Sustainable Agriculture Development Seminar
Hughes Hall, Cambridge, 12th May 2014

The seminar was led by the TAA, with enthusiastic support from the Humanitarian Centre (Cambridge), Cambridge University's Strategic Initiative in 'Global Food Security' (GFS) and the Cambridge Conservation Forum (CCF). There was an amazing turn out of some 50 people from a wide range of institutions and individuals from Cambridge and beyond. The high attendance was much to do with the TAA's partner organisations.

Following brief descriptions of the Partner Organisations by their representatives, Keith Virgo, of TAA, introduced the topics of the seminar. He recalled how, since the mid-1980s, people have lost interest in "soil", there are now few people who can call themselves soil scientists. Likewise, donor interest in agriculture itself waned from the 1990s onwards and largely disappeared from the funding agencies' radars. He expressed satisfaction that two new approaches to agriculture have emerged over the last 15 to 20 years, both of which recognized the crucial importance of "soil" and the need to ensure environmentally sustainable methods of food production.

These were the subjects of this seminar

- System of Rice Intensification (SRI)
- Conservation Agriculture (CA)

These methods enable producers to raise production with lower cost, less dependence on agro-chemical inputs and lower energy and water requirements. Moreover, they optimise conditions for crop growth, both above and below ground.

Presentations were made by two TAA members, which outlined the principles of these agro-ecological concepts and practices, with evidence that the approaches can reorientate agriculture in developed and less-developed countries to achieve greater productivity with sustainability.

Presentation 1. ***From field observation to agricultural science: the case of the System of Rice Intensification (SRI),*** by Willem A. Stoop. Willem was trained as an agronomist/soil scientist at Wageningen and the University of Hawaii. He had a career with the international agricultural research centres. Since 1998, when doing research at WARDA, he became increasingly involved in rice research and particularly SRI (System of Rice Intensification). He was co-author with Norman Uphoff of the first formal / peer reviewed publication on SRI in 2002. Presently, he is involved in advising three Indian PhD candidates doing their research on socio-economic aspects of SRI in India.

Willem traced the post-WWII emphasis on high-input–high yield cropping but noted the missing elements of soils, root systems, organic matter and soil biota. The empirical nature of SRI (*labelled* as an agro-ecological method) developed progressively on the basis of field practices (*bottom-up* orientation). This compared with the scientific theory and/or fundamental research (*top-down* orientation).

He outlined the SRI package of practices as compared with conventional, *best* practices: very low seed rates, very young transplants (8 to 15 days old), single transplants/hill, wide spacing (20x20 to 50x50 cm), no flooding, moist soil, use of compost, thorough weed control with 3 to 4 passes by manually-pushed rotary hoe. Figures in Table 1 showed a potential for doubling yields under SRI, with fewer inputs.

Most crop varieties (local and improved) respond positively to SRI practices. This is accompanied by drastically reduced (1/5th to 1/10th) seed rates that lead to more efficient phenotypes, because the expanded root development per plant will permit an increased efficiency in moisture and

nutrient uptake from the soil. Willem supported this by numerous illustrations of SRI cropping from around the world.

In conclusion he cited the overall effects as increased yields and reduced costs (savings on seeds; on chemicals: mineral fertilisers/ plant protection and on labour). Conventional (science-steered) intensification has seriously overshot its target thereby even endangering sustainability!

Key points were noted that *Diversity* and *variability* in production systems and in socio-economic conditions require *flexible* implementation strategies. SRI is not a *fixed* blueprint package. It involves a grassroots *learning* exercise: adaptation and timing are essential requirements. Grassroots farmer organisations and local development agencies need to guide integration into actual systems.

Table 1: Comparisons of yields under conventional and SRI systems

Rice systems	Hills/m^2	Plants/m^2	Root dry weight (g) per hill	Root dry weight (g) per m^2	Rice grain yield (t/ha)
Conventional rainfed rice	50	150	4.1 d	206 c	2.9 d
Rainfed SRI rice	25	25	7.5 c	187 c	4.4 c
Rainfed SRI rice with suppl. irrigation from groundwater	25	25	10.2 b	254 b	5.7 b
Rainfed SRI rice with suppl. irrigation from stored run-off water	25	25	12.3 a	308 a	6.2 a

Note: In each column, values with different letters differ significantly (p=0.05)

Presentation 2. *Conservation Agriculture: sustainable production with environmental protection*, by Brian Sims. Brian has agriculture and engineering degrees from Reading University and the National College of Agricultural Engineering in the UK and a Diploma in Tropical Agriculture from the University of the West Indies. He was leader of the International Development Group at Silsoe Research Institute (SRI) in the UK. He is now an independent consultant working in tropical agriculture and agricultural engineering, focusing on the development of small holder farming-systems with an emphasis on farm mechanisation. More recently, he has focused on the mechanization of conservation agriculture principally for FAO.

Brian introduced CA as a key component of Sustainable Crop Production Intensification as promoted by FAO. The aim is to strengthen natural processes to underpin increased production and boost ecosystem services and to avoid losses, by only using the inputs that the system can utilize. The basic features of CA were explained as:

- **Minimum movement of soil** (no-till or direct sowing – every season)
- **Permanent soil cover**, with crops, cover crops, crop residues or mulch
- **Rotations and/or associations** of crops, through crop sequences, associations, relay crops and mixed cropping

He described the ways that CA works in practice, especially in encouraging better soil health, higher soil fertility, improved infiltration and soil water availability. The benefits were cited as reductions in:

- Fertilizer requirements (30-50%)
- Water requirements (30%)
- Fuel consumption (60%)
- Pesticide applications (20%)

Reduction in these production costs is the key to improved profitability under CA. He cited figures to show that, globally, CA farmed areas increased from about 2-5 million ha from 1974 to 1990 and then expanded to 125 million ha by 2010. Globally, the area under CA is increasing by 6 million ha per year.

He concluded with a comprehensive description and illustrations of mechanisation systems appropriate to CA under small-scale and large-scale farming. Overall, the principals of CA are **universal**, the applications are **local.** We have the technology already developed. What is now needed are supportive policies and mutual support groups.

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Following the formal presentations there were many relevant questions and valuable discussion. These included:

- Lack of recognition of SRI as a viable husbandry system by international agencies, such as IRRI, and the difficulties in scientific comparison between conventional and SRI results.
- SRI provides a set of flexible techniques that can be adapted and used to suit local needs.
- SRI is beneficial in areas where arsenic toxicity is a risk (like Bangladesh) because arsenic is less prone to uptake in the predominantly aerobic soil conditions under SRI.
- CA was seen as a micro-scale change for macro-scale impact.
- Integrating CA with free-grazing livestock in semi-arid areas was seen as a big challenge in terms of maintaining year-round soil cover.
- Conversion to CA from conventional tillage farming may involve an initial down-turn in yields and high initial costs of new equipment but input costs are far lower.
- CA can sequester carbon in the soil at rates of up to 0.5 ton/ha/year. One Lincolnshire farmer has increased SOC from 2 to 6 percent over a 10-year period.

If anyone would like copies of the presentations, please email eastanglia_convenor@taa.org.

Feedback from the participants was enthusiastic and many requested copies of the presentations. Selected comments from the participants included:

- *It was incredibly insightful.*
- *The seminar was really interesting and inspiring.*
- *The seminar was very well organised.*
- *I thought everything was excellent!*
- *It was a really excellent seminar after which I felt quite inspired!*
- *It was very worthwhile.*
- *I certainly think that the exploration of rice intensification and sustainable agriculture should continue and look forward to future developments.*