FOR PRIVATE CIRCULATION ONLY

Issue 15 : Sept 2010

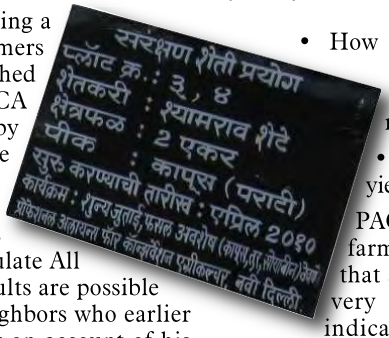
Conservation Agriculture newsletter

Getting Agriculture to Work for People and the Environment

Zero-till Planting of Cotton in Vidarbha - Farmer Shows the Way with PACA Support

The lead article shares PACA's experience at inducting Conservation Agriculture in July 2010 in the rainfed region of Vidarbha, India; otherwise known as a region with a high rate of farmer suicides. Since the story takes a human approach the article has discussed the events surrounding the cotton farmer though sowing was done on a demonstration plot for soya as well.

Shyamrao Shete a small farmer of Hingna village in Vidarbha, about 20km from Nagpur is a much relieved farmer today than he was two months ago. He can now see a good stand of cotton crop on his field. As a small farmer, for over two months he had been anxious and concerned if he would be able to successfully raise his cotton crop using the new approach of conservation agriculture. Shyamrao was exposed to the new concept at a meeting a couple of months ago and unlike other farmers of the region he had left his fields unploughed because he had committed himself to PACA that he would give the technique a try by planting of cotton without ploughing the land in the Kharif season. With the emerging stand of cotton crop, he stands vindicated for the decision taken and has set an example that many are keen to emulate All this because he has realised that good results are possible even without ploughing the land. His neighbors who earlier thought that Shyamrao was sure to suffer on account of his decision are already thinking of switching over to the same approach in their own fields next year.



Cotton planted in Shyamrao's no-till field (above) and the marker board on his field (below)

A Small Beginning Made in February, 2010

It all started with a meeting on February 26, 2010 where the PACA team interacted with a group of 35-40 farmers of village Hingna at the residence of Bhaurao Thakare, a progressive farmer of Hingna village. PACA team shared the concept of "Conservation Agriculture" (CA) with the farmers and how this was relevant to finding solutions to multitude of problems being faced by the farmers of the region. While the farmers appeared to understand and appreciate the tenets of CA and how these might benefit them, they were at a loss to comprehend if and how it would be feasible to translate these principles in terms of farm operations and practices. As was to be expected, the farmers had many questions and expressed apprehensions on the practicality of the approach. The following concerns were shared:

- In absence of ploughing how will the seeds germinate?
- How will the soil get aerated if it is not ploughed?
- Will the rainfall not experience higher runoff?
- Wouldn't there be an issue with controlling weeds?
- How will the wooden marker work on the unploughed land and how will the furrows be formed to sow cotton/soyabean in the rainy season?
- What if seeds did not germinate, affecting yield?

PACA appreciated the well placed concerns of farmers and shared with them their own feelings that adopting CA practices was not going to be a very smooth process. However, the problems indicated were not insurmountable and that farmers and scientists working together could overcome them to make the practice of CA work in the field. The team further shared its plan that if a group of farmers were willing to come forward to try the new approach, PACA would be happy to support them for their technical needs to make a success of the effort. This was a beginning of our contact with Shyamrao Shete who was one of the few who had built conviction and was willing to try out the new technology with all the attendant risks, if technical support was extended to him.

Farmers in Vidarbha Face Unique Problems

The Vidarbha region forming part of the eastern part of Maharashtra state *(see map on following page)* is a semi-arid region where agriculture is the predominant means of rural livelihood pursued. The average annual rainfall varies between 850 to 1100 mm with monsoon active from June to

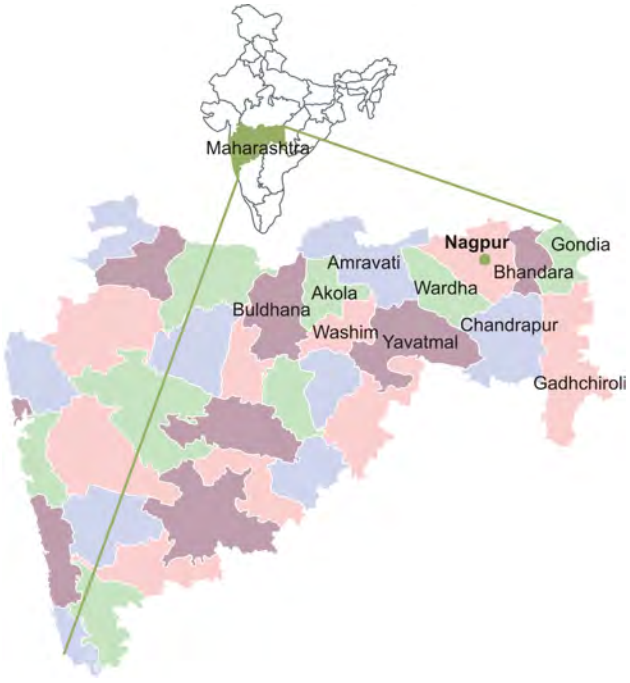
IN THIS ISSUE

mid-September. Nearly 90% of the cultivated area is rainfed with only 10% area having access to irrigation from wells. Soils of the region, the black cotton soils, are heavy textured with depth varying from 100-200 cm or more. Cotton and soyabean are the principal cash crops grown in the kharif season. Pearl millet, sorghum and pulses (eg. toor) are also grown in a sizable area. Where irrigation facilities are available, farmers go for wheat as the post-rainy season crop. In some area farmers tend to go for a second crop of gram in rainfed conditions. Land holding is small, usually between 2-8 acres. Poor plight of farmers in the region resulting from declining output-input ratio in farming is leading to increasing debt and migration to urban areas, a manifestation of increasing disenchantment with the pursuit of agriculture. In our interactions with the farmers several issues were highlighted that reflect how farmers perceive problems being encountered by them:

Shyamrao sharing his experience with Dr. I.P. Abrol, PACA. Also in the picture are Dr. Tayade, Central Institute of Cotton Research, Nagpur (left) and Dr. Abha Paranjpe (far right), Regional Co-ordinator, PACA

- Increasing input costs resulting from increased levels of application and increasing prices over the years with output remaining constant or declining is principally what ails the farmer today. Farmers feel that they have to spend more on every ingredient, be it fertilizers, pesticides, weedicides without getting any additional benefit, so to say.
- Over the years, the decline in soil fertility is evidenced by depleting soil organisms. Similarly the incidence of pests both above and below ground has been on the rise with new and more resistant pests attacking crops.
- In many situations salt deposition is rendering soils hard and impermeable, needing soils to be ploughed deeper. There is also a tendency for greater runoff causing erosion of surface soil.
- Greater uncertainties of rainfall in terms of onset, intermittency and volume with overall rise in temperature are further adding to risks associated with agricultural activities.

Farmers are well aware of problems but to them solutions are nowhere in sight. It is in this context that the PACA team shared the concept of CA approach with the farmers to seek there response if it made sense as a sensible approach to pursue to overcome the problems that were being faced.



Vidarbha region comprises 11 districts of Maharashtra as named on the map

Conservation Agriculture Explained

PACA team took an opportunity in the meeting of 26th February to share with the farmers the concept of CA and how agricultural practices rooted in the principles of CA had the potential to address the very issues they had highlighted. One of the root causes of many problems faced by the farmers was the declining health and quality of soil resources affected by a number of factors. Most importantly, over the years, due to increasing dependence on chemical fertilizers as source of plant nutrient, the farmers were returning little or no organic matter to the soil through manures or crop-residues, among others. With organic matter being a vital component of soil and much required to ensure performance of many of its functions, its decline was impacting productivity and efficiency of nutrient supplying capacity of soils. The farmers understood and agreed that organic matter was the food for soil organisms to grow and multiply and impact the soils capacity to perform host of functions helping maintain good physical, chemical, and biological properties; regulation of water storage and flow; nutrient supply and regulation; etc.

Inducting CA Under Watching Eyes

The farm of Shyamrao Shete was a topic of intense discussion during the period April to June 2010 when various activities like burning the residue, deep ploughing of land, and harrowing before and after first monsoon shower were being done on all surrounding farms. There was no dearth of advice on how and why he should go back to the conventional method of seeding. There was a strong feeling that any marker would not work on such unprepared field and even if sowing could be done, the germination would not take place and the crop would fail. 30th June would always hold a special place in Shyamrao's memory because as he started marking the land and sowing was initiated, 6-7 neighboring farmers, with astonished faces, came rushing to the field. As the sowing progressed farmers passing by too stopped and enquired about what Conservation Agriculture was about. By evening, about 20 farmers had visited the demonstration plot. The visiting farmer Satpal *(see box on next page)* and Dr. Abha Paranjpe, PACA's Regional Co-ordinator were happy to share information to the curious onlooking farmers regarding CA, and PACA's efforts and future plans for Vidarbha. Saving on input cost proved to be the main point of attraction to the farmers while many appreciated the value of timely sowing. They also enquired about the long term impact of CA and showed keenness to practice it in the next season. A few farmers, who had already spent Rs. 4,000/- per acre for ploughing and de-weeding were already considering to adopt CA from the rabi season itself with cultivation of Wheat/Gram.

The main rationale underlying the CA principle was to reverse processes contributing to declining soil health helping enhance productivity. Key tenets of CA include:

- Causing minimal disturbance to soils through practices like no tillage
- Keeping soil surface covered by leaving crop residues on soil surface/ or by growing cover crops, perennial vegetation, etc.
- Adopting varied rotation system (eg. inter-cropping, agro-forestry) including legumes for optimal resource use and conservation.

Adoption of agricultural practices that are in tune with these principles, it was explained, could contribute to reversing processes that contribute to soil degradation making agriculture more sustainable and profitable. In practical terms this implied that farmers not plough their lands, seed crops in unploughed lands and after harvesting the grain leave crop residues on soil surface and allow it to gradually decompose and enrich the soils. The apprehension and fears of farmers was accompanied by the temptation of the benefit that could accrue on account of lowered production costs due to reduction in ploughing and inputs used. Practices like maintaining crop residue on the surface would not only improve soil health but also considerably enhance water entry into soils as also reduce evaporative water losses from fields. The positive outcome of the meeting was that 5 farmers indicated their willingness to try out the new technology of planting cotton/soyabean in unploughed land in the ensuing kharif season.

Adapting the Marker for CA Sowing

Cotton in Vidarbha region is normally sown by dibbling seeds after marking with a bullock pulled "Datar", a wooden implement having adjustable and removable teeth. Datar works well on well ploughed clean harvested fields when the soils are wet to a depth of 8-10 inch. It didn't take much to realise that this implement would not work in unploughed land with residues on it even if the soil was wet. An iron implement similar to the traditional "Datar" was therefore needed and this had to be fabricated by PACA from a local fabricator. Anil Sonole, who was an experienced farmer helped fabricate the needed equipment using a 2.5 inch diameter, 6.5 feet long hollow pipe with 11 holes punched at a distance of 6 inch from each other. Adjustable teeth that were 10 inch long and 2 inch in width end were fixed in the holes with the objective of making a 2 inch slot in the unploughed land. The implement was tested and after carrying out needed adjustments was successfully used to mark and dibble cotton in the demonstration plot. The cost of getting the implement fabricated was Rs 4,000. Although the implement was successfully used to mark and seed cotton it was felt that the hollow pipe used in the implement needed to be of 3" diameter instead of 2.5" to make it a little heavier for the teeth to cut to the required soil depth. This learning has been internalised since.

Locally Fabricated Marker (Datar)

Farming Operation	Cost incurred (Rs/acre)	
	Traditional	CA Approach
Summer ploughing – 2 rounds @ Rs. 400 each	800/-	-
Pre-Monsoon Harrowing – 1 round @ Rs. 400	400/-	-
Harrowing after 1st rain shower – 1 round @ Rs. 400	400/-	-
Pre-sowing weedicide "Round Up" @ 1 litre/acre + labor	-	420/-
Marking and Dibbling (bullock + labor)	600/-	800/-
De-weeding, 3 Blade Hoeings @ Rs. 500/Hoeing	1500/-	900/- (1st spray)
2 Hand De-weeding Operations @ Rs. 500 each	1000/-	320/- (2nd spray)
		200/- (3rd spray)
Total	**4700/-**	**2620/-**

Indicative cost saving for cotton sowing through CA approach

Get a Farmer to Talk to a Farmer

Satpal, a farmer from Sohna, Haryana who has been practicing Conservation Agriculture on his fields under PACA's guidance, was deputed by PACA to stay at Hingna village, Vidarbha for 10 days and help the willing farmers to pursue needed steps during the sowing time for cotton and soya. His presence helped guide and gave confidence to farmers involved.

He began by sharing initial fears that he had to counter when he decided to switch over from traditional farming to zero-till seeding. He then assured farmers that they would save on inputs once they started pursuing CA practices, commencing with not ploughing and harrowing their farm land. Later, as availability of residue increased and got applied to the field as cover they would save on water and inputs too. Incidence of pest and weed growth too had reduced. From his own experience he conveyed that over the last two years he had not needed any pesticides, weedicides and fertilizers on his farm, yet the crop yield was as expected and the soil quality had in fact improved. This measure of confidence building worked well with farmers who better understood CA when conveyed by another experienced farmer. He is now rearing to go to other sites after viewing the results in Vidarbha.

Commitments are Easy to Make, Difficult to Keep

As time went by (around April-May) most farmers of the region, as is the normal practice, started burning standing crop residue on the field to commence ploughing activity. This is the time when those farmers who had volunteered to undertake the new approach started fearing if indeed they should not plough their fields and run the risk by opting to wait for zero-till planting. With peer pressure building up some farmers understandably wriggled out of their commitment and ploughed their land to prepare for conventional seeding. It is at this time that a discussion between farmers and PACA team and scientists from the Central Institute for Cotton Research, Nagpur who had agreed to extend field support prompted three of the farmers to continue with their commitment; Shyamarao of Hinga village (20 km from Nagpur) agreeing to plant cotton on 2 acres, and Kishore Neware and Dilip Neware from village Rui (15 km away from Nagpur) agreeing to plant 1 acre each

Continued on page 8

No-till for Efficient Management of Crop Residue, Irrigation Water, and Fertilizer Nitrogen in Rice-Wheat Rotation

N.S.Pasricha, Potash Research Institute of India

Improved soil and crop management practices that reduce tillage intensity and increase amount of plant residue to return to the soil are needed to increase soil organic matter (SOM) and sustainability of a cropping system. The turning of crop residue C and N into mineral forms (CO_2 and NH_4+/NO_3-) or stabilization into humic substances is determined in part by tillage practices. Conventional tillage (CT) disturbs the soil and may result in the oxidation of crop residue C and N into mineral forms while no-till (NT) practice helps in stabilization of these C and N contents into humic substances. Reduced tillage can alter soil moisture and temperature, that both in turn regulate soil respiration. A common observation is that N supplying potential of soil increases after NT practices have been adopted for a few growing seasons, as does the closely related content of active N. It is especially important to understand how tillage management, that can greatly influence soil NO_3 levels, affects soil N mineralization (N-source) and N use by crop (N-sink).

Wheat crop sown with NT growing in standing straw of rice

Rice-wheat is the most popular cropping system pursued on about 10 million ha of land in India extending across the Indo-gangetic alluvial plain. Sowing of wheat following rice is invariably delayed, as these soils receiving pre-sowing irrigation require considerable time before they can be ploughed and planked for seeding of wheat. Delayed sowing of wheat after 15th November thus reduces grain yield considerably. Farmers often burn rice straw in the fields in order to vacate them at the earliest possible time. This burning practice may eliminate 70-80% C and N held in straw and roots resulting in not only loss of organic carbon (OC) and nutrients but also contributing to green house gas (GHG) emission load. Excessive use and poor efficiency of water and fertilizer N are the other factors for low profitability and un-sustainability of these production systems. To overcome some of these problems, zero-till seed-cum-fertilizer drill is now being used for sowing of wheat in residual moisture (after combine harvesting of rice) without any preparatory tillage in the standing straw of rice.

The objective of controlled experimental station sites reported here was to understand how no-till and residue retained on soil influenced the fertilizer dynamics and needs in wheat crop in a rice-wheat cropping system.

Wheat was sown with zero-till seed-cum-fertilizer-drill (NT) in standing rice straw with residual moisture in one block of three plots as shown in picture above. In the other block of 3 plots, rice straw was cut to ground level and removed from the plots. In this case, wheat was sown by conventional tillage in residual moisture by providing two hoeing followed by planking. Nitrogen as urea was applied uniformly at 150 kg N ha^{-1} to both the tillage treatments along with 60 kg ha-1of P_2O_5 and 60 kg ha^{-1} K_2O. Micro plots confined in iron frames (1.2 m x 1.2 m x 0.45 m size) were maintained in each wheat plot for 15N studies. 15N tagged urea (10 atom % N-15 excess) was applied in micro plots. Measured amount of irrigation was applied in NT and CT plots with 5 irrigations provided to wheat crop till maturity. Immediately after harvest of wheat, soil moisture in two tillage treatments was determined by collecting three 3 cm diameter cores per plot at random. Soil samples were collected from 0 to 0.15, 0.15 to 0.30, 0.30 to 0.60, and 0.60 to 1.20 m soil depths. Each soil core was analyzed separately for moisture content by gravimetric method. Similarly, soil cores collected from micro-plots were analyzed for soil total N and N-15, only results of 0 to 0.15m and 0.15 to 0.30m are reported here since most differences occurred in these layers. Soil, plant and grain samples were analyzed for N, P and K by following standard procedures. International Atomic Energy Agency, IAEA staff, Vienna, Austria under RCA program did analysis for 15N in soil, plant and grain samples.

Total crop residue of rice retained on the soil surface in NT treatment was 3.13 t ha^{-1}. Mean N, P and K content of rice straw were 0.53, 0.11 and 1.55 % respectively, and the mean amount of N, P_2O_5 and K_2O in the residue returned to the soil was 16.6, 7.91 and 59 kg ha^{-1} (Table 1). Total amount of organic carbon added to the soil through the above ground straw of rice in the NT plots was 1.25 t ha^{-1}. On an average, 40% more of organic carbon and around 45% more of N, P and K were returned deploying no-till as compared to conventional till.

Tillage Treatment	Crop residue (t ha-1)		Residue (kg ha-1)			
	Above ground	Root mass	C	N	P_2O_5	K_2O
CTI	-	6.86	3090	36.4	17.28	128
NT	3.13	6.87	4340	53	25.19	187
Increase	-	-	1250	16.6	7.91	59
% Increase	-	-	40.45	45.66	45.77	46.09

Table1. Crop residue C, N, P and K returned in rice straw

Thus land management practice of NT promoting increase in the amount of organic carbon in soil contributes in offsetting CO_2 emissions from open field burning of the rice straw. This practice of NT in the present case will prevent, on an average 4.6 t ha^{-1} of CO_2 from being directly released to the atmosphere. After harvest of rice crop, fields were prepared for sowing of wheat in the CT plots by ploughing twice with tractor followed by planking; while in NT plots, no preparatory tillage was required and wheat was sown with zero-till seed-cum-fertilizer drill in standing rice straw with residual moisture. Saving in 35 HP-tractor running time with NT was 10.88 h ha^{-1}, with a net saving of 32.64 litres of diesel per hectare. At the selling price of INR.32 L^{-1} diesel, there is a net saving of INR 1045/- which is equivalent to US$ 21 ha^{-1}. This can help in reducing the cost of production and net increase in the profitability of the farmer.

Total amount of post-sowing water needed to irrigate the wheat crop to full maturity was less by 1016.5-kilo L ha^{-1} in NT plots. The tube-well run for irrigating NT plots was less by 13 h ha^{-1} as compared to CT. Thus there was a net saving of 100 mm ha^{-1} water in wheat in NT plots. There was no significant difference in the grain yield of wheat sown with NT (6.07 t ha^{-1}) and CT (5.95 t ha^{-1}) method. Water use efficiency in terms of kg grain ha-1 mm^{-1} was higher by 16% in NT as compared to CT. Saving in irrigation water in rice-wheat cropping system is important, as rapid depletion of ground water and constant recession in the water table is the greatest threat to sustainability of rice-wheat production system in the Indo-Gangetic Plains. Analysis of soil cores drawn from different soil depths immediately after the harvest of wheat showed as containing almost 30mm higher moisture content in the NT profile (0 to 1.2m). Higher moisture content in NT can be attributed to lower evaporation losses from the soil surface due to mulching effect of rice straw. In the NT system, crop residues were present as mulch layer on top of soil surface. Thus use of NT practices may allow producers to increase cropping intensities, because NT conserves surface residues and retains water in the profile more than the CT does.

Tillage Treatment	N-content (%)		% 15-N EXC	
	Straw	Grain	Straw	Grain
CT	0.521	2.44	3.645	3.602
NT	0.352	1.973	4.193	4.517

Table 2. N-concentration and % 15-N EXC in straw and grain of wheat crop as influenced by tillage treatment

Data in Table 2 clearly indicates that N content both in straw and grain in NT crop of wheat is lower than that of CT plots. The rate of N applied was 150 kg ha^{-1}, which seems to be not adequate to meet N requirement of NT crop. The crop has, perhaps, less access to soil-derived N, therefore, requires higher fertilizer N than CT crop. A lower uptake of N in NT plots suggests a lower net mineralization in NT plots. This is also apparent from greater % 15N EXC in NT treatment. In the absence of adequate soil derived N, crop plants derived greater N from fertilizer source in NT plots.

Total N harvest was lower in NT as compared to CT plots (Table 3); however, percent N derived from fertilizer at 42 in straw and 45 in grain in NT was almost 15% and 25%, respectively higher than CT treatment, which were only 36.5 in straw and 36 in grain.

Tillage Treatment	N-uptake (kg ha^{-1})			N derived from Fertilizer (%)		N-derived from Fertilizer (kg ha^{-1})		
	Straw	Grain	Total	Straw	Grain	Straw	Grain	Total
CT	39.45	145.2	184.7	36.45	36.02	14.38	52.55	66.93
NT	24.88	119.8	144.6	41.93	45.17	10.53	54.1	64.53

Table 3. Total N uptake and N-derived from fertilizer in wheat crop as influenced by tillage treatment

Soil analysis data on 15N and total N content of soil (0 to 0.30 m) under two tillage treatments (Table 4) show that soil total N content at 1622 kg ha^{-1} in NT plots was greater by about 112 kg ha^{-1} than CT plots at 1510 kg ha^{-1}. This is due to greater mineralization of N in tilled plots and its utilization by wheat. This shows that in tilled plots, because of more mineralization of organic N, there is higher availability and consequent higher uptake in the crop, the amount left in soil is lower than no-till plots. In CT plots, greater levels of soil N have been mineralized due to unrestricted aeration in the plots. The SOM is lost more easily in tilled plots. In NT plots, on the other hand, such SOM remains intact for greater period of time and thus is helpful in improving the soil health. Moreover, most of the remaining mineralized N present in the tilled soil (CT) after the harvest of wheat is

Tillage Treatment	Depth (m)	Soil total N content		Fertilizer N remaining in soil	
		(%)	(kg ha-1)	(% of soil N)	(kg ha-1)
CT	0 - 0.15	0.0444	889	2.008	17.84
	0.15-0.30	0.0311	622	0.427	2.65
	0 - 0.30	-	1511	-	20.49
	0 - 0.15	0.0489	978	2.494	24.39
NT	0.15-0.30	0.0322	644	0.441	2.89
	0 – 0.30	-	1622	-	27.23

Table 4. Soil N content in 0-30 cm layer after harvest of wheat crop as influenced by tillage treatment

invariably in NO_3 form which is liable to be lost through leaching and denitrification as soon as these soils are submerged during the land preparation for transplanting of following crop of rice after wheat in rice-wheat rotation.

The amount of soil total N in the upper 0.3 m layer under NT were higher by 7% and fertilizer N remaining unutilized by crop was higher by 33% than in CT. This fertilizer N is probably present as soil microbial biomass and, on the other hand, even at lower level of fertilizer N remaining in soil in CT plots, a part may be present in mineralized form of NO_3-N, which may be lost through leaching when soils are flooded for field preparation for following rice crop and another part may be lost as N_2O gas due to low oxidation potential of submerged soils. Thus, there is likelihood of apparent retention of more C along with N per unit C input in NT treatment. Therefore, NT or reduced tillage practice is a good option for sustaining rice-wheat cropping system and can safeguard the productivity of Indo-gangetic soils.

These studies clearly suggest that no-till together with crop residue retention on the soil surface can substantially alter/influence the transformation and overall dynamics of fertilizer nitrogen applied to soils including mineralization losses through leaching, denitrification etc. and may offer a strategic intervention for controlling GHG emissions from soils.

Conclusion

With no-till, an estimated 1.25 t C ha^{-1} was sequestered through above ground crop residue that remained anchored to the soil during combine-harvesting of the rice and subsequent sowing of the field with wheat with the help of zero-till seed-cum-fertilizer drill in residual moisture. Conversion from conventional tillage to no-tillage for wheat in rice-wheat cropping system will help in reducing CO_2 loss from cropland due to open-field burning of rice-straw in the Indo-gangetic plains. Our data indicates saving in fuel and more efficient use of post-sowing irrigation water in no-till treatment. The source of plant available N changed slowly in NT plots over growing season and wheat grown with two tillage systems assimilated different quantities of this available N. NT immobilized large quantities of N during decomposition of the residue from the preceding rice crop. A mulched, non-plowed tillage system can potentially affect mineralization through, perhaps, altered soil temperature and altered moisture content. Indo-gangetic plain where rice-wheat production system occupies over 10 million ha of area is now under threat of decreased soil quality and increased ground water depletion and constant recession in water table. Any technology that can help in improving soil health and use efficiency of water and fertilizer N will be highly desirable for sustaining this production system without adversely impacting environmental quality.

Ravine Lands Reclamation and Conservation Agriculture - Workshop Report

As part of the World Bank assisted project, Uttar Pradesh Bhumi Sudhar Nigam (UPBSN) proposes to take up a pilot project on reclamation of ravine lands that occupies around 1.2 mn. ha. area in the state. The workshop was intended to define a strategy that could be replicated over such a large area.

Uttar Pradesh Bhumi Sudhar Nigam (UPBSN), a Government of Uttar Pradesh undertaking, proposes to launch a pilot project on "Reclamation of Ravine Lands" as a part of the phase III of World Bank assisted Sodic Land Reclamation Project. The earlier phases of the project focused on reclamation of sodic lands which occupy large areas in the state. The overall objectives of the project are to reverse water induces processes of land degradation and fertility loss of soils and thereby contribute to enhanced productivity and food security of the poorest section of farmers. It is expected that pilot project, will provide a basis for upscaling efforts aimed at closing the "productivity gap" in the state by promoting new technologies and agronomic practices. The aim of UPBSN sponsored one day workshop held on July 7, 2010 at Lucknow was to seek professional inputs with a view to define a strategy to be adopted during the pilot phase of the project that can in turn be upscaled to larger areas in the post-pilot phase of the project. *The main objective to be addressed during the pilot phase is to demonstrate, adopting watershed based approach, ways to reverse water induced processes of land degradation and to enhance agricultural productivity by focusing on in-situ water conservation, reducing soil erosion, improving soil fertility and natural vegetation through appropriate interventions.* Nearly one hundred participants representing UP state departments and UPBSN, officials of the World Bank and experts in the area of soil and water conservation joined the workshop deliberations.

The term "Ravine" land refers to extensive network of gullies along rivers and estuaries and represents an extreme case of land degradation due to water erosion. Ravines are found extensively in the states of Uttar Pradesh, Madhya Pradesh, Rajasthan and Gujarat.

Ravines of Uttar Pradesh

The formation and extension of ravines is the result of severe misuse, mismanagement and neglect of rainwater and improper agricultural practices in the upper parts of the watershed accounting for some 80% of the watershed area, contribute to the problem. Of the estimated 3.97 million hectares of gullied and ravinous lands in the country, Uttar Pradesh accounts for some 1.23 million hectares. The problem assumes seriousness on account of continued degradation further reducing productive capacity of already degraded lands.

Farming in Ravine Affected Areas in UP

Typical features of a ravinous watershed comprises 3-4 distinct land forms – good agricultural lands in the upper reaches of the watershed followed by sloping terrain increasingly subject to erosion and merging into deformed gullied areas. Due to continued and accelerated erosion the most visible impact is in terms of totally deformed land in the lower reaches. Gullied lands constitute about 15 to 20% of the watershed area, the remaining 80 to 85% of the table and peripheral lands are cultivated to grow a variety of rainfed crops. These areas receive a mean annual rainfall of 550 to 600 mm concentrated in July to September. While the ownership of most medium and deep ravine areas lies with the forest department or the village panchayat, the ownership of all table lands and most of the shallow ravine areas rests with the farmers. Most farmers (80%) own 1-2 ha or less and depend on rain for raising crops. Bajra, Sorghum (millets) and Arhar and Urad (Pulses) are the principle rainy season crops while Barley, Mustard and Gram are the principal post rainy season crops. Farmers grow crops only in one season rotating between rainy and post rainy season cropping in the alternate years. Crop yields are low, often one third to one fourth of the achievable yields. Table lands are largely flat to mildly sloping but due to poor infiltration capacity much of the rainfall is lost as runoff carrying large amounts of surface soils further degrading the soils. Extremely low levels of soil organic matter and poor soil structure principally contribute to low infiltration capacity of soils.

Ravine affected agricultural fields of Uttar Pradesh

Summer ploughing of the land is the main strategy recommended and followed as a way to retain maximum rainwater in-situ. *Most farmers in the region felt that on account of hard setting nature of the soils, more than 70% of the rainfall received was lost as runoff even in the ploughed lands.* Poor capacity of soils to absorb rainwater appears the single most important factor limiting productivity of these lands. Soils being prone to crusting, farmers are frequently forced to reseed crops. Soil associated limitations and uncertainties of rainfall events discourage farmers from adopting improved crop production practices including using improved crop cultivars, fertilizers etc.

Surface Sealing

Livestock forms an important component of the livelihood system. Cattle, buffalo and goats account for bulk of population. With very little cultivated areas (<4%) devoted to fodder production milk productivity is low. Free grazing of cattle is allowed adversely impacting regeneration of vegetation in panchayat and forest lands. It would thus appear that enhancing productivity of table lands constituting some 80% of the watershed area and which form primary source of livelihood for the majority of population is the key issue. Low capacity of soils to absorb rainwater is the primary cause of high volumes of runoff, continued erosion in table lands further reducing their productive capacity and accelerated erosion and expansion of gullied lands downstream. Any strategy to reverse processes of degradation and stabilize/rehabilitate gullied lands must, therefore, focus on improving their productivity by improving in-situ rainwater conservation and reducing runoff and erosion-these being the stated objectives of pilot project.

Past Efforts

Presentations and discussions during the workshop highlighted the approaches and technological interventions adopted in past efforts aimed at rehabilitating ravine lands. It was clear that technological focus of efforts was two-fold:

1. Prevent and/or reduce runoff and soil erosion from cultivated lands and regulate the flow/storage of water downstream. Towards this objective technologies and activities promoted at the field levels includes:
   - Construction/strengthening of field bunds and/or contour bunds involving construction of earthen bunds at suitable interval along the contour in sloping fields.
   - Construction of peripheral bunds along gullied areas to check runoff directly into shallow ravines.
   - Construction of other structures including outlets, in bunds, spillways, gully plugs, check dam etc with a view to store runoff and regulate flow.
2. Promote improved crop production practices in cultivated fields. To achieve this objective practices of cultivation and seeding along the contour line are promoted as a way to improve in-situ moisture conservation. In addition crop demonstrations involving seeds of improved cultivars, use of fertilizers etc are an important component of the overall strategy.

A broad assessment of the past efforts as highlighted during the workshop discussions permit a few conclusions. These are:

- Watershed based approaches which call for priority to reducing runoff and erosion in the upper reaches of the catchments was rarely adhered to, this rendering control of water in the lower reaches an impossible task.
- Undue emphasis on cost intensive construction of earthen bunds/pucca structures did not contribute to enhanced crop productivity, the main objective of the efforts. Construction of bunds does not, in any way help either conserve water in-situ or check soil erosion. Indeed by checking the flow water pounded along the bunds caused more damage to crops than being beneficial in any way. Bunds occupied considerable space, were difficult to maintain and damaged bunds caused accelerated erosion downstream.
- Farmers rarely adopted contour cultivation due to operational difficulties and in the absence of significant improvements in in-situ moisture conservation farmers were hardly enthused to adopt or invest in other crop improvement practices.
- With past approaches having yielded limited or no success it is important that any future efforts take a more considered view of interventions and their sequencing in addressing the problem of rehabilitating ravinous lands.

Conservation Agriculture Approaches – Relevance and Opportunities

It is clear from the above that in any future strategy the balance of focus has to shift from controlling runoff/and erosion to one that contributes to enhancing in-situ conservation by improving the capacity of soils to absorb (infiltration capacity) rain water. Further proposed interventions must contribute to achieving the desired objectives in a cost effective manner and should be replicable over large areas and can be upscaled with limited outside support. It is in this context that CA approaches offer as strategic intervention to improve crop productivity while reversing processes causing soil degradation through runoff and soil erosion. The CA approach essentially call for adopting and promoting agricultural practices which are embedded in some of the scientifically sound and well understood principles which include:

1. Disturbing soil to minimum by practices like ploughing, tillage etc
2. Keeping the soil surface covered by adopting practices like leaving and maintaining crop residues on the soil surface, growing cover crops etc
3. Adopting cropping pattern and sequences in the temporal and spatial context to optimize resource use and conservation

In the context of ravine lands reclamation, the key challenge is to minimize runoff and erosion and conserve water in-situ these being pre-requisite to enhance crop productivity in upper reaches and in turn runoff and erosion causing degradation downstream. Keeping the soil surface covered by leaving and maintaining crop residue on soil surface or growing cover crops is an effective way to improve the capacity of soils to absorb rainwater reducing runoff and erosion. Residues on the soil surface prevent high velocity raindrops directly striking the soil surface reducing soil sealing and permitting greater infiltration. Crop residues on the soil surface also provide resistance to rapid runoff providing greater opportunity for water to infiltrate. More importantly gradual decomposition of residues on the soil surface over a period of time brings about improvements in carbon status, soil structure and biological activity in soils and thus the overall productive capacity. Farmers well understand the benefits of recycling organics. They also well understand the benefits of crop rotations and value of green manure crops as a way to enhance soil fertility. The key challenge during the pilot phase will be to successfully demonstrate the benefits of the, approaches on farmer's field working together with them and building conviction so as to form a basis for upscaling adoption.

Conclusion

Rehabilitations of ravine lands will call for interventions that:

- Focus on improved soil, rainwater and crop management practices embedded in principles of CA to improve productivity of table lands in the context of watershed. Past

Continued on page 9 column 1

Zero-till Planting of Cotton - Vidarbha Farmer Shows the Way with PACA Support

Continued from page 3

of soyabean crop. While these farmers agreed, the fear in their mind was still very apparent and this for good reasons. Unlike most other groups intending to demonstrate a practice or a technology, PACA provided no incentive by way of compensating the farmers by way of cost of inputs or any other means, that farmers have come to consider almost as a right. In a way, this was very encouraging.

Monsoon Sets In

With first rains of the season arriving on 18th of June there was a fresh wave of fear in the mind of the farmers since it was suggested that the crop be seeded only after the weeds sprouted and were controlled by a weedicide. Accordingly , under the advice of Dr. Tayade, the nominated scientist from the Central Institute of Cotton Research, the weedicide 'Round Up' was sprayed at 1litre/acre on 24th June and by 29th all the weeds had perished. Cotton seeds were dibbled on 30th of June with the help of the locally fabricated bullock driven metal marker.

Two cotton seeds were dibbled at a depth of 1.5-2.0 inch by women labourers. Row to row distance of 3 feet and plant to plant distance of 1.5 feet was maintained with 8 women completed sowing of 1 acre in about 5 hrs.

The total time taken for marking and sowing was nearly twice that required traditionally. This was on account of more time for marking the unploughed field and larger population adopted by Shyamrao. This decision to crop at a closer distance was Shyamrao's personal hunch and if the crop comes good, he would stand to gain on account of higher intensity of cropping. Seeds germinated on the 5th day after sowing and no reseeding was required at any spot. A weedicide spray was done when the plants were 15 days old and another flush of weeds was required to be controlled when plants were 1 month old. After the second round of weedicide spray the field was devoid of any weeds and the farmer has applied a dose of fertilizer in the 1st week of August. Shyamrao is happy with the performance of crop thus far, almost 2 months since he had sown the seeds. He is reassured that his decision to take a risk stands vindicated resulting in saving on input costs. He is now looking forward to function as a spokesperson for Conservation Agriculture.

Experience with Soyabean Sowing Demonstration Plot at Vidarbha

Along with sowing of Cotton using CA practices, a similar effort was carried out for Soyabean too. This effort was carried out on two, 1 acre plots at village Rui, 15 km away from Nagpur. Both the plots were kept unploughed after cultivation of wheat in the past Rabi season and were covered with wheat stalks of about 8-10 inches height.

Dr. Tayade, CICR with the two farmers, Dilip Neware (behind) and Kishore Neware (right)

Sowing: With the onset of monsoon in the third week of June the farmers were eager to initiate sowing. As zero-till was to be followed they were advised to wait till weed growth had set in and the soil was wet up to the depth of 6-8 inches. Weed growth was observed within a week's time and a spray of "Round Up" was carried out on 26th June. The weeds perished by 1st July, paving the way for sowing to be carried out on 2nd July.

A tractor driven implement was used on one of the demonstration plots. The teeth adjustment of the implement was done such that furrows 9 inches apart would be made in the soil. Usually 12-14 inches spacing is kept as blade hoeing is to be done to remove weeds. About 40kg seeds and 30kg fertilizer was utilised for sowing on 1 acre of land. As the soil was wet enough, the implement could be easily used to make furrows and do the sowing even though the land had residue on it. No difficulties arose during sowing. One hour was needed to do the sowing operation for this plot.

Sowing on the second demonstration plot was carried out using a bullock driven implement, a cultivator similar to the tractor driven one but smaller in size. The wheat stalks interfered with movement of the implement and the bullocks took more time and needed more draught to pull the implement. The time needed for this operation was 3 hours and the farmer did not face any other difficulty while carrying out sowing.

Post Sowing Scenario: Even though sowing was done successfully, the farmers had doubts about the degree of germination. They also had apprehensions that the weedicide spray carried out 5 days earlier may negatively affect germination. Further, the residue might not allow the seeds to germinate properly. All their fears vanished in a week as germination took place. No re-seeding was needed at any location in the field. The plant growth was as expected in the first 15 days, but along with them, the weeds too had re-emerged bountifully. The weed growth was quiet fast and became a cause for worry and a round of weedicide spray was carried out on 18th July that eliminated the weeds. The weedicide did hamper plant growth for about a week but growth was normal thereafter. A few difficult weeds had to be uprooted manually.

Present Status of Soyabean Fields

At present (August-end 2010) the soyabean plants are about 50 days old, 1-1.5 feet tall and are in the flowering stage. Their growth is satisfactory and comparable to plants on the other plots where traditional methods were used and the sowing too was done 10 days earlier. The problem of weeds is no doubt an important one but the other fields where 2-3 blade hoeing had been done had a high incidence of weeds this year. According to the farmer, the health and the growth of the plants is good, and he is confident that the yield will not be compromised.

Effect of Residue

Part of the Soybean demonstration plot was covered with shredded wheat straw in such a way that no soil was visible. It was observed that there was no weed growth on this patch of land. After sowing, the farmers had a doubt that the seeds in this patch too would not germinate, but all the seeds germinated well. This experience, on however small an area, was very valuable because it proved to be a live demonstration of the initial benefits of residue cover. The farmers could themselves see that the residue prevented weed growth and did not negatively affect the germination or the growth of the crop.

Ravine Lands Reclamation and Conservation Agriculture - Workshop Report

Continued from page 7 column 2

misplaced emphasis on cost intensive engineering approaches to control runoff and erosion in gullied lands must not be repeated. As the efforts in the upper reaches succeed increasing attention should be given to measures downstream.

- Farmers must be involved from the beginning starting with a small number of farmers in a watershed, sharing concepts and defining interventions aimed at improving crop and livestock productivity (availability of fodder through agro-forestry intervention for fuel, fodder and biomass etc.).
- Unlike reclamation of sodic soils which has been pursued by the UPBSN where technological elements (eg. gypsum application etc.) were rather well defined, the technological intervention for rehabilitation of ravine lands are not as definitive. For this reason the approach has to be more flexible and open to allow for choosing situation appropriate options. Thus for seeding crops without tilling the land, modification and adaptation of local/available equipment will be required. Similarly choice of crop/agro-forestry based interventions in different parts of the watershed will need to be arrived at considering farmers needs, past experience and perceptions. Particularly important will be the need to build the context of increasing vulnerability of production system and societies to climate change.
- Unlike in the past, the approach to technological dissemination viz. promoting CA based practices in an integrated manner will be more knowledge intensive and not prescriptive in nature. This will call for developing and strengthening a component of "adaptive research" where in team of scientists from different disciplines work closely with farmers in defining and adapting practices and options which are best suited considering their resource endowments. Adaptive research on the one hand provides a much better feedback to the scientific system as to what works and what does not work and on the other greatly accelerates the uptake and adoption of new technologies by farmers. For this reason a strong component of education/training and technological backstopping will be important during the pilot phase.
- Monitoring resource degradation, eg runoff and soil erosion in the watershed should be an integral component of the project.
- It is important to achieve success and build conviction amongst all partners not withstanding scale of efforts during the pilot phase.

Continuing with our effort to develop content related to Conservation Agriculture in the South Asian context we have uploaded new publications. The publication titled "Maintaining and Improving Soil Health" has been uploaded in English and Hindi languages that also signals the end of the 5 booklet series on Soil.

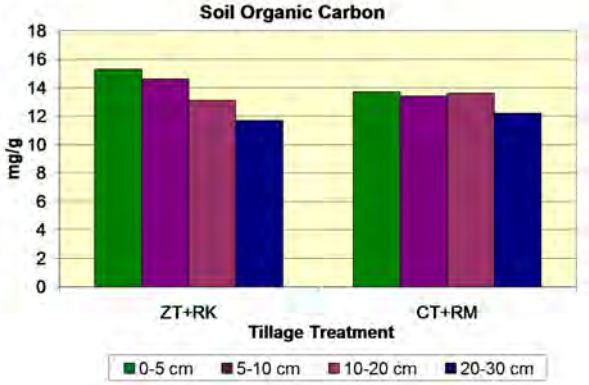
These publications may be downloaded from www.conserveagri.org/content.htm.

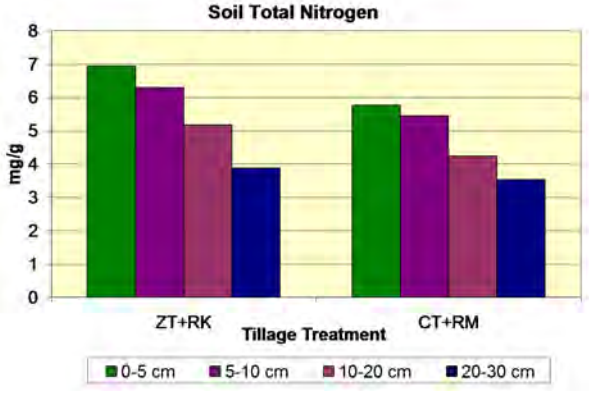
We hope to soon take up a similar series on water and will keep you informed about our plans of "Water for Agriculture". Given the value of this important resource PACA will endeavour to address issues involved having a bearing on this resource that has become a cause of worry to all.

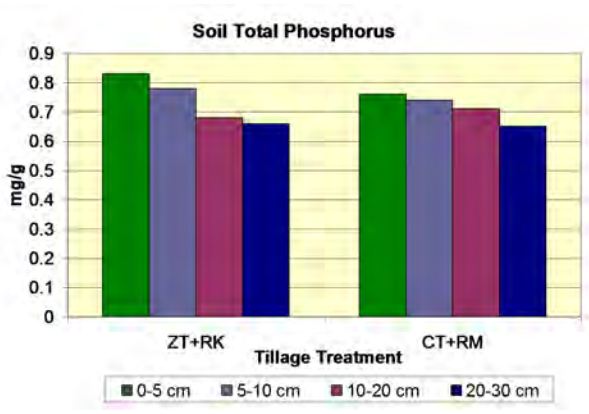
INFOPIX

This section will present research data in pictorial form from past studies for benefit of readers

Conservation Agriculture and Soil Characteristics







In a 4-year study in the semi-arid area of North China, authors compared conventional tillage (with crop residue removed; CT+RM) and zero tillage (with crop residue maintained on the soil surface; ZT+RK). Results showed that over a period of 4 years ZT+RK resulted in increasing soil organic carbon (SOC) content by around 10% in the 0-5 and 5-10 cm layers. Similarly, Soil total Nitrogen (STN) increased by about 18.9% in the 0-5 cm layer and 7.4% in 5-10 cm. While Soil total Phosphorus (STP) was 8.6% higher than under CT in the 0–5 cm layer. ZT+RK thus resulted in improved soil characteristics.

Source: WenQing, H, EnKe, L, ChangRong, Y, Govaerts, B, XuRong, M, CaiXia, Z, Qin, L, Shuang, L, & Castellanos, A 2008, 'Effect of conservation agriculture on the soil biochemical characters in semi-arid area of North China', paper presented at 2nd International Forum on Water and Food, Addis Ababa, Ethiopia, 10-14 Nov.

Happenings

Senior Agricultural Development Advisor, USAID Washington visits CSISA sites in Haryana

Dr. Scott Christiansen, Senior Agricultural Development Advisor, USAID, Washington along with Ms Helen, Intern, USAID, India and Dr. ML Jat, Sr Scientist, CIMMYT visited CSISA sites in Haryana and interacted with public and private sector partners, service providers, Farmers' Cooperatives and farmers to view on-going CSISA activities in the Haryana hub. Dr. Scott was very much impressed to see the progress and farmers' response and awareness on new technologies (laser levelling, DSR, etc) and also the public-private sector partnerships in place. He mentioned that it's a breakthrough in the sense that farmers are very much satisfied with the new technologies and they are aware of the challenges of water scarcity, labour shortages and resource degradation. He emphasised the need for four key technologies, (i) laser levelling (ii) direct seeded rice (DSR) (iii) rice residue management in zero-till wheat, and (iv) introduction of summer mungbean in rice-wheat rotation for the sustainability of the rice-wheat system of the region.

Dr. Scott interacted with an innovative farmer named Surender Singh, Village Chandauli in Panipat District, who for the first time purchased a multi-crop planter for direct seeding of rice on all his 70 acres of land. He also rendered services to nearly 50 farmers on DSR planting. Dr. Scott was amazed to see the spirit with which the work was being done. He also visited and interacted with the farmers in Gudha, Madhuban, Rambha and Taraori cluster of villages in Karnal district and was impressed to see the bountiful DSR crop with farmers seeming well satisfied .

He also interacted with the public (KVK, NDRI, State Dept. of Agriculture) and private sector partners (Hariyali, Dow Agro Sciences, Syngenta, Devgen Seeds and Crop Technologies Pvt Ltd.) and farmers cooperative societies. He also emphasised the need for strong partnerships between US and India not only to work for Indian farmers but also to help farmers of other countries as well.

FAO Develops Parameters for Quantifying and Reporting Conservation Agriculture Worldwide

According to latest FAO updates, Conservation Agriculture is being practiced most extensively in Argentina with 25.6 million hectare area under CA. In India, a beginning is now being made to promote CA approaches and there is need to put in place mechanisms to coordinate, collect, and update information on these lines.

FAO is monitoring the global adoption of Conservation Agriculture and the data presented alongside is the result of an ongoing collaboration between FAO's Conservation Agriculture and AQUASTAT programmes, and presents the latest figures available for all countries that report Conservation Agriculture practices. The reported areas comply with the CA definition, with the following quantifying parameters:

1. Minimal Soil Disturbance: The disturbed area must be less than 15 cm wide or 25% of the cropped area (whichever is lower). No periodic tillage that disturbs a greater area than the above mentioned limits was considered.
2. Soil Cover: Three categories are distinguished - 30-60%, 61-90% and 91%+ ground cover, measured immediately after the planting operation. Soil cover less than 30% would not be considered as conservation agriculture.
3. Crop Rotation: Rotation should involve at least 3 different crops. However, monocropping is not an exclusion factor for the purpose of this data collection but rotation is recorded wherever applied.

According to this concept, the database counts actual land area under annual crops with CA (permanent no-till). Area under perennial crops would be recorded separately. No-till area by crop will not be recorded to avoid double recording of the same land area.

The data has been presented in a script that automatically displays new data as updates become available and can be considered the most up-to-date repository for global implementation of conservation agriculture.

The database on CA land area is being updated and displayed in AquaStat, and other regular sources of information would also be contacted for the next few weeks. Anybody who would like to provide information on the land area under CA systems at the national level is most welcome. Any information on CA area at the sub-national level, together with any relevant historical information on adoption, cropping pattern, farm size, agro-ecology, associated constraints would also be appreciated.

Source: http://www.fao.org/ag/ca/6c.html

Country	1973-1977	1978-1982	1983-1987	1988-1992	1993-1997	1998-2002	2003-2007	2008-2012
Argentina		2	6	500	3,950	15,001	22,708	25,553
Australia	100		400				9,000	17,000
Bolivia						240	706	
Brazil	57	232.5	650	1,350	8,847	18,744	25,502	
Canada				1,951	4,592	8,823	13,481	
Chile							120	180
China							100	1330
Colombia							102	
Finland								200
France	50		50				150	200
Germany							354.1	
Ghana								30
Hungary							8	
Ireland							0.1	
Italy							80	
Kazakhstan							600	1,300
Kenya							15	33.1
Lesotho							0.13	
Mexico							22.8	
Morocco								4
Mozambique							9	
Netherlands	2		5					
New Zealand	75		75		63.16			162
Paraguay					200	1,200	2,094	2,400
Portugal							25	
Slovakia							10	
South Africa	1						300	368
Spain							300	650
Sudan								10
Switzerland							9	
Tunisia						0.027	6	8
Ukraine								100
U.K.	200		275				24	
U.S.A.	2,200		4,800	6,839	17,361	22,400	26,500	
Uruguay						337.5	553.9	655.1
Venezuela							300	
Zambia						40		
Zimbabwe								15

Table showing Conservation Agriculture area globally: >30% ground cover (1000 ha)

Conservation Agriculture as a Sustainable Agricultural Production Model

Conservation Agriculture stands as a solution to problems caused by conventional agriculture, such as greenhouse gas emissions (GHGs), soil erosion, biodiversity loss, and energy consumption. In addition, the conservation practices it promotes are increasingly seen as a way of farming that is in line with the new European legislative requirements. Thus, Conservation Agriculture is being more and more recognised as a real alternative as evidenced by the tremendous increase of the area under these techniques in recent years, not only in Spain but also in other European countries.

Conservation Agriculture reduces or eliminates soil tillage, maintaining soil covered by vegetation or crop residues. This protects the soil from impact of raindrops and increases infiltration, naturally improves the soil structure and fertility, reduces pollution of surface water, promotes carbon sequestration in the soil, and decreases the emission of carbon dioxide. Particularly, Conservation Agriculture greatly reduces soil erosion - over 90% with no-tillage and over 60% with minimum tillage. This ensures good quality ground and surface water bodies due to reduced sediment load, surface runoff, and the consequent reduced off-site transport of pesticides and nutrients.

The residue that permanently covers the soil surface increases biodiversity by promoting the conditions for development of many species as birds, small mammals, reptiles and soil invertebrates, such as earthworms or pest predators. As far as GHG emissions are concerned, the reduction of tillage contributes to atmospheric carbon storage in the soil, as plant organic carbon is retained as soil organic matter (SOM). The higher SOM, achieved through a much lower oxidation of soil carbon contributes to an increase in soil fertility in the medium and long run, allowing the reduction of mineral fertiliser inputs. Furthermore, the need for less traction leads to a reduction of fossil fuel consumption. Compared to conventional soil tillage, crop establishment through Conservation Agriculture may save over 50% of fuel.

Studies conducted in Europe, based on EU 15th implementation report provided that 70% of the farmland was under direct seeding and minimum tillage, leading to a reduction in CO_2 emissions of more than 135 MT per year. This amount represents almost 40% of the annual CO_2 emission reduction target until 2012, which was established at 346 MT CO_2 yr-1. This study assumes that the sequestration of 1 ton of carbon is equivalent to 3.7 tons of CO_2 and that the consumption of 100 litres of fuel produces an emission of 303 kg of CO_2. It is also assumed that direct seeding results in an increase of soil carbon of 0.77 t ha-1 yr1 and minimum tillage of 0.5 t ha-1 yr-1.

Conservation Agriculture is not only a sustainable alternative and an environmentally friendly approach, but is also more profitable than the conventional system. For example, with no-till system in olive groves and annual crops, one can save about 60-80 and 31.5 litre ha-1 yr-1 of fuel, respectively. In total, conservation agriculture reduces energy consumption between 15%-50%, reduces the working time by over 50%, and increases energy efficiency between 25% -100%.

To conclude, nowadays, agriculture is subject to social, economic and environmental pressures, which is the source of growing concern among an increasing number of professionals who demand new technological alternatives. "Conservation Agriculture", and in particular direct seeding and the use of cover crops, belongs to these alternatives and is the best approach to a system that combines high production and sustainability.

Source:http://www.congresoeuropeoac.eu/en/component/content/article/34-novedades/19-agricultura-conservacion

Frame Work for scaling-up Climate Resilient Conservation Agriculture – an Initiative of Uganda

Conservation Agriculture (CA) practices enhance the resilience of the agricultural sectors to the shocks of climate change as well as ensure the attainment of improved livelihoods, crop yields and food security. The Government of Uganda and the COMESA Secretariat convened a national stakeholder's workshop from 12th and 13th July 2010, in Mukono, Uganda, to chart the way forward for scaling up Conservation Agriculture.

Conservation Agriculture (CA) has been identified as a key intervention area in Uganda's Sustainable Land Management Investment Framework that seeks to improve food security, minimise soil degradation, and contribute to climate change adaptation and mitigation efforts.Conservation Agriculture leads to buildup of soil carbon and provides an opportunity for farmers to benefit from selling carbon credits in carbon markets. Once the COMESA Carbon Fund is operational, investment in projects that sequester carbon in the agriculture sector and also link the farmers to the Carbon markets will be increased. Mr. Miti, the COMESA Climate Change Coordinator indicated that achieving measurable progress and successes in climate change adaptation and mitigation requires rapid roll-out of tangible actions such as Climate Resilient CA at the grassroots level. He was of the view that up-scaling of CA is a way of implementing the Bio-carbon initiative that was launched in Poznan, Poland, on the margins of UNFCCC COP by the COMESA Secretary General, Mr. Sindiso Ngwenya.

It was finally agreed upon in the meeting that Uganda should develop a framework that will be anchored on the Comprehensive Africa Agricultural Development Programme (CAADP), Sustainable Land Management Framework, the National Adaptation Plan of Action (NAPA) and the United Nations Conversion to Combat Desertification. COMESA under the Norwegian support would carry forward the development and implementation of the framework for up-scaling of CA.

Source: http://www.comesa.int/lang-en/component/content/article/34-general-news/483-uganda-to-develop-a-frame-work-for-scaling-up-of-climate-resilient-conservation-agriculture

India Certified Crop Adviser (CCA) Program

India CCA Program is part of the International Certified Crop Adviser (ICCA) Program that is one of the professional certification programs of the American Society of Agronomy (ASA). The ASA's ICCA Program is based in the United States but the India CCA is based in New Delhi, India. ASA has partnered on the Cereal System Initiative for South Asia (CSISA), which brings together a range of public and private sector organizations to enable sustainable cereal production in India, Pakistan, Bangladesh, and Nepal. The India CCA Program is a professional development objective of the CSISA project that focuses on individuals who advise farmers. Certification strives to set a standard that individuals meet to prove to others that they are qualified to do the work. Individuals become certified as a professional enhancement and professional development. Employers use the certification to qualify applicants for employment, improve performance and to lower their risk exposure by having a highly qualified work force. Farmers and growers use the certification to ensure that those they work with on agronomic advice are competent, up to date on the latest technology and practices and ethically bound to do what is in their best interests.ASA has partnered through a licensing agreement with the Indian Society of Agribusiness Professionals (ISAP) to be the administrative organization for the India CCA Program. ISAP will coordinate the efforts of the India CCA Board who will implement the policies and procedures of the ICCA Program. The CCA Program is a voluntary program providing a base level of standard through testing and raising that standard through continuing education. Each CCA must meet examination; experience; education and ethical requirements to become certified and to maintain their certification. These standards are basically the same regardless of the country where the crop adviser resides. Any adviser, who spends the majority of their time working with farmers and can meet the standards, has the opportunity to become a CCA and join the more than 12,500 CCAs worldwide. For further information please visit https://www.certifiedcropadviser.org/india

SNIPPETS

Second Announcement- European Congress on Conservation Agriculture

The European Congress on Conservation Agriculture "Towards Agro-Environmental Climate and Energetic Sustainability" has recently come up with its second announcement. The event is being organised in Madrid, Spain, from 4th to 7th October, 2010. The Conference would comprise of plenary as well as technical sessions, covering various topics pertaining to conservation agriculture. For more details regarding the programme, click here.

No-Till Conference-2010

The annual conference of the KwaZulu-Natal No-Till Club is being organised at Drakensberg, South Africa from 7-9 September 2010. The conference aims to cover various aspects pertaining to no-till farming. The 3-day conference would comprise the following:

- Equipment Expo
- Session on "The Future is No-till"
- Session on "Success Stories from No-till Farmers

To know the programme in detail, click here.

National Crop Residue Management Survey

The National Crop Residue Management (CRM) Survey is the only survey in the US to measure at the county level the type of tillage used by crop. Tillage methods tracked are: no-till, mulch-till, reduced-till, and conventional tillage. Data is available online from 1989 to 2008. Some of the data can be accessed without a password (unsecured data) and the rest requires a log in and password (secured data). Passwords are given to institutional and corporate members of Conservation Tillage Information Centre (CTIC). The last full set of National Data was taken in 2004.
Source: http://www.ctic.purdue.edu/CRM/

CIMMYT Graduates its First ever CA-Certified Technicians

After months of training, studying, and practical application, four ASGROW technicians successfully completed a written and applied test on conservation agriculture (CA), achieving the first-ever CIMMYT-approved CA certifications on July, 2010. This was part of a CIMMYT-led initiative to disseminate CA in central Mexico. "Technical Certification in Conservation Agriculture," which focused on CA for highland maize in central Mexico covered CA techniques for all farming stages.

"This certification for technicians in conservation agriculture is very important for CIMMYT," said DG Tom Lumpkin. "It is through these technicians that we are able to promote CA dissemination and achieve advances in Mexican agriculture."
Source: http://blog.cimmyt.org/?p=5484

Expression of Interest for hosting 6th World Congress on Conservation Agriculture

National and regional organisations supporting conservation agriculture are invited to present expression of interest for hosting 6th World Congress on Conservation Agriculture (WCCA) to be held in 2014 for consideration by the International Steering Committee. The last date for receiving the expression of interest is 1st September 2010. To know about the hosting criteria, and other related details, click the link
http://wcca2011.org/downloads/WCCA%206%20expression%20of%20interest%20b.pdf

15th Annual Conservation Agriculture Conference, Australia

The CANFA 15th annual conservation agriculture conference is being orgainsed at Wagga Wagga, New South Wales, Australia, on 16th September 2010. The theme of the conference is "A-Z of No-till Farming - A bit for everyone". One of the topics under this conference would dwell upon how to maximise benefits, and limit the problems associated with stubble retention system. Other topics include disc planters, herbicide incorporation discs vs tynes, the latest review of world grain markets, cover cropping, and precision agriculture.

Zimbabwe's Agricultural Science and Technology Conference

The Zimbabwe's Agricultural Science and Technology Conference is being held at Midlands State University from 27-30 September 2010. The theme of the conference is "Science and Technology for sustainable food production in Zimbabwe's next Agricultural Revolution" and aims at bringing together agricultural researchers, agricultural extensionists, research institutions, universities, agricultural colleges, farmer organizations, foundations, Zimbabwean Development partners, policy makers, policy analysts, etc. to discuss issues relevant to the development of agriculture in Zimbabwe. The conference would cover various aspects in the field of conservation agriculture among various other topics.

PUBLICATIONS

Thierfelder, C. and Wall, P. C. 2010. Rotation in Conservation Agriculture Systems of Zambia: Effects on Soil Quality and Water Relations. Experimental Agriculture, Volume 46, Issue 3, pp. 309-325.

Aurora Sombrero and Avelino de Benito. 2010. Carbon accumulation in soil. Ten-year study of conservation tillage and crop rotation in a semi-arid area of Castile-Leon, Spain. Soil and Tillage Research, Volume 107, Issue 2, April 2010, pp. 64-70.

Wang, J., Huang, J., Zhang L., Rozelle, S. and Farnsworh, H.S. 2010. Why is China's Blue Revolution so "Blue"? The determinants of conservation tillage in China. Journal of Soil and Water Conservation, March 2010, Volume 65, Issue. 2, pp. 113-129
http://www.jswconline.org/content/65/2/113.refs

Ted M. Zobeck and Willia F. Schillinger. 2010. Soil and Water Conservation Advances in the United States. Soil Science Society of America, Inc 677 South Sogoe Road, Madison, WI 53711-1086, USA

Alison J. Eagle, Lucy R. Henry, Lydia P. Olander, Karen Haugen-Kozyra, Neville Millar, and Phil Robertson. 2010. Literature Review: Greenhouse Gas Mitigation Potential of Agricultural Land Management Activities in the U.S. (Draft). Nicholas Institute for Environmental Policy Solutions.
http://www.nicholasinstitute.duke.edu/institute/ecosystem/land/TAGGDLitRevDraft

Toward Sustainable Agricultural Systems in the 21st Century. 2010. Committee on Twenty-First Century Systems Agriculture, National Research Council. ISBN: 978-0-309-14896-2, 598 pages.

Biodiversity, Biofuels, Agroforestry and Conservation Agriculture. 2010. Sustainable Agriculture Reviews, vol. 5, 390 pages.
http://www.springer.com/life+sciences/agriculture/book/978-90-481-9512-1

H. Blanco-Canqui, M. M. Mikha, J. G. Benjamin, L. R. Stone, A. J. Schlegel, D. J. Lyon, M. F. Vigil, P. W. Stahlman, 2009. Regional Study of No-Till Impacts on Near-Surface Aggregate Properties that Influence Soil Erodibility. Soil Science Society of America Journal, vol. 73, no. 4, pp. 361.
http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1012&context=panhandleresext

Mbah, CN, Nneji, RK, 2010. Effect of Different Crop Residue Management Techniques on Selected Soil Properties and Grain Production of Maize, J. Appl. Sci. Res., vol. 6, no. 2, pp. 151-155.
http://www.insipub.com/jasr/2010/151-155.pdf

We look forward to hear from you on Conservation Agriculture practices in your region. We would also be happy to consider an article on the subject of conservation agriculture if you desire to contribute to our newsletter.