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An Initiative of ICRISAT-WWF Project



SugarCane

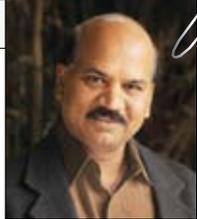
matters

Volume 1 • Issue 1 • November 2009

"More with Less"

An initiative in sustainable sugarcane production





Foreword

Sugarcane is an important crop in India and it will continue to be so in future. But it is facing a major crisis, and there are many reasons for it. One of the most important is the water crisis. The yields are low, the cost of cultivation is increasing and prices are fluctuating – to mention a few – all of which add to the uncertainties and low profitability. These are known facts, but what is unknown so far and is becoming increasingly important is climate change. Until now climate change was debated by non-farming community, primarily scientists and lately politicians, but farmers have already begun to experience it. Climate change is adding to the uncertainty of agriculture in general but specifically to sugarcane.

Sugarcane requires large quantities of water – 1500 to 3000 liters to produce 1 kg of sugarcane. Crop which stands in the field for several years once planted. As such the water requirement is almost the whole year round. In a country like India where during the grueling summer, water becomes acute, sugarcane puts a heavy strain on the depleted resource. And if that summer were to become little more acute due to climate change, the implications on the sugarcane crops are significant.

But the Climate change - which is directly affecting the crop - is also going to be biggest opportunity for sugarcane in terms of market opportunity. There is an increasing demand for ethanol - the climate friendly fuel. Given that sugarcane is a future crop, it needs to be cultivated with futuristic concepts and methods. The old way of growing sugarcane not only will push the farmers into deeper debts, but it will also lose the freshly opening market opportunities for ethanol. So sugarcane, a crop with great future and potential to address the most pressed global issue - climate change - has to be cultivated with radically different approaches and methods. That is the reason SSI - Sustainable Sugarcane Initiative - has been put together.

Until now the fundamental thinking in agriculture has been 'more to get a little more'. This path has reached its dead end and the more has become ever more and margins to farmers have become very little. The result has plunged Rural India into a four-fold crisis: One, the farmers are borrowing more and more and not able to pay back due to dwindling yields and increase in costs. Also, farmers are not able to pay the laborers as much as the fast growing industrial sector. This is driving them to migration, to the cities.

Two - Since agricultural wages are not competitive, the government has to pump in large amounts of money to keep the rural people employed, often in jobs which may not be directly linked to production or enhancement of agricultural productivity. Since the workers have been 'employed' by governments as part of creating livelihoods (ex. NREGA), farmers complain that they are not getting enough labor in time for the regular agricultural operations. The story is far from over yet.

Dr. Biksham Gujja
Team Leader,
ICRIAT-WWF project

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We invite sugarcane farmers, scientists, agriculture officers and staff from sugar factories to send in articles on innovations, practices in sugarcane and share ideas and feedback on the articles in the Newsletter. We also invite news items, events and information on seminars/workshops/trainings with photographs to the following email ID: m.agarwal@cgjar.org

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Three - Excessive use of fertilizers, which are of course heavily subsidized, indiscriminate use of pesticides, massive pumping of ground water with free electricity, all of the above have contributed to soil degradation, over-exploitation of ground water, pollution of rivers and prevalence of health hazards, etc. The ecological degradation in turn is resulting in the decline of yields and increasing costs in agriculture.

And Four - There has been significant change in periodicity and intensity of rainfall and associated with it, the availability of water for agriculture - both ground water and surface. This is evident from the droughts followed by massive floods in the same area in the same year. This will only further add to the already difficult situation in agriculture.

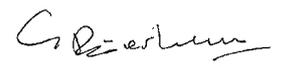
These are but some of the problems and list might go on and on. Regarding solutions, there is no new 'magic' technological breakthrough in the near future like improved varieties, Hybrids, GMs, etc. While there was some excitement generated - about how these new varieties can solve all the problems - in reality, the 'benefits' are not as exciting to the farmers. On the contrary, they would need to invest even more to get access to them. The 'More to get little more' strategy has increased the government spending on fertilizer subsidy, large resources have to be diverted to rural employment, construction of large water infrastructure to divert the non-existent or uncertain water resources, subsidizing the farmers to pump out ground water from deeper and deeper, resulting massive conflicts - none of these measures seem to be working.

As mentioned before, there are no magic solutions to the present agricultural problems. So the question is, 'Is it possible to produce more with less?' Certainly, the question might sound unrealistic. But that is the challenge. To some extent, the System of Rice Intensification (SRI) method has proved that it is indeed possible to produce more with less - less seed, less fertilizer, less pesticides and less water. The results are out there in the public domain to verify. For any agriculture practice, the ultimate test is the acceptance of farmers. SRI has been accepted by millions of farmers and many more will do the same. SRI has not only changed the method of rice cultivation but has also transformed the thinking process for future agriculture.

The Sustainable Sugarcane Initiative (SSI) has to be seen in this context. It is already a big success. Already it has caught the attention of many stakeholders - farmers, millers, agricultural equipment manufacturers, researchers, and even the policy makers. Again, SSI is not magic or some mystifying technology. It is even now evolving and is like open source programming. Many farmers are going to add and modify to the method to suite their own specific situation. Few things are quite apparent already though - it is possible to use a lot less sugarcane to plant the crop, it is possible to grow a nursery without any additional costs, it is possible to plant wide and most importantly, it is possible to reduce water input significantly. In spite of all the reduction in costs and materials, the production increases from 25% to 50%, depending on several factors.

The SSI manual released in May 2009 attracted the attention of many stakeholders. The process of working together to scale it up is on. All the stakeholders - farmers, millers, agriculture equipment manufacturers and policy makers, need to have a combined vision and direction - something like 'producing at least 25% more sugarcane, while consuming 25% less water by adopting SSI by 2015'. It is possible. SSI will surely inspire millions of farmers and assist them in improving their cane production while reducing the costs. SSI will help farmers to adapt to the uncertainties of climate change while at the same time contributing to the reduction in the release of greenhouse gases, by producing more ethanol. It is adaptation and mitigation, both as part of the same intervention. SSI is going to help reduce the human footprint on planet earth without compromising the production or profits.

This newsletter is a forum to assist that process of scaling up the SSI methods. This is the first issue in the series and we present some experiences of the SSI demonstration sites. More importantly, the farmers behind this, the farmers who have done pioneering work, have been given focus. We also give a brief taste of the progress in our systematic demonstration sites. This only a beginning and we are sure SSI is certainly going to effect a change in the way sugarcane is cultivated. We invite individuals and institutions to be part of this process and use this newsletter to improve the understanding on SSI and refine it to further suit the farmers. We do expect this newsletter to become a forum to exchange ideas, challenge findings and add to the knowledge base in improving the sugar sector.


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"More with Less"

An initiative in sustainable sugarcane production

Water is proving to be one of the major constraints for Indian farmers affecting the productivity and profitability of both farmers and millers. Excessive ground water exploitation, leading to decline in soil moisture and extreme variability in rainfall influenced by climate change are debilitating the sugarcane farmers in the country today.

■ Dr. V. Vinod Goud

The effects of climate change are becoming apparent more and more all over the world and agriculture is the most affected due to changes in the rainfall pattern. Delayed and insufficient rainfall has led to shortfalls in food supplies and spiralling prices of essential food commodities.

The mitigation of the effects of climate change is complicated due to its multidimensional nature. In agriculture, this necessitates identifying and developing better crop management options, which can tolerate water shortages and adapt to the extremes of weather induced by climatic change and yet produce more without putting pressure on the ecosystem.

Rice, sugarcane and cotton are among the highest water guzzling crops. Sugarcane consumes between 1500-3000 litres of water to produce 1 kg of cane. Besides, sugarcane is one of the most important commercial crops in India both for its sugar and other by-products. India ranks second in the world, after Brazil, in terms of sugarcane growing area (4.1 m ha) and production. Sugar industry is the second largest in the country in the agro-processing sector worth Rs. 30,000 crores and supports the livelihood of 35 million farmers. Sugarcane cultivation assumes greater significance in the present context for another reason – it's potential to address energy needs through Cogen and ethanol production.

Of late, there is increasing concern about low productivity in most of the sugarcane





During the SSI Training Manual Release: From (L to R) Dr. S. P. Wani, Principal Scientist, ICRISAT; Shri. Prabhakar Reddy, President, Farmers Federation of AP; Dr. Biksham Gujja, Team Leader, ICRISAT-WWF Project, Dr. William Dar, Director General, ICRISAT; Shri. Sucha Singh, Hon'ble Agriculture Minister, Punjab; Dr. Dave Hoisington, Deputy Director General-Research, ICRISAT; Dr. Vithal Rajan, Board of Directors, KCP Sugars; Shri. P. K. Singh, General Manager-Cane, Triveni Engineering & Industries Ltd

producing states in India - in AP, where 132 lakh MT of cane was crushed in 2007-08 and that figure came down by more than half, to 60 lakh MT in 2008-09; in UP, the average number of millable canes per unit area has come down by as much as 40% which means the average yield has been only 40 to 60 t/ha, though this state has the largest area under cultivation of sugarcane.

Sugarcane production is expected to reduce by 30% in the future due

to climatic change, as revealed in a recent four-year study conducted by the World Bank.

While sugar mills are suffering due to inadequate supply of cane for crushing, the sugarcane farmers are facing problems of their own. On the one hand, the cost of cultivating cane is increasing and on the other, the prices offered by the factories are making it uneconomical to continue its cultivation. Therefore, farmers have

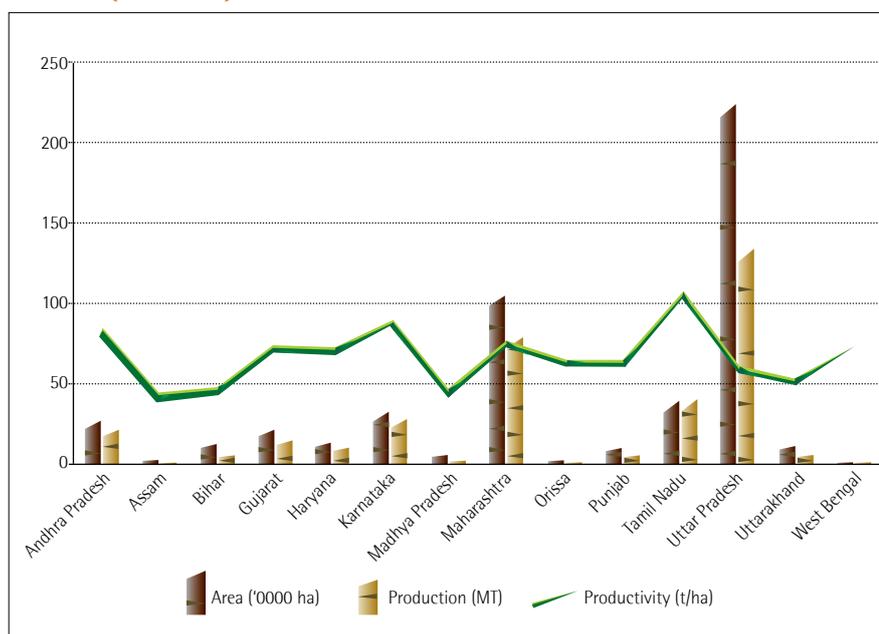
no choice but to shift to remunerative commercial crops.

Under these circumstances, if India has to sustain its sugarcane production profitably, it needs to improve the productivity of sugarcane per unit of land, water, labour and capital all at the same time, while striking a balance between economy and ecology.

Responding to this need, World Wide Fund for Nature (WWF) has partnered with International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) to explore options for "Improving water productivity in Agriculture" in order to improve water use efficiency and reduce pressure on freshwater ecosystems.

Based on the principles of 'more with less' in agriculture, the project initiated its work on the first crop, rice - as it is the largest water-guzzling crop - through field extension, documentation, and research and policy advocacy to popularise and mainstream the System of Rice Intensification (SRI) method in rice cultivation (see website: www.sri-india.net). Encouraged by the results in the fields and success of the project in promoting SRI for more than 5 years now, the focus shifted to sugarcane in the last one and half years.

State-wise Area, Production and Productivity of Sugarcane in India (2006-07)



Source: Directorate of Economics and Statistics, Ministry of Agriculture



The Triveni Industry team during a training session at ICRISAT

Inspired by the principles of SRI, the project team started identifying, compiling, refining and authenticating practices in sugarcane already in use in the public domain for long but limited to a few farmers.

SSI was evolved after one and half years of extensive consultations with progressive sugarcane farmers across the country combining the cane planting innovations, better plant and water management and protection measures, the benefits of which will accrue to the cane producer and mill owner on the one hand and on the other, to the environment as a result of reduced

water abstractions and farm chemical usage.

The objective of this exercise was to understand the problems of growing sugarcane and to study the innovations in reducing the inputs and cost of cultivation while improving yields and incomes of the farmers.

As a first effort, 1000 copies of the "*SSI Training Manual: Sustainable Sugarcane Initiative (SSI) – Improving Sugarcane Cultivation in India*" in English was published and launched by Dr. William Dar, the Director General of ICRISAT at an event organised to introduce and make the

SSI methods popular among farmers and sugar industries. After the book release, the wide media coverage of the event generated huge interest regarding the SSI methods among industrialists, farmers and the State Agriculture Ministries across India and other countries. The Manual is now ready for publication in Hindi, Telugu, Tamil and Marathi – in partnership with various Government and agriculture-banking agencies – for farmers to read and understand them in their own language.

Simultaneously, trainings, field visits, and demonstration plots are being set up in partnership with industries, NGOs and farmers in states such as Uttar Pradesh, Punjab, Tamil Nadu, Andhra Pradesh, Karnataka and Orissa.

The results so far have been very encouraging in the demonstrations plots. The tillering and crop growth are much better than the sugarcane crops grown under conventional methods.

A long-term strategy is being developed to scale up SSI in all sugarcane growing states in order to make a dent in the sugar industry and target at improving the conservation of water in sugarcane cultivation in particular and the agricultural sector in the country in general. It is imperative that a consortium based institutional mechanism be evolved, with an objective of generating mutual benefits of a diverse range of stakeholders like millers, refiners, sugar farmers, researchers, equipment and machinery interests. This would help in promoting wider adaptation of SSI, along with active Government support – in the form appropriate policy as well as field support – to eventually cover at least one third of India's total sugarcane planting area under SSI by 2015.



Dr. Vinod Goud inspecting the nursery seedlings at Farmer Makhan Singh's place

The following article was written by Frank A. Hilario and is a detailed analysis of the present world situation of sugarcane and sugar industry and how well the SSI Manual of ICRISAT-WWF can come to the rescue of the resources strapped farmers. It has been reproduced here with his kind permission.

Sweet Revolution, 2009! SSI gives birth to Neo-Agriculture



■ Frank A. Hilario

May 27, 2009

Revised 29 May 2009
at 0949 Manila time

SWEET LOVE C12H22O11, Sweet Ignore C7H5NO3S. Quite simply, I like my sugar naturally sweet, not artificially saccharine. I like it harvested from the field rather than from the lab; I like it cultured on soil rather than cultured on Petri dishes or whatever. I want to be in the US, the home of the brave and the land of the free. But I don't want to be sugar-free.

I'm in the Philippines; I am a farmer's son; I am part of the island – I prefer the natural to the man-made. Today, I want to talk nicely about sweetness. Grown by mild-mannered chemists in immaculate facilities, C7H5NO3S, Saccharin is sweet; grown by tough-talking farmers on uneven farms with hard methods, C12H22O11, sugar is sweet and delectable.

And that would be muscovado. In the late 1940s to early 1950s, as a boy in shorts going to grade school in the village of Sanchez in the sleepy town of Asingan, Pangasinan in Central Luzon in the Philippines, I had muscovado in my pocket somewhere to bring out as snack. Were we poor? Not really, but I have always been a sweet tooth; I loved the brown color and the God-given sweetness. Asingan never had a sugarcane plantation, but we always had muscovado. It must have come from Tarlac, from the Central Azucarera De Tarlac, the sugar refinery of the Cojuangcos, who

own Hacienda Luisita, all of 5,000 hectares, reportedly the Philippines' largest sugarcane plantation (manilastandardtoday.com) – Tarlac Province is next to Pangasinan. I preferred the light one 'with a warm honey color and creamy fudge flavor' (billingston.co.uk). Today, raw sugar, muscovado is considered a health food. Not surprisingly, it has all the natural vitamins & minerals in sugarcane juice (sugarindia.com). I love it!

Raw sugar is a major export of the Philippines. For 2009, the country will supply 13% of the total volume the US is importing for the year (March 2009, agriculture-ph.com). How sweet!

We Filipinos are good in raising Cain, that's for sure. If you didn't know, you have not been reading the papers. Now, are we Filipinos good in raising cane? Definitely not! That's why I'm writing this long essay. But we are good producers of sugar. In crop year 2002-2003, total sugar production in the country increased by 32.6% compared to 1998-1999 largely due to higher sugar recovery by 22%; the increase can also be attributed to 'favorable climatic conditions, adoption of high-yielding varieties, improved cultural practices, increased farm inputs, and better milling facilities' (Asia Pulse, August 2003, goliath.ecnext.com). (I tried hard but I couldn't get 2007 or 2008 data on recovery rate.)

The problem there is that 'favorable climatic conditions' doesn't apply anymore; cultural practices need to be much improved still – and farm

inputs need to be decreased. Our technical knowledge needs to change for the better, and not only in making things clear to the layman.

We Filipinos learned to produce sugar in Luzon for export in the 1830s (Michael S Billig, 2003, cited in World Sugar History Newsletter July 2004). Today, some 170 years later, the way we grow sugarcane leaves much to be desired.

Actually, the world over, most sugarcane farmers have much to learn about raising cane. We need a Sweet Revolution in sugarcane farming in response to the realities of climate change (global warming/global cooling), inefficient practices (like too much fertilizer), and dwindling resources (like the water table going down – our water deposits are overdrawn).

For sugarcane farmers in the dry tropics, who can they turn to, to learn to grow sugarcane much, much better? The Brazilians are the biggest sugarcane producers in the world, but Brazil doesn't have the drylands that we have. In the 2007-2008 season, total sugarcane production was estimated highest in Brazil at 491 M tonnes, followed by India at 348 M tonnes (commodityonline.com). So



maybe we should go to India and learn from the Indians. After all, in history, sugar was first squeezed out of cane grown in that country (Wikipedia). Except the latest news is that, in contrast to the Philippines, last year India had a decline in recovery rate, which is the amount of sugar you get out of sugarcane (13 May 2009, commodityonline.com).

Consider: The above production figures in reality are estimates, and yield estimates change during the year as the weather changes; after all, in agriculture, harvests are only as good as the weather allows. So, expect that for any growing season, any country's sugarcane yield estimates will be revised at least 4 times: early in the year, before harvest, harvest time, then afterwards.

In agriculture as in flying, the weather is a risk. That is to say, your field as well as your flight is only as good as your weather. And why is that? As far as I can tell, the telling effect of the weather is felt by plants via the water in the soil. Water is that important.

Mark Twain did say, 'Everybody talks about the weather, but nobody does anything about it.' In this age of Climate Change, I say we need to and indeed we can modify the weather, if we simply modify the water in the soil: how much is in it and how much the plants are taking out and transpiring from it. We need to practice out-of-the-box water management.

I did say we should go to India and learn. You know, we learn from mistakes, preferably those of others, preferably big. In this case, India is the biggest sugar producer in the world (ANN, ethanolindia.net) – and they must make big mistakes there. In fact, in 510 BC Emperor Darius of Persia invaded India and found 'the reed which gives honey without bees' (quoted by ANN in sucrose.com). Now then, the Indians have been raising



In fact, in 510 BC Emperor Darius of Persia invaded India and found 'the reed which gives honey without bees' (quoted by ANN in sucrose.com).

cane for more than 2,500 years; their huge mistake is that they have been profligate with their resources when it comes to the growing of sugarcane: too much water for the canes in the field, for one thing.

And that's one of the modern Indian lessons we can learn on campus at ICRISAT at Patancheru. As far as I know, they are very serious when they say, 'We need to explore every possible approach to reduce the water input to all crops, particularly those which excessively depend on scarce resources.' That's ICRISAT Director General William Dar speaking. In other words, he is telling us we have to save on water, and so do our crops. I know him personally to be a non-traditional and out-of-the-box manager-thinker, looking for, in his own words, 'approaches wherein the resource inputs are low and yields are high.' The mantra of the Consultative Group on International Agricultural Research, CGIAR, is 'Doing More with Less' – and ICRISAT is part of the CGIAR. Plow in less, harvest more – that kind of farming is contrary to textbook economics, isn't it? As well as textbook agriculture.

Going-against-the-grain-of accepted practices was very much in the minds of the experts when they worked out the joint project Sustainable Sugarcane Initiative, SSI. I'm referring to the World Wide Fund for Nature, WWF and the International Crops Research Institute for the Semi-Arid Tropics, ICRISAT. The Team Leader for the SSI project is Biksham Gujja of ICRISAT – he has been a Special Project Scientist for WWF based at the ICRISAT headquarters in Patancheru, India since 2005.

In this unusual Age of Climate Change, I do not find it strange that the panda is talking to the plant. Based in Switzerland, the current top panda of WWF is President Chief Emeka Anyaoku of Nigeria; based in India, the current top crop of ICRISAT is Director General William Dar of the Philippines – these tropical minds were thinking of, if vaguely, if I may borrow from the science of fisheries, the concept of optimum sustainable yield. OSY is where you decrease the cost in general – in the case of SSI, water, fertilizer and seed in particular – and yet you do not decrease the yield – you only maintain it. SSI does OSY one better; it so happens that in SSI, while you decrease the costs, you increase the yield. Plow in less, harvest more – SSI is sugarcane agriculture at its best.

The ICRISAT-WWF partnership is a revelation. The WWF has a mandate of protecting ecosystems; considering that, 'ICRISAT is collaborating with WWF to understand and integrate the ecological concerns of agriculture,' Dar says. 'This partnership is unique, and we are looking forward to many more practical results on the ground.' Not just theories but practices.

And so, on March 2009, the ICRISAT-WWF project came up with a training manual with the long title, Sustainable Sugarcane Initiative (SSI): Improving Sugarcane Cultivation in India. Dated March 2009 and released May, the document is in pdf form, 34 pages with plenty of photographs, freely downloadable from here: panda.org.

About the training manual, Project Leader Gujja says that 'the inspiration for putting this package together is from the successful approach of SRI, System of Rice Intensification,' which has been proven to need less water and yet to yield more. And do you know who invented SRI? It was Fr Henri De Laulanie SJ who spent 34 years of his life working with the

Malagasy rice farmers in Madagascar (ANN, ciifad.cornell.edu). He came up with the idea of SRI in 1983. In 1990, Fr De Laulanie, along with some Malagasy colleagues set up a non-government organization, NGO, the Association Tefy Saina, to help improve lives in Madagascar. 'Tefy Saina' means, in Malagasy, 'to improve the mind.' Cornell International Institute for Food, Agriculture and Development, is now working with Tefy Saina. The Jesuits can teach even the experts a thing or two about culture and agriculture.

From SRI to SSI. The SSI approach has been tested by farmers in different climatic zones of India: Punjab, Uttar Pradesh, Andhra Pradesh, Karnataka and Orissa (KV Kumanath, 07 May, thehindubusinessline.com). With very encouraging results, Gujja says he expects that the SSI practice will replace farmer's practice in sugarcane within 5 years (FnBnews, sucree-thique.org). I expect the same for the Philippines.

In fact, SSI is the new economics of agriculture – neo-agriculture I shall call it from here on, because it's new and because I believe the concepts are applicable with other crops. This is the Sweet Revolution of 2009 I refer to in the title to this essay.

Call it SSI or call it neo-agriculture, it has been shown to work in practice, not simply in theory. One Indian farmer, PK Singh, in Uttar Pradesh found that cane yields went up to 100 tonnes to a hectare as against a 'normal' yield of 30 tonnes (ANN, 06 May, expressbuzz.com). That's an increase in yield of more than 3 times.

From the training manual, the first recommendation that caught my eye is that on water. If you follow neo-agriculture, all things being equal, your input will be up to 80% less water for irrigation and your output will be up to 50% more cane for sugar. The new economics of agriculture. Why didn't

pre-climate change agriculturists think of that?! They couldn't have because they were not thinking out of the box. Now, neo-agriculturists, as well as neo-economists perform must think of water used in production, not as a dependent but an independent variable, something that can be to the highest degree manipulated, controlled, varied or changed. This is water before the bridge.

The ICRISAT-WWF sugarcane scientists may have been thinking more of Indian sugarcane farmers than those in other lands, but that was natural. They had enough problems in India already! Neo-agriculture will have greater impact in India than the Philippines, simply because in the Land of the Maharajas, there are 36 million sugarcane farmers, and that number is more than the entire population of Canada, estimated at 32 million in 2006, 35 million in 2021 (sustreport.org). This is not to mention the multiplier effect in India on another 50 million who depend on employment generated by the 571 sugar factories and industries using sugar.

It is true that we have only 56,000 Filipino sugarcane farmers (Katharine Adraneda, 2007, newsflash.org), but even then, all of them too have to practice neo-agriculture for cane starting right now. Filipinos, neo-farmers of sugarcane? That would be sweet music to my ears.

For starters, here are some techniques

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prescribed for SSI/neo-agriculture for sugarcane (mostly from the SSI training manual):

- (1) **Raise single-budded setts in nursery.** Grow the setts in trays filled with coconut coir. Being hygroscopic, the coir absorbs water 8-9 times its own weight, then slowly releases the precious liquid to the feeding roots of the setts. Also, nursery-raised settlings are excellent for filling up missing hills at anytime – the nursery settlings are of the same age as the ones growing in the field. They will mature at the same time.
- (2) **Transplant young settlings (25-35 days old).** By then, the settlings are old enough and vigorous to withstand the shock of transplanting. Well-developed, the setts can compete with the weeds better, and can increase cane yield by up to 85% (Yukio Ishimine et al, 1994, University of the Ryukyus, rms1.agsearch.agropedia.affrc.go.jp).
- (3) **Space widely (5x2 feet) in main field.** Rather than at 1.5x2.5 ft, plant at 5x2 ft. This will result in 2 times more millable canes because the setts produce more tillers. It also reduces the number of setts needed from 16,000 3-budded setts to 4,000 single-budded setts to an acre.
- (4) **Apply a trash mulch.** Apply sugarcane trash within 3 days of planting. Mulching is the best practice in controlling weeds. Trash mulch can also increase yield and decrease energy cost (AC Srivastava, 2002, asae.frymulti.com). I myself have written about what Edward H Faulkner calls trash farming in my 'Lesson of the Water Cycle' (20 April 2008, americanchronicle.com).

(Contd. on page 14)

SSI Introduced Districts in India



Scale:- 1:16,000,000

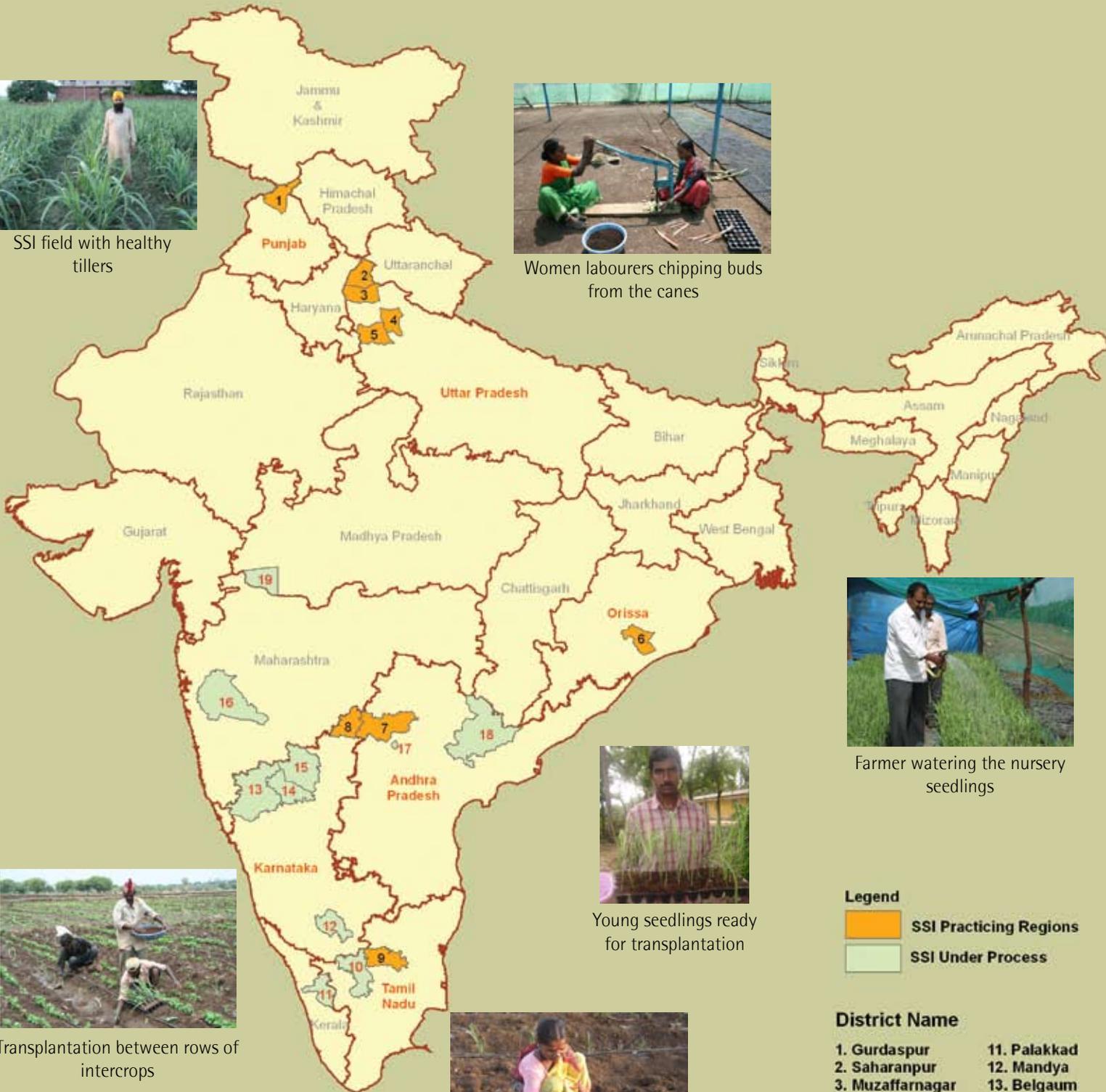
0 200 400 Kilometers



SSI field with healthy tillers



Women labourers chipping buds from the canes



Farmer watering the nursery seedlings



Young seedlings ready for transplantation



Transplantation between rows of intercrops



Cutting of mother shoot

Legend

- SSI Practicing Regions
- SSI Under Process

District Name

- | | |
|------------------|---------------|
| 1. Gurdaspur | 11. Palakkad |
| 2. Saharanpur | 12. Mandya |
| 3. Muzaffarnagar | 13. Belgaum |
| 4. J P Nagar | 14. Bagalkot |
| 5. Bulandshahar | 15. Bijapur |
| 6. Nayagarh | 16. Pune |
| 7. Medak | 17. Hyderabad |
| 8. Bidar | 18. Khammam |
| 9. Salem | 19. Barwani |

SSI interventions

The progress made and the plans ahead

The following is a brief report on the interventions taken up by ICRISAT-WWF project this year in some states across the country.

■ Dr. N. Loganandhan



On field training in one of the Triveni Industries unit in UP

To create awareness about the SSI methods among farmers, sugar factory field staff and other stakeholders, and review its adoptability in different field conditions, the ICRISAT-WWF Project team has taken initiative

of disseminating these practices through capacity development programmes like trainings and field demonstrations in different states across India. The following table details the training programmes undertaken so far:

SSI trainings organized by the ICRISAT-WWF Project team (Sep 2008 to July 2009)

State	Organization	Date of training	No. of participants	
			Staff	Farmers
Uttar Pradesh	Triveni Engineering	26-27 September 2008	5	--
Punjab	Agricultural Technology Management Agency (ATMA), Government of India, Gurdaspur	21-22 January, 2009	--	5
Orissa	NIRMAN, Nayagarh	21-22 January, 2009	1	6
Karnataka	Outreach, Bidar	13 March, 2009	2	6
Tamil Nadu	Thumbal SRI Farmers' Association, Salem, Ponni Sugars, Erode	6-7 May, 2009	--	8
Andhra Pradesh	Kakatiya Sugars, Khammam district	8-10 July, 2009	30	--

This article presents a brief overview of the progress made so far and the future plans as part of this process.

Uttar Pradesh

Uttar Pradesh is first in terms of area under cultivation (2.25 m.ha) and production of sugarcane at 134 m.t (2007). The country's three biggest sugar mills are located in this state. During September 2008, a five member team from Triveni Engineering and Industries (Sugars), UP, the third largest producer in the country, visited the WWF office. The programme included theoretical inputs in classrooms and field level training in the fields of innovative farmers. Detailed practical information on bud chip nursery, planting techniques and water saving technologies was imparted to them.

The visiting staff of Triveni Sugars was impressed with the seed saving, wide spacing and water saving potential of the SSI methods. Subsequently, a partnership has been established with them as a consequence of which, it was decided to conduct experimental trials to field test SSI practices in their factory locations.

Details of the field trials

- ◆ The trials began during February - March this year at four sugar factories located at Khatauli in Muzaffarnagar, Deoband in Saharanpur, Sabitgarh in Bulandshahar and Chandanpur in J.P Nagar.
- ◆ About one lakh seedlings were produced to cover an area of 25 acres.
- ◆ Experiments comprising different treatments are being tried out considering the variations like plant spacing (3-8 X 2 feet), planting direction (N-S and E-W), furrow and drip irrigation, organic and inorganic fertilizers, intercropping etc., along with a control plot with conventional practices to

compare with the performance of SSI methods.

Performance so far

- ◆ Up to 80% of seed materials were saved during the nursery stage
- ◆ More number of tillers were seen per clump (about 8 on an average when compared to 5 in control)
- ◆ Compared to control plots, only 60% of water has been used in the SSI fields
- ◆ The girth (about 10 cm) of individual canes is comparatively better in SSI plots

Future plans

Impressed by the results so far, the management has decided to upscale this method and so has planned to cover 60 ha under SSI this autumn, including about 50 ha in the farmers' fields. The nursery preparation has been initiated and the planting will be carried out in November 2009.

Punjab

Sugarcane is one of the major crops of Punjab, thanks to the availability of abundant water resources. Punjab farmers are known for their enthusiasm in adopting any innovative technology as was evident from the time of Green Revolution. In the month of January 2009, five farmers from ATMA, Gurdaspur district, underwent the SSI training supported by the ICRISAT-WWF project. Soon after the training, the farmers initiated the activities of SSI in their respective fields. Apart from the trainees, some of their neighboring farmers also undertook the SSI practices. Especially, Shri. Sucha Singh Langah, the Hon'ble Minister for Agriculture, Government of Punjab has shown keen interest and has taken up SSI in 1½ acres of his own field.

Efforts taken

Materials like bud-chippers, trays and coco-pith were distributed to

the farmers from ATMA. Farmers initiated their field trials between March and May. It was interesting to note that they have also tried out several other materials like sawdust, vermi-compost, poultry feed, etc., for raising bud chip nursery, in the place of coco-pith.

The present scenario and performance

- ◆ At present, 7 farmers are practicing SSI in an area of 8 acres in this state.
- ◆ The crop shows healthy signs in terms of increase in tiller count (about 8-15, 50% increase from their earlier experience).
- ◆ Intercrops like *maize* and *bhendi* have been *successfully* tried by the farmers.
- ◆ As the seedlings were well established while earthing up, lodging of the crop was minimal.

The path ahead

In the Kisan Mela conducted at Gurdaspur on 10th September 2009, more than 50 farmers evinced keen interest to try this new method and registered their names to know more about it. It is learnt that trainings would soon be conducted for these registered farmers by ATMA and selected farmers among the trainees would be supported with materials to initiate SSI in their fields.

Orissa

Along with the Punjab farmers, six farmers and a staff member from NIRMANN, a local NGO of Nayagarh district, Orissa, underwent the training in the month of January. After the completion of the programme, the farmers appreciated the cost effective SSI practices and showed keen interest in taking up SSI in 4 acres under rainfed conditions. Support in terms of materials like shade net shed, plastic trays and

coco-pith were provided to them to raise nursery. Farmers got involved in the activities very actively and are satisfied with the present status of the crops with promising performance of the sugarcane crop under SSI. Details in this regard can be read from another exclusive article in this publication.

Andhra Pradesh

In 2008-09, the productivity in sugarcane in Andhra Pradesh was reduced to 77 t/ha as against 82 t/ha in the year 2006-07. Considering the demand for SSI methods from many farmers and industry staff, a need for establishing model farms in the vicinity of ICRISAT was felt. In the month of March 2009, about 10,000 seedlings were provided to two farmers of nearby Madgi and Hathanura villages. In the month of July 2009, a training programme was organized for 30 staff members of Kakatiya Sugars in Khammam district by the SSI project team.

In August 20-21, an experience sharing workshop on better management practices was organized by the Consortium of Indian Farmers' Association (CIFA) in Hyderabad, with support from the ICRISAT-WWF Project for selected innovative farmers from Karnataka, Tamil Nadu, Andhra Pradesh and Maharashtra. Delivering the Special Message, Dr. Lakshmi Narayana, I.A.S, Commissioner of Sugarcane, Government of Andhra Pradesh said he was indeed happy to see the presence of farmers' associations participating in the Workshop which will be beneficial to all farmers. He added that, it is indeed wonderful that SSI is getting such wide publicity and as soon as the Manual was released, word came from the Chief Minister and meetings were convened the very next day with the Assistant Cane Commissioners and Managing Directors as well as managers of mills, both public and private, to discuss at greater length the SSI methods and how to disseminate the information. Eminent



Shri. Laxmi Narayana, Cane Commissioner, Govt. of AP, lighting the ceremonial lamp and formally inaugurating the workshop on 'More with Less - Better Management Practices for Improving Productivity in Sugarcane' at Hyderabad in the month of August 2009.

sugarcane scientists Dr. Hapse and Dr. N.V Naidu participated and shared their experiences with the farmers. The benefits of SSI practices were appreciated by the sugarcane experts and farmers alike – in reduction of the cost of cultivation and improvement in cane yields – during the course of deliberations.

The present situation

- ◆ Mr. Anji Reddy, whose case history is carried in this newsletter, has taken up SSI in another plot in 5 acres more, during the month of June. This he has done by raising his own nursery.
- ◆ He has planted soya bean as intercrop in both the plots. The cane crop shows healthy growth under drip irrigation with about 15 tillers (on an average) in each of the clumps.
- ◆ His fields are attracting many visitors, be it farmers, staff of sugar industries from neighbouring districts or government officials.
- ◆ The crop performance is equally good under sub-surface drip

irrigation in the field of another farmer, Mr. Manik Reddy.

Future developments

- ◆ Mr. Anji Reddy is planning to establish a bigger nursery to supply bud chip seedlings to other farmers as additional income generating activity.
- ◆ Plans are on to bring in more farmers under SSI with support from the State Government and nearby mills.
- ◆ Kakatiya Sugars is planning to initiate the SSI methods in 5 acres of its fields in December this year.

Karnataka

Karnataka is also another state with high productivity of cane (88t/ha in 2007). It is known for its rich belt of sugarcane farming, thanks to the Cauvery River basin. Six farmers and two staff members from Outreach, a well known Bangalore based NGO working in the Bidar district of Karnataka visited the ICRISAT-WWF office to undergo training during March this year. They found the SSI methods to be very innovative and expressed interest

to take it up in a limited area to begin with in the forthcoming season.

Further follow up and progress

- ◆ Some support in terms of trays and coco-pith (sufficient for 5 acres) were given during the month of July 2009, to kick start the process of establishing bud chip nursery for the first time in that area.
- ◆ Subsequently, a two-day meeting was organized at Koutha B village of Bidar on 17th and 18th September 2009, in order to initiate the planting in the coming October season.
- ◆ More than 50 farmers participated in the programme organized by Outreach. Six farmers and three staff members from AME, another reputed NGO based in Bangalore and working in the Dharwad district also participated.
- ◆ The Chief Guest of the function, the Assistant General Manager (AGM) of NABARD, encouraged the women members of Self-Help-Groups to take up the bud chip nursery as an income generating activity. He assured them financial support to raise the shade net shed and procurement of required materials to initiate it as a group activity.
- ◆ Nursery activities were initiated to cover 5 acres under SSI in Bidar this autumn season.

Future developments

- ◆ More training programmes in other nearby districts like Bijapur, Bagalkote etc., will be taken up.
- ◆ Demonstration plots will be established in at least one acre in each district with the technical support of ICRISAT-WWF project.
- ◆ Publication of Manuals in local languages will be taken up in the near future with support from NABARD.

Tamil Nadu

Tamil Nadu stands first in sugarcane productivity in India at 105 t/ha (2007). The state is known for its well organized cooperative and private sugar mills. Eight farmers (two supported by Ponni Sugars, Erode and six from SRI Farmers' Association, Thumbal, Salem district) attended a 2-day training programme on SSI in the month of May 2009.

Progress so far

- ◆ Nursery materials to cover an area of 10 acres were provided to the Salem farmers on their request.
- ◆ Planting was initiated in an area of 1.5 acres in the fields of Mr. Baskaran and Mr. Vinod during June-July 2009.
- ◆ Though 25% mortality rate was observed in the nursery due to

their selection of 11-month old canes, there were no such issues in the main field.

- ◆ Presently, crops look healthy with an average of 18 tillers per clump.
- ◆ On 22nd June 2009, an awareness programme on SSI was organized at Thumbal with the support of the SRI Farmers' Association, sponsored by NABARD.
- ◆ Needed support was assured from AGM, NABARD for the SSI trainings in the state.

Conclusion

It is quite encouraging to note the wide adoption of SSI methods by farmers, millers and government agencies alike. The fact that almost all the farmers who underwent the training in SSI methods adopted the

practices shows that the sugarcane farming community has received the SSI methodology well. The ongoing performance of the crop is quite promising in almost all the fields, compared to the crops being cultivated in the conventional methods.

Farmers and field staff are confident that the present signs are indicators of a good harvest. More data and information with regard to improvement in yields and savings in inputs will be shared in this newsletter in the coming months. With the support from farmers, mills, NGOs and government agencies like NABARD, SSI would definitely have a significant role to play in the sugarcane sector of India in the future.

■ Dr. N. Loganandhan is the Visiting Scientist at ICRISAT-WWF Project



Sweet Revolution...

(Contd. from page 9)

- (5) **Avoid flooding.** Do alternate furrow irrigation to minimize water loss, or employ a drip irrigation system. Drip irrigation is where you get 80% savings on water.
- (6) **Go organic.** Gradually switch from inorganic to organic manures and bio-fertilizers. These are natural materials and do not pose any danger to the crop or soil. Organic methods help directly reduce the carbon footprint of sugarcane farming by reducing use of farm chemicals that require fossil fuels that emit carbon dioxide in their production. Organic methods also help build soil, not only add to its fertility.
- (7) **Do bio-control of pests.** Instead of applying pesticides, learn to apply biological methods of minimizing pest damage to your crop. An example of beneficial insects? Lady bugs are predators of aphids, mites, scale insects (Erv Evans, NC State U, ces.ncsu.edu), and caterpillars (Washington State U, spokane-county.wsu.edu).
- (8) **Intercrop.** You can intercrop wheat, potato, cowpea, French bean, chickpea, watermelon and many other crops with sugarcane with your wider spacing between rows and hills. Aside from the extra income, the intercrops will help control weed growth because of the combined denser canopy of the crops, depriving the weeds of sunlight.
- (9) **Ratoon.** Harvest the plant crop when weather conditions are

conducive for stubble growth. Cut the canes close to the ground level.

So: Neo-agriculture is not only saving on water but also saving on fertilizer, saving on seed, saving on cost, saving on time – and saving against pollution of the soil, water and air. This is a paradigm shift in thinking agriculture. I can imagine that neo-agriculture is also good for other high-value crops like hybrid rice, fancy rice, tropical fruits, vegetables, flowers whatever. This is a change in climate in understanding agriculture. Biksham Gujja imagines SSI will replace farmer's practice in 5 years in India. Beyond SSI, I am already imagining Sweet Revolution! 2009.

■ Frank A. Hilario is a popular Filipino writer who is known for his extensive writings on issues of agriculture and other world concerns

SSI: A New Experience in Sugarcane Cultivation

Triveni Industries, as a sugar industry took the first pioneering step in implementing the SSI methods in UP – in the form of trial plots in 4 districts – to improve upon the present sugarcane scenario both for the industry and farmers. And now, encouraged by the results, they plan to extend the SSI methods further in 60 ha this autumn season, including about 50 ha in the farmers' field.

■ **Shri. P. K. Singh**

Background

The role of sugarcane in uplifting rural economy particularly in the Northern plains of India is well accepted. Even after contributing significantly, sugarcane has over the years lost its place of prominence in farmers' field and farmers today consider sugarcane as one of many alternatives. Several factors can be attributed for this decline. The first and foremost is the reduction in returns per unit area of sugarcane, in spite of increase in cane prices. This is mainly because of lower yields and increase in the cost of inputs.

The paying capacities of the factories have also dwindled because of lower sugar recovery, affecting the cane payment to farmers which has further aggravated the situation. The interest and confidence of the farmer in sugarcane can only be restored if he is sure of better returns on sustainable basis. The three variables affecting the returns are yield per unit area, cost of cultivation and certainly the price of the output. The third variable is largely dependent on many volatile factors and Government policies, which are generally not in the hands of the farming community and the scientists. But the first two variables i.e. yield and cost of production can certainly be addressed. Several attempts have been made in the past and some new ones are being tried for improving yields.

It is not that the new technologies tried have not given results, but the fact remains that even after giving results, those technologies could not be further scaled up. This is either due to some adaptability issue or a cumbersome process difficult to understand or even due to last minute cost enhancement. It is important that the technology is farmer friendly, economical and easy to implement in order to improve yields on a sustainable basis. However, before getting into the technological aspects, it is better to understand the problems and the factors affecting cane yield in U.P. Lower yields in U.P can be attributed to the following factors:-

- ◆ Late planting of sugarcane – most of the planting is done after the harvest of wheat in the month of April and May, thus reducing the life span of the crop.

As a consequence, the period for tillering phase is reduced significantly.

- ◆ Narrow spacing between rows – the distance between two rows is generally 60-70 cm or even low. This causes competition for sun light and air among the tillers, which in turn causes severe tiller mortality and heterogeneous cane.
- ◆ Inadequate and imbalanced fertilizer dosage with more focus on use of Nitrogenous Fertilizer.
- ◆ Over dependence on monsoons is adversely affecting the yields especially in the case of failure of or variation in the monsoon pattern.
- ◆ Lower yields in ratoons due to improper ratoon management practices.
- ◆ Irrigation method followed led not only to wastage of water but also created anaerobic condition in the field. Also, high cost of irrigation affect the frequency of irrigation.

There are several other factors relating to field preparation, seed quality, use of organic manure, plant



Triveni Industry staff visiting the sugarcane fields in Andhra Pradesh

protection measures etc., which are also attributed to lower yields. As a result of these factors, not only is the individual cane weight very low (at an average 400-500 gm per cane), but the number of millable canes per unit area is also reduced by over 40% and the average yield ranges from a mere 40 to 60 tonnes/ha in several parts of U.P. Until and unless farmers start getting a yield of 100 tonnes/ha on a sustainable basis, the future of sugar industry will remain uncertain and India might end up becoming the net importer of sugar.

In view of the above facts and replicability issues of the potential technologies, the possibility of getting a yield at the above mentioned level in larger area was a distant dream. But that was until SSI, the sugarcane version of SRI came into the picture.

Opportunities offered by SSI

The following opportunities in this technology are immediately apparent:-

- ◆ Addresses the issue of late planting by raising seedlings and their transplantation later on which actually advances the entire process
- ◆ Addresses the issue of narrow spacing as the technology is based on successful exploitation of sunlight and air by following wider spacing in the main field
- ◆ Addresses the problem of improper method of irrigation, namely, flooding
- ◆ Significant reduction in seed requirement, as only the bud is used as seed material

With this background, Triveni collaborated with the ICRISAT-WWF Project for studying the feasibility of this technology in U.P. with the following terms of reference:

- ◆ Initial target yield of 90 tonnes/ha as against prevailing 50-60 tonnes/ha



- ◆ Reducing water requirement by 30%

Pilot field trials

Before taking this technology to the farmers' field, it was decided that this method will be tested in the Triveni mill farms, located in different units. Triveni conducted field trials at four of its units – Khatauli in Muzaffarnagar, Deoband in Saharanpur, Sabitgarh in Bulandshahar and Chandanpur in J.P Nagar. Apart from adaptability of SSI, effort was dedicated to study the impact of the following variables:-

- ◆ Impact of various spacings on the performance of SSI
- ◆ Impact of sowing direction – North- South Vs. East -West
- ◆ Impact of Ammonium Sulphate in the place of Urea
- ◆ Impact of organic farming by using *Nava Dhanya* and *Amritpani*
- ◆ Performance of different seed material – single budded and two budded setts
- ◆ Effect of different intercrops on SSI
- ◆ Effect of Drip Irrigation
- ◆ Varietal interaction with SSI

One treatment of conventional method as control was also under taken to study the net gains and all expenses incurred are recorded for each treatment. Although there are still almost 4 more months left to harvest the crop, a

distinct difference is visible between the SSI plots and the conventional plots.

Results

Following are some of the observations from the SSI trials:-

- ◆ Enhanced number of millable canes/clump (8 Millable canes per clump against 3-4 in conventional; there are a number of clumps with 15-16 millable canes which is the actual potential of the technology)
- ◆ Increase in the girth of each cane by 30%
- ◆ Increase in height by about 25 cms
- ◆ Saving in seed – 3 qtls/acre as against 25 qtl/acre in the conventional plot
- ◆ Homogeneous cane in SSI with uniform height and girth as against canes of varied height and girth in the conventional plot
- ◆ Net reduction in irrigation hours and this in spite of increased frequency of irrigation
- ◆ The average weight per cane is expected to increase by over 250% when the crop is finally ready for harvest. Being new to the technology, some errors occurred inadvertently or else the performance would have been even better

Learnings:

Some of the learnings to enhance the performance, experienced as part of the process need to be mentioned:-

- ◆ Selection of bud while chipping and for use as seed material is very important
- ◆ Grading at 20-22 days' stages should be done very cautiously
- ◆ In no case should weak seedlings be transplanted
- ◆ Pocket application of fertilizer improves its uptake and effect

Minister with a farmer's heart and soul

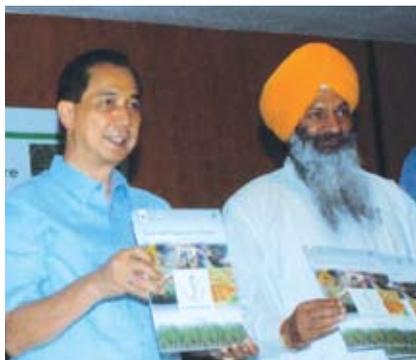
The crisis in conventional sugarcane cultivation in Punjab has been becoming more and more acute every year. It is hardly surprising then that the farmers in the state are more than willing to experiment with the new method of SSI for improved production and overall productivity of sugarcane.

■ Dr. Amrik Singh

Shri. Sucha Singh Langah, who is 55 years old, has been the Minister of Agriculture for the State of Punjab for the last 3 years. He is the owner of 25 acres of land himself and has taken up cultivation of sugarcane and rice among other crops, in his field. His introduction to the SSI methods came when he was invited to attend a four-day Agriculture Development Exhibition and Workshop, organized by the Agricultural Technology Management Agency (ATMA), Gurdaspur under the aegis of Dr. Amrik Singh, Deputy Project Director, ATMA, Gurdaspur who gave a detailed presentation of the SSI methods.

Shri. Langah was so impressed with the possibilities of this new method that he decided to implement it on an experimental basis in 1½ acres

The benefits – both short term and long term – of SSI were so easily apparent that Shri. Sucha Singh Langah, the Minister for Agriculture, Government of Punjab, who himself is a farmer, took up SSI in his fields and is today the greatest advocate of SSI in his state.



Hon'ble Punjab Agriculture Minister Shri. Sucha Singh (right) with the Director General of ICRISAT, Dr. William Dar (left) during the SSI Training Manual release

as a part of which he began the chip bud nursery in March of this year. He has been actively involved in the propagation of the SSI methods to other farmers in the state, bringing more and more focus through the media. His keen interest in SSI prompted him to visit the ICRISAT-WWF Project office and meet the scientists to further enhance his knowledge. It was during this visit that he was able to participate in the official book release of the SSI Trainer's Manual.

As the minister is new to this method, he has been encountering problems in implementing the SSI practices in the field. As he sowed his seedlings in late May, a little later than the other farmers, the growth of cane was slower, though the tillering is quite good at an average of 15 per clump, as against 8-10 tillers in the conventional method. Speaking about the SSI methods and practices, Shri. Sucha Singh Langah says, "As a farmer and the Minister for Agriculture, I understand that SSI is practically beneficial and will bring profits to the sugarcane farmers of Punjab".

■ Dr. Amrik Singh is the Deputy Project Director, ATMA at Gurdaspur

♦ Light earthing up is essential for increasing tillering. Proper compaction of earth near the stem is real earthing up or else there is no use of earthing up

With certain precautions and balancing of activities – which comes naturally with experience – the technology can very well give a yield of 120-150 tonnes/ha, not only on experimental plots but on mass scale also. Wider spacing of rows eases the entire activity taken up, as the labourers have sufficient space for movement and reduced number of rows to work. Hence, SSI is a very easy to use and farmer friendly

technology. Encouraged by the initial response, Triveni is now providing the raised plantlets to the farmers to plant in their own fields. In the next stage, the nursery raising activity will be taken up at the farmers' field as part of the next phase as a strategy for scaling up this technology.

Transporting coco pith from South India is the only concern, as it increases the cost of nursery raising. Already other alternatives to coco pith are being explored, which shall further reduce the cost.

This technology is seen as a suitable and promising alternative to address

the concerns of farmers, industry and the ecological activists. The Government agencies and Agriculture Universities should certainly adopt and take forward this technology, which has been invented by the farmers themselves.

Encouraged by the results in the trial plots, Triveni is now scaling it up further in 60 ha under SSI this autumn, including about 50 ha in the farmers' fields. The nursery preparation has already been initiated and the planting will be done in November 2009.

■ P.K. Singh is the General Manager (Cane), Triveni sugars

SSI field interventions in Nayagarh District of Orissa

Though the farmers of Orissa have been into sugarcane cultivation for a long time now, SSI is a new arena into which these farmers are stepping in with caution but also happiness in their hearts. Below is the intervention of ICRISAT-WWF in extending the necessary technical support for better yields and profits for sugarcane farmers in the state.

■ **Sraban Kumar Dalai and Arundhati Jena**

Overview

Nayagarh district covers 3,890 sq. km. of the geographic area with 41% of the forest area, with a population of 8, 64,516 and with an annual normal rainfall of 1449.1 mm.

There are six sugar mills in Orissa which are in operation, including the Nayagarh Sugar Complex Pvt. Ltd in Nayagarh. Now, according to the State Government and Team Orissa (a State Government agency working on industrial promotion) Report, there are going to be 14 sugar projects in the state. Also, it is interesting to note that the paddy area has been increasingly diverted to non-paddy crops during the years 2005, 2006 and 2007 in the state. Sugarcane is one of the preferred crops for diversion, replacing paddy. Area diverted to sugarcane crop during *kharif* season was 12,792, 4,244 and 5,836 hectares in the above mentioned years respectively. If the statistics of sugarcane area and productivity in Nayagarh district were to be observed for the last 8 years, it shows that the yield hovered between 50 and 70 t/ha. And there was no improvement

in yield beyond 70 t/ha, even though the area under sugarcane has more than doubled!

A Sustainable Sugarcane Initiative (SSI) training was organized along with practical demonstrations at WWF-ICRISAT, followed by a field visit on January 20-21, 2009. Four farmers from Nayagarh district of Orissa attended it. Apart from these trainees, 15 other farmers also got motivated by the SSI methods. They are all marginal and small land holding sugarcane farmers. A total of 4 acres were brought under cultivation using this method in Biruda, Ikiri, Tipura villages of Nayagarh district with the support of NIRMAN, a local NGO.

The materials used for raising nursery like bud chipper, shade net shed, trays and a small quantity of coco-pith were provided through the WWF-ICRISAT project to kick start the SSI adoption in Orissa. In the initial period, farmers used decomposed sawdust, coir waste, vermi-compost, etc., for raising a nursery in the 1.3 acre land in their backyard. Some



problems were encountered here due to ant, termite and rat infestation.

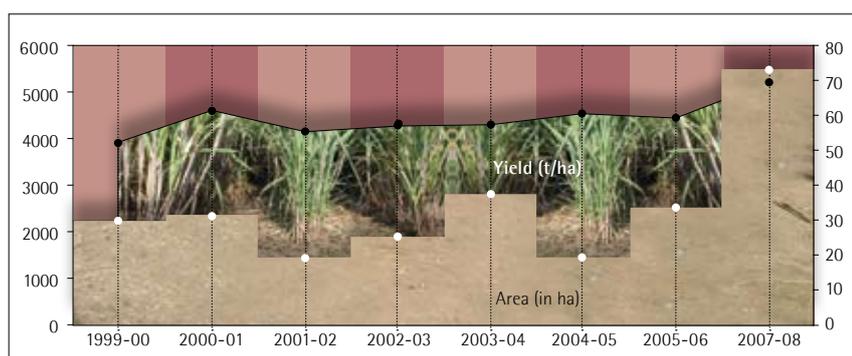
Later, coco-pith was prepared at the NIRMAN office by mixing coir waste and vermi-compost. During the months of February and March, farmers started raising a nursery in the backyard of the NIRMAN office, under the supervision of their staff. The nursery seedlings were healthy and the transplantation was done during the last week of March and first week of April. During that time, three farmers initiated intercropping with the lady's finger (*Bhendi* or Okra) crop.

Results

Presently, the SSI crops in the fields are 6 – 8 months old. The cane varieties planted are 6907 (local), Asika (local) and 86 R 97. The number of tillers varies from 6 to 12 per clump, the girth of canes varies from 3.8 to 5 inches, and the height of canes varies from 1.6 to 2.6 metres.

Future plans

NIRMAN has conducted meetings in two villages of Khairapati and Gopalpur where 7 farmers from the former village agreed to go for SSI in 3 acres and 30 farmers from the latter village agreed to go for it in 7.5 acres. Subsequent meetings are planned in the remaining 12



Farmer's Experience

Mr. Natabar Gochhi has an experience of 30 years in sugarcane cultivation. After attending the training programme and practical demonstration at NIRMAN's office, he adopted the SSI method of cultivation in 0.25 acres of his field. He has used coco-pith along with vermi-compost to raise the nursery. He used about 90 canes (of the variety 6907) to get 1200 bud chips. At present, the age of the plant is 7 months with 8-10 tillers on an average per clump. Girth and height of the cane is 4.5 inches and 2.6 metres, respectively. In the conventional method, 32 quintals of seed materials are required per acre. But in SSI only 25 kg seed materials are required, which is less than 1%. In the conventional method effective tillers are not more than 4-5 per plant.

Mr. Gochhi says that SSI requires less than half of the water that was normally used, as furrow irrigation is practiced just to wet the soil. But it is sad to know that the farmers had to buy water from the bore well owners at the rate of Rs. 3200/acre for a period of six months, mostly from January to June. Nonetheless, adoption of SSI has reduced the burden of this farmer to some extent by saving on water, which otherwise he would have to buy.

Farmer's Name:
Natabar Gochhi
Dist:
Nayagarh, Orissa

villages. Most of the local farmers have agreed to adopt SSI after seeing the current year's results. NIRMAN has planned to cover more areas with centralized nursery by the end of this year.

■ Sraban Kumar Dalai is the GIS Coordinator for ICRISAT-WWF Project

■ Arundhati Jena is the coordinator at NIRMAN, an NGO in Nayagarh, Orissa



After the release of the SSI Training Manual and the media attention given to SSI method - terming it as a 'Ray of Hope for Sugarcane Farmers' - representatives from sugar industry across the country visited ICRISAT to know more about the methods. Some of the visits were captured on camera.



1. Visit by staff from Mawana Sugars from UP (Aug. 3, 2009)
2. Visit of staff from Barwani Sugars from MP (Aug. 26, 2009)
3. ICRISAT-WWF Project team presenting the SSI practices to staff of Ponni Sugars (May 2, 2009)
4. Visit of staff from EID Parry's from Chennai (May 8, 2008)



Anji Reddy

The New Age Farmer of SSI

Anji Reddy was able to make use of the knowledge of researchers and scientists on the one hand and his own experiences on the other to effectively implement the SSI methods in his small plot of land. He took a bold leap into the Unknown, as it were, and came up smelling roses. This is his story and his experience with SSI which is indeed emulatory.

At the age of 51, Barur Anji Reddy is an enthusiastic, practical and innovative farmer. He is agile, has keen interest and has the capacities to go to the core of the problem, whereby his innovativeness. Life has completely changed for Anji Reddy since he implemented the SSI method in his one acre plot which he has now extended to five acres. In fact, his field has become a classic model for SSI all over the state for other farmers to emulate.

The "wonderful magic formula" – as he calls the SSI – has had nearly 500 people visiting his field which includes farmers, industrial and factory representatives and media, to see and learn more from and about this new and innovative method. Over the last few months, Anji Reddy has been featured as an innovative and progressive farmer in most of the audio-visual as well as print media.

Anji Reddy, a Graduate in Geology, lives in Madgi village of Zaheerabad Mandal in Medak district and comes from a family dependent on agriculture. Initially when he began cultivation, he tried several crops unsuccessfully and so moved to sugarcane as it was more resistant to climatic extremities. He would get 25 to 30 tonnes of sugarcane per acre, for which he would have to use 5-6 tonnes of cane as setts.

Tryst with SSI

In 1994-95, he came to know about the Hapse method of cultivation and decided to experiment with it in his

■ Manisha Agarwal

field. In 2006, Anji Reddy went to Tamil Nadu on an exposure visit and learnt about new methodologies in running a nursery. He was introduced to the ICRISAT-WWF project team at the same time and was provided seedlings, training and technical support. Anji Reddy was able to get the other materials like shade net, plastic trays and coco pith. Other than the materials, he was able to get lot of technical support also from the team and he attended several meetings and workshops during this period organized by ICRISAT-WWF Project.

Anji Reddy began SSI in 1 acre as a trial. He expressed that with the conventional method of cane cultivation, the problem with finding labor was immense but with the new SSI method, not so much labor is required. There is lesser use of chemical fertilizer as organic compost is used more and the usage of seed is less and there is greater saving of water.

Saving in Seed Material

Today, Anji Reddy uses 2½ tonnes of cane for his 5 acres of crop. The yield in this method would then be 80 tonnes and more, if the weather and climactic conditions are conducive. By following SSI, almost 3.5 tonnes of canes are left within the field, thus producing about 3.5 quintals more sugar per acre.

He says that if the crops were to be

protected carefully for the initial 3 months, then there will be an assured yield of 100 tonnes per acre (For this he gives the statistics: 5000 plants X 10 millable canes X 2 kg per cane).

Saving in Labour

Anji Reddy says, "In conventional farming, a sugarcane farmer is spending more on the laborers as they are demanding high wages while the factory owners are refusing to pay remunerative prices for the cane so more and more farmers are reduced to shifting to other lucrative crops. But if a farmer adopts SSI, then the labour requirement is reduced. For example: In the conventional method, if 4 tonnes of cane needs to be cut for setts, then at least 8 laborers are required at the rate of 2 people for each tonne. Now with the SSI method, not more than 2 people are required as the seed cane required is just 0.5 tonnes per acre. Which means a farmer can save up to 50% of labor. Labour requirement is also reduced during transplantation and other intercultivation practices because of wider spacing in the SSI methods."

Intercrops – A Bonus

Intercropping is another practice which Anji Reddy feels is like a boon to his field. He says, "if the intercrop is planted immediately after planting the sugarcane, then the risk of weeds growing would come down drastically. As such there is a need for weeding only twice within the crop period".

Speaking about the various inter crops that can be sown along with cane, Anji Reddy says, "French beans can be sown in June and Potato in October. Though sugarcane cultivation is becoming more and more risky, through the SSI method and intercropping, there is much less expenditure, in spite of the hike in prices of almost every commodity today. While the cane seedlings are getting ready in the nursery, the intercrop can be sown in between the rows. If the soil is black cotton soil, then soya bean is a very good option. There is a yield of at least Rs. 25, 000 to Rs.30,000 from the potato crop, which is a bonus to the income from the sugarcane harvest. The total cost of cultivation under SSI does not cross beyond 10 to 15 Thousand Rupees."

"Two legume crops, if sown, can fetch up to 5 to 10 Thousand Rupees per acre. In a cycle of one sugarcane crop – which is the principle crop – musk melon can be sown, to be harvested within the first 60 to 90 days. Then, in the 6 feet wider spacing, ginger or green chillies can be sown and these can be harvested at the end of

6 - 8 months. This list of intercrops can also include paddy, pigeon pea, all varieties of vegetables, etc. So, totally, in 11 months, 2 intercrops can be cultivated."

Fertilizers – Chemical to Organic

"Since I began to follow the SSI method, I was able to reduce the usage of fertilizers by as much as 50%. Instead of randomly sprinkling the fertilizer all over the crop in the field, I mixed the fertilizer in the water that was released to the crop through the drip irrigation. This ensured that fertilizer reached the roots of each plant, which is the aim of the application. Another option for the farmer is to make a small deep hole near each of the plants and put the fertilizer in this hole for it to reach the roots directly."

Water – Saved and Regenerated

"I save nearly 50% of water in 1 acre when compared to the conventional method. Water gets saved right from the time of raising the nursery. The amount of water that goes into

irrigating 1 acre of land under flood irrigation can actually be used for 2 acres of cane and intercrops now. The drip system that I have installed is working very well with the intercrops as well".

Fruits of Success are Sweet Indeed!

Anji Reddy says, "I am able to get a clear profit of around 15 Thousand Rupees per acre on an average, after all the costs are paid off. The money is saved at every level, when buying seed, when buying fertilizers, and there is a reduction in 50% of labor wages. Added to all this, the yield is doubled.

Compared to my earlier yield of 30 to 40 tonnes, today I can get even 100 tonnes per acre. The number of millable tillers has increased from 2-4 to 10-15 per plant. The girth of the cane has also increased manifold. And this became possible because of the SSI methods".

■ Manisha Agarwal is the Communication Officer for ICRISAT-WWF project.



Fundamentals of



Sustainable Sugarcane Initiative (SSI) aims at providing practical options to farmers in improving the productivity of land, water and labour, all at the same time. SSI is also expected to reduce the overall pressure on water resources and contribute to recovery of ecosystems in the long run. Below is a description in brief of some of the essential practices under SSI.

What is SSI?

Sustainable Sugarcane Initiative (SSI) is a system of better management practices that involves use of less seeds, less water and optimum utilisation of fertilizers and land to achieve more yields and profits to farmers and millers alike. It is an alternative to the conventional seed, water and space intensive sugarcane cultivation. The main principles of SSI are:



1 Raising nursery using single budded chips



3 Maintaining wider spacing in the main field

Conventional sugarcane cultivation consumes two to four tonnes of cane per acre because 2-3 budded cane cuttings, called setts, are used as seed material. On the other hand, in SSI, instead of using 2-3 budded cane setts, the area of bud only is chipped with the help of an instrument called Bud Chipper. The chipped buds are then placed in coco-pith (coir waste) filled plastic trays for raising the nursery. Only 500 kilograms of cane needs to be cut to be used for bud chips as seed materials. A point to be noted here is, unlike the conventional method, the seed requirement comes down due to minimum spacing of 5 feet between rows and 2 feet between plants, is recommended under SSI. Of the 500 Kilograms again, only 50 kilograms of bud chips are required for actual use (which is about 95% of saving).

SSI advocates wider spacing between rows and plants (4-6 X 2 ft), unlike the conventional close spacing (1.5 to 2.5 ft) and continuous planting within the row. As a result, only 4000-5000 plants are required per acre in SSI, whereas the conventional method consumes 16,000 three budded setts. Hence, wider spacing in planting under SSI supports easy air and sunlight penetration in the crop canopy for better and healthier cane growth.



2 Transplanting seedlings



4 Providing sufficient moisture to plants and avoiding flooding of water in the field

It is recommended that 25 to 35 day-old seedlings should be used for planting. By then the seedlings are healthy, robust and disease free with 4-6 leaves, due to the systematic nurturing, grading and maintenance in the nursery.

SSI emphasises on providing sufficient moisture to plants rather than inundating the entire field. Thus, about 40 - 80% of water can be saved by measures like raising planting stock in nursery and other water saving techniques like furrow irrigation, irrigation through alternate furrows, drip irrigation and so on. Flooding the entire field, as in the conventional cultivation, consumes not only huge quantity of water (consequently more power) but also affects the growth of the crop.



5 Encouraging application of organic manure, better cultural and plant protection measures

In SSI, farmers are encouraged to practice organic method of cultivation like incorporation of organic manures, application of bio-fertilizers, and use of bio-control measures and so on. Trash mulching and earthing up practices are highly recommended for retention of moisture, enhanced microbial activity and aeration to the roots on the one hand and for better cane growth – the weeds get converted into manure during the earthing up process – and prevention of lodging, on the other. Gradual reduction of inorganic and adoption of organic methods is advised for long-term benefits like reduction in external inputs and improving the quality of cane.



6 Practicing intercropping to utilize land effectively

SSI supports intercropping in sugarcane with crops like wheat, potato, cowpea, French beans, chick pea, water melon, *brinjal* and so on. This practice not only reduces the weed growth up to 60% in the initial 3-4 months but also provides extra income to farmers, in addition to the effective utilization of land.

The SSI method can improve cane yields by 20-50% depending upon the agro-climatic conditions and the efficiency with which farmers adopt these methods. Sugar mills can promote SSI in their operational areas to improve productivity and for assured supply of quality cane, to run the factories for a longer period. Either enterprising farmers can set up nurseries to sell plants to neighbouring farmers and/or mills can establish decentralised nurseries in their operational area to help motivate farmers to go for SSI.

The benefits of SSI are:

- ◆ Reduction in cost of cultivation by 20-30%
- ◆ Reduction in use of labour by 20-30%
- ◆ Reduction in seed material by 95%
- ◆ Water efficiency saved up to 40-70% (depending on the irrigation methods applied)
- ◆ Weed reduction by 40-60% (in the first three months) by raising intercrops
- ◆ Yield improvement of 20-50% (depending on how effectively the SSI practices are implemented)
- ◆ Additional income from intercrops

Other advantages of SSI are: –

- ◆ Better germination %age of seed material
- ◆ Reduced plant mortality rate in the main field
- ◆ Easy transport of young seedlings for longer distance
- ◆ Intercultural operations carried out easily due to wider spacing
- ◆ More accessibility to air and sunlight
- ◆ Reduction in lodging due to earthing up
- ◆ Increase in healthy plant growth due to mulching
- ◆ Reduction in use of chemical fertilizers due to use of organic manure produced as part of mulching
- ◆ Increase in length and weight of each cane
- ◆ High number of millable canes
- ◆ Reduction in duration of crop
- ◆ Optimum land utilisation

Quotes

Sustainable Sugarcane Initiative is people oriented and it will increase productivity and will put to place coping mechanism in future that is to come.

Dr. William Dar,
Director General, ICRISAT

It is an innovative idea, and it is nice to see so many farmers taking up the SSI methods.

Dr. Dave Hoisington,
Deputy Director General- Research, ICRISAT

SSI initiative will bring new hope in sugarcane cultivation for Punjab.

Shri. Sucha Singh,
Hon'ble Agriculture Minister, Punjab

Sustainable Sugarcane Initiative (SSI) has great potential to give additional benefits which are expected to unfold when more and more farmers adopt this technology of 'growing more with less' across the sugarcane growing states in the country.

Shri. Dhruv Mohan Sawhney,
Chairman and Managing Director,
Triveni Engineering Co. Ltd.

The training manual is quite useful and I am sure that it will prove useful in achieving the set goals.

Dr. N. Vijayan Nair,
Director Sugarcane Breeding Institute,
Coimbatore, Tamil Nadu

There are several subsidies and schemes available to sugarcane farmers today. They should make use of these subsidies vis-à-vis the SSI Training Manual for improved production and productivity.

Dr. Laxmi Narayana,
I.A.S, Commissioner of Sugarcane,
Government of Andhra Pradesh

SSI is a profitable alternative for farmers where they can get good returns – through increased production – with very little costs/investments by introducing innovative technologies.

Dr. N.V. Naidu,
Principal Scientist,
Regional Agriculture Research Station (RARS),
Anakapalli in Andhra Pradesh

"This Manual has been prepared specifically to disseminate and describe in detail proper management practices in order to reduce the cost of cultivation, improve water management and increase productivity and will be extremely useful to both sugarcane farmers and sugar producers."

- Dr. P. Murugesha Boopathy,
Vice Chancellor,
Tamil Nadu Agricultural University (TNAU),
Coimbatore

Forthcoming Publications



SSI Training Manual
in Hindi



SSI Training Manual
in Telugu



SSI Training Manual
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