reduced and conditions remain aerobic. In the Africare project, SRI was tested only in irrigated fields so that water application was controlled. Fields are amended with organic fertilizer such as compost or manure; in some cases, a small amount of chemical fertilizer is added although their use is gradually being reduced. Under SRI, frequent weed control is necessary, particularly in the early stages when seedlings are particularly vulnerable to competition from weeds. A handheld, low-tech conical weeder, such as the Sri Lankan "Cono Weeder," which can be easily reproduced by local blacksmiths, is an efficient and widely used device.

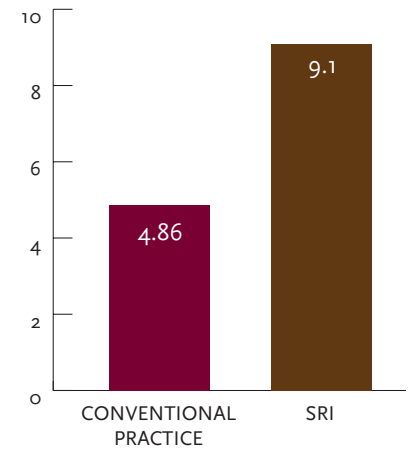
RESULTS[4]

- Farmer-led SRI field trials in Douegoussou in the 2007/2008 growing period produced rice yields averaging nine tons per hectare, an increase of 2.3 tons per hectare (or 34 percent) over yields obtained under conventional irrigated production techniques; the latter see higher plant densities, heavy chemical fertilization and permanent flooding. The gain was even higher when compared to average irrigated rice yield that year in the Timbuktu region of four tons per hectare.
- Overall revenue from SRI production was 2.1 to 2.4 times higher than under conventional practices, or 1,000,000 FCFA ($2,075) per hectare versus 426,000 to 490,000 FCFA ($884 to $1,016) per hectare.[5]
- While input costs for SRI—labor and manure purchase—were 15 to 25 percent higher than control and conventional plots, higher yields brought in greater sales revenue than control plots.
- Under SRI, only six kilograms (kg) of rice seeds per hectare were needed for planting, compared with conventional methods where farmers used 40 to 60 kg seeds per hectare (an 85 to 90 percent reduction). Reduced seed needs left more rice available for household consumption. Chemical inputs were 30 percent lower and water use was 10 percent lower. Overall, production costs per kilo of rice grown using SRI averaged 52 FCFA ($0.11) versus 76 FCFA ($0.16) for conventionally grown rice. [6]
- After the success of the first year's harvest, the project expanded from a handful of participating farmers in two villages to 60 farmers in 12 villages the following year.

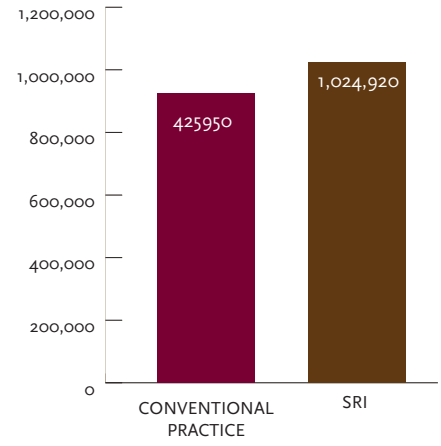
"Now that farming is profitable for us, my family and I can all stay in our village and the children go to school. Before SRI, we couldn't even think about school for them."

– Moussa Ag Demba, president of the Federation of Goundam Circle Cooperatives

SRI Yield in Tons per Ha



SRI Net Revenue in FCFA per Ha



- During the 2008-2009 season, yields ranged from 5.4 to 12.4 tons per hectare, averaging 9.1 tons per hectare. Regardless of the rice variety used, SRI greatly outperformed control plots, with yield increases from 45 to 105 percent. Under SRI, plants produced, on average, 50 percent more shoots than plants planted in groups of two or three. The number of panicles per square meter was 31 percent higher than in conventional plots, and the number of grains per panicle was higher (133 versus 97 grains per panicle).
- Farmers in three of the SRI trial villages decided to extend the principles of SRI to wheat production with exciting preliminary results: using direct seeding yielded 13 percent more wheat than controls.
- Africare has continued with the SRI initiative in Mali. During the 2010-2011 season, production on SRI plots increased from 30.8 tons in 2009-2010 to 60.6 tons. Moreover, the production value of SRI plots increased 64 percent between the 2009-2010 season and the 2010-2011 season.[7]
- In addition to the Timbuktu successes and nearly three decades of increased yields in Madagascar, SRI has proven successful in other African rice fields. In 2008, the IFAD-funded PAPSTA project (Support Project for the Strategic Transformation of Agriculture) reported increased rice yields in the Rwandan villages of Kibaza and Rwabutazi, from four to six and seven tons per hectare, respectively. Yield increases under SRI are supported by data found in scientific research. In a study in Gambia, for example, SRI yielded between 4.7 to 7.3 tons per hectare at 20, 30, and 40 cm spacing, outperforming conventional irrigated rice production, which ranged from 1.3 to 2.5 tons per hectare at the same spacing intervals.[8]

Though SRI is a more labor-intensive system of rice cultivation, it provides clear benefits to farmers, local communities and the environment. The benefits include reduced water usage and lower chemical inputs, all while providing increased revenue for farmers. Moreover, this transformative system can be maintained with low-tech equipment provided within the community. This in turn creates a ripple of community-centered benefits while pushing back on the notion that communities must rely on imported mechanized equipment. Overall, SRI creates stronger food security and community development at a time when global warming creates an ever-unpredictable growing environment. With results this clear, it is an imperative that community-focused SRI programs are supported and continue to grow.

This case study was produced by the Oakland Institute. It is copublished by the Oakland Institute and the Alliance for Food Sovereignty in Africa (AFSA). A full set of case studies can be found at www.oaklandinstitute.org and www.afsafrica.org.

"Today, it takes a lot less money to grow rice. Before, we used five times as many seeds, eight times as much fertilizer, twice the water and three times as much gas to pump the water. Now, we do not have to spend as much to grow our rice."

– Moussa Ag Demba, president of the Federation of Goundam Circle Cooperatives

Farmers, NGO agents, donors, and Malian agricultural services during an intra-village field visit in Timbuktu.
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FOR MORE INFORMATION
www.oaklandinstitute.org
www.afsafrica.org

ENDNOTES

1 Climatemps. *Average Weather of Nigeria*. http://www.climatetemp.info/nigeria/ (accessed June 26, 2014).

2 Africare. Africare-Mali. http://web.archive.org/web/20101212041632/http://africare.org/our-work/where-we-work/mali/programs.php (accessed June 26, 2014).

3 Stoop, Willem A.; Uphoff, Norman, and Amir Kassam. "A review of agricultural research issues raised by the system of rice intensification (SRI) from Madagascar: opportunities for improving farming systems for resource poor farmers." *Agricultural Systems* 71, no. 3 (2002): 249-274.

4 Unless otherwise indicated, the source for the data below is: Styger , Erika. *System of Rice Intensification (SRI) – Community-based evaluation in Goundam and Dire Circles, Timbuktu, Mali.* Africare, 2009. http://ciifad.cornell.edu/sri/countries/mali/MaliAfricare%2008and09.pdf (accessed June 26, 2014).

5 The West African CFA franc is permanently pegged to the euro at the rate of 1 euro to 656 FCFA. One million FCFA equals roughly $2,075.

6 Styger, Erika. *The System of Rice Intensification (SRI) – First Experiences from Timbuktu – Mali, Farmer-led SRI test in Goundam*. http://www.erikastyger.com/SRI_Timbuktu_Mali_Africa.html (accessed June 26, 2014).

7 Dembele, K. and H. M. Toure. Mid-Term Evaluation of the Timbuktu Food Security Initiative. Africare, 2011. http://pdf.usaid.gov/pdf_docs/Pdacs580.pdf (accessed June 26, 2014).

8 Ceesay, Mustapha. "The effects of repeated soil wetting and drying on lowland rice yield with System of Rice Intensification (SRI) methods." *International Journal of Agricultural Sustainability* 4, no. 1 (2006): 5–14.

FRONT PAGE PHOTO:
A deepwater rice field that has almost matured, Timbuktu. © Erika Styger