

Excerpt from: REPORT ON SRI STATUS IN THE INDIAN STATES OF ANDHRA PRADESH AND KARNATAKA – Field Visits, October 5-8, 14-17, 2006 – Norman Uphoff

Another SRI -- The System of Ragi Intensification

Monday morning [October 16] started at 5:15 as we had to catch a train leaving Bangalore at 6 a.m. for Haveri in the northern part of Karnataka state. Traveling with me were **Krishna Prasad** from the Green Foundation and **Ravikumar** (Ravi), area unit coordinator for AME. We had long conversations on the six-hour train trip, such as why SRI yields in India have not yet matched what is reported from some other countries. My suggestion was that Indian soils are not just low in soil organic matter, but deficient in abundant and diverse populations of soil organisms.

Continuous heating by the tropical sun raises soil surface temperatures to 50-60 degrees C, possibly even higher, practically sterilizing the top horizon. SRI methods by themselves can raise yields to the 6-8 t/ha range; achieving yields beyond this requires active growth-promotion by soil organisms. I suggested that conventional practices -- flooding, close spacing, etc. -- are keeping rice production 'grounded,' while SRI methods can help farmers achieve the equivalent of 'flight,' making rice production take off. However, these methods are like propeller airplanes that can overcome the force of gravity. When the services of soil biota are mobilized, this adds the equivalent of 'jet propulsion' to rice production.

When we arrived in Haveri about noon, a driver from the Green Foundation met us at the station and took us to a local hotel where we left our things before driving 45 minutes to the village of **Chinnikatti**.

The first thing we did in the village was to visit its village seed bank that The Green Foundation has helped establish, with a huge variety of different seeds from dozens of local varieties of different crops. The matronly woman who serves as manager of the seed bank proudly showed us the biodiversity being husbanded and was pleased to have pictures taken of the facility (Picture 10).

Farmers here cultivate *ragi* (finger millet) in a very innovative – and productive – way. This coarse grain is the staple food for millions of Indian households, especially poor ones. It is grown as a rainfed crop, enhanced with supplementary irrigation where possible. Yields are usually in the range of 5-10 quintals per acre (1.25-2.5 tons/ha). A yield of 15 quintals is considered a very good yield (3.75 tons/ha).

The cultivation system practiced here in Chinnikatti, called *guli ragi*, has many resemblances to SRI for rice. It achieves yields of 18-20 quintals per acre (4.5-5 t/ha) and as much as 25 quintals per acre (6.25 t/ha) without use of chemical fertilizers. Also, 20 to 25 cartloads of ragi fodder are also produced per hectare which is valuable for animal production. After the Green Foundation learned of this system ten years ago, it began trying to promote *guli ragi* elsewhere. On the poster that it produced to describe *guli ragi*, the similarities with SRI are noted.

Farmers clear their field as usual for crop production, and then they create a grid similar to that with SRI. Furrows 18 inches (45 cm) apart are incised on the soil using a simple ox-drawn plow,

pulled across the field in perpendicular directions. Then young seedlings, 20-25 days old (never more than 30 days old), are planted, 2 each at each intersection. Note that the word *guli* means intersection or node, so *guli ragi* is ‘intersection millet,’ implying widely-spaced millet.

The most innovative part of *guli ragi* is what is done to the growing crop. While the young plants are still supple, between 15 and 45 days after transplanting, when their stems will not break when bent over, farmers draw a simple ox-drawn implement -- a wooden implement called a *koradu* -- across the field in different directions.

Bending the plants over traumatizes their stems at ground level, where root and shoot meet and where the plants’ meristematic tissue which produces new tillers and roots is located. Dragging a *koradu* across the field 3 and 6 times during this period of early plant growth (during the third to sixth week) stimulates profuse growth of adventitious roots and also much more tillering above-ground (Picture 11).

The *koradu* is essentially a hollowed-out log, about 6-7 feet long and 15-18 inches wide, attached by ropes to the yoke of a team of oxen. A farmer stands on the *koradu* to add weight to it as he guides the team and the *koradu* over the field. Farmers showed me with pleasure the system of sticks and ropes that enables them to steer the oxen while riding on the *koradu*.

When other growing conditions are favorable, a single *guli ragi* plant will have 25-30 tillers, with heads that are considered ‘fisty,’ meaning tight and full. The larger root system enables the panicles to be larger and better filled with grains. In SRI, we treat the young seedlings with the utmost gentleness and care; however, young *guli ragi* plants are ‘abused’ to achieve the same result -- larger root systems and more productive canopies.

The village temple, where we held our discussions, had a large covered veranda fairly freshly decorated with colorful paintings of deities (Picture 12). I was told that this is the usual place for meetings in the village. To begin the meeting, one farmer stood and sang a prayer, a song in praise of ragi, Krishna told me. The panchayat leader then greeted us, and we talked about *guli ragi* so that I could understand better its details. The farmers commented that at first the seedlings look “very sparse,” just as is said of SRI rice transplants. But they fill dramatically in the field once their growth accelerates.

There was no consensus on how old the system is. Some thought it was developed 25-30 years ago, but others said it was much older. The traditional method of ragi cultivation, still used in most villages, is to sow ragi seeds with the first rains. An improvement upon this is to broadcast seeds together with farmyard manure (FYM).

The introduction of sowing in lines to permit intercultivation (weeding) between rows was an innovation that probably came with colonial agricultural extension. However, it was not clear when transplanting in a square pattern was started, rather than rows, permitting intercultivation in perpendicular directions.

Transplanting of ragi was prompted by good experience with putting young ragi seedlings in between rows of maize or cotton. *Guli ragi* requires more input of labor, they acknowledged, but the returns are several times higher than with conventional cultivation.

During our discussion, I suggested to the farmers that they experiment with transplanting of younger seedlings. Researchers at the Andhra Pradesh agricultural university (ANGRAU) have shown that, at 60 days of age, the roots of ragi plants that were transplanted as 10- or 15-day-old seedlings become much larger than those of seedlings transplanted when 21 days old. The picture that I showed farmers on my laptop screen was quite convincing, and many expressed willingness to try using very young seedlings.

We were invited to have lunch in a farmers' home before going to see *guli ragi* in the field. How such a delicious meal could emerge from such a dark and smoky kitchen was a mystery to me, but the *jowar* (sorghum) chapatis were crisp and delicious. There were several forms of ragi served, including a sweet porridge that was eaten between the chapati course and the rice course. Most Westerners would have considered it a fine dessert.

We drove to some fields outside the village and then walked past a conventionally-managed field of ragi with a hybrid variety recommended for the area. The advantages of *guli ragi* using a traditional variety were immediately evident. There was no lodging in the latter, whereas there was much lodging of the fertilized hybrid field. Also they said that *guli ragi* grains were ripening synchronously, something seen also with SRI, whereas the conventional ragi was maturing unevenly. The farmers said that stem borer problems are less when they use the *koradu*, and so are aphids.

The crop had not filled the field as much as I expected, so I asked whether it might not be a good idea to try somewhat narrower spacing. Farmers said that what I was seeing was an effect of this year's drought. Normally the field would be well covered by now, they said, with a closed canopy. This year, they had been only able to do one *koradu* pass over the field during the first 45 days, so this was not a good example of the method (Picture 13).

I asked again, to be sure, when and where *guli ragi* cultivation had started, and they said it started here in Chinnikatti, and had spread over most of three neighboring taluks (subdistricts). We visited some other fields nearer to the village, and in one area, seven different ragi varieties were being grown.

One variety, *Salemsana*, was particularly beautiful, bolt upright with brownish colored grains. This was direct seeded and has very good cooking qualities, farmers said. I told them that in the U.S., I usually eat millet 5-6 times a week, in the breakfast cereal that my wife prepares. Millet is increasingly appreciated as a health food in America.

Back at the temple, we resumed the discussion. They demonstrated another implement, the *yade kunte*, which is used for intercultivation (Picture 14). I had thought that this referred just to weeding, but it clearly includes what we refer to as 'active soil aeration.' The long handle of the *yade kunte* is connected by a rope to an ox-yoke, and it is steered by a farmer walking behind.

The implement demonstrated was about 12 inches (30 cm) wide, with a blade that digs about 4 inches (10 cm) underground, cutting off the roots of any plants (weeds) at that depth and also turning up this depth of soil, aerating it in the process. The implement is similar to what gardeners have called a ‘stirrup hoe.’

The *yade kunte* can be made wider and able to plow more deeply. That it prunes some of the roots of the ragi plants growing in rows on either side is not considered a problem. One farmer said: ‘My father always told me: if you break one root, you get ten more.’

For *guli ragi* cultivation, the *yedekunte* is pulled through the field between plant rows 5 or 6 times during the growing season starting 15 days after transplanting “as often as possible,” someone said. One of the reasons for *guli ragi* success, I am sure, is the active soil aeration that it achieves, especially when used in perpendicular directions with seedlings planted in a square pattern.

I congratulated the farmers on having such a ‘modern’ implement since active soil aeration is now being better understood through scientific studies to know how and why it contributes to better crop performance.

We said farewell as the sun began setting and drove back into Haveri, where we had a leisurely supper at the hotel and got to the railway station by 11 that night for a scheduled 11:30 departure, taking the overnight sleeper train. Unfortunately, it was late and did not reach Haveri until 1:15, so we got back to Bangalore only at 8:30 the next morning, not much before the SRI forum scheduled to begin at 10:30 am on Tuesday.