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Getting Agriculture to Work for People and the Environment

Development of Happy Seeder for Direct Drilling of Wheat into Combine-harvested Rice Fields

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Development of the Happy Seeder (HS) machine was initiated at Punjab Agricultural University, Ludhiana in collaboration with Australian scientists and funded by the Australian Centre for International Agricultural Research (ACIAR) in 2002. There are three major prototypes developed till date, each being an improvement on the previous versions and having their own particular advantages. The first two versions helped cut and lift the standing stubble and loose straw ahead of the sowing tynes so that they could engage in bare soil, and then deposit the stubble as mulch on the sown area behind the seed drill. The third version of the Happy Seeder consists of a rotor for managing the paddy residues and a zero till drill for sowing wheat. Flails are mounted on the straw management rotor that cuts (hits/shear) the standing stubbles/loose straw encountered in front of the sowing tyne and cleans each tyne twice in one rotation of rotor for proper placement of seed in soil. The rotor blades/flails guide the residue as surface mulch between seeded rows. Fine-tuning of the third prototype was carried out in the second phase of the ACIAR project (2007-10) in collaboration with Charles Sturt University, Wagga Wagga, Australia. The features of the three prototypes are summarised below, followed by the results of experiments to evaluate design and operating configurations.

Fig.1 Happy seeder with no-till drill with inverted T type furrow openers

Prototype 1: The first prototype of the Happy Seeder (HS) was a trailing machine developed in 2002 that consisted of two separate units, a straw management unit, and a sowing unit. The straw management unit comprised a forage harvester with modified chute that would cut, lift and throw the standing stubble and loose straw. This was backed by a no-till seed drill with inverted T type furrow openers (the sowing unit), which followed the straw management unit and conducted the sowing activity concurrently (Fig 1). The initial field trials of the machine were conducted at a PAU, research farm during year 2003-04 with satisfactory machine performance and crop establishment results. Prototype I was improved upon by balancing the rotor to reduce vibration and adding safety guards for drive belts.

Establishment and wheat yield were similar with and without residue *(Sidhu et al., 2007)*. Weed biomass was also reduced by almost 50% in mulched treatments compared to those without mulch. Prototype I could also be used for collecting rice residue for other uses (e.g. cardboard manufacture, animal fodder) and to cut and collect grass.

Prototype 2: To overcome the problems of poor maneuverability and visibility the seeding unit, the straw management and sowing units were combined into a single, compact unit that could be lifted on the three-point linkage of a 45hp tractor. The machine has the same sowing configuration as the standard zero-till drill with 9 row inverted T-tynes spaced 20 cm apart. A light weight (540 kg) tractor mounted new machine called "Combo Happy Seeder" was developed (Fig. 2) that could cut and manage the straw from seed row (having width of 8 cm cut only). This reduces the straw load on the germinating wheat seeds and power requirement of the tractor. The "Combo+Happy Seeder" unit includes strip tillage in front of the inverted T-tynes to improve establishment and was tested extensively during 2004-05 and 2005-06. The results showed similar or higher yields by sowing into rice residue with the Combo+ compared with the farmers' practice of burning and conventional tillage, with an average yield increase of about 10% *(Sidhu et al., 2007)*. However, the Combo design had some disadvantages, including considerable dust generation and difficulty in lining up adjacent sowing passes accurately *(Sidhu et al., 2008)*.

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Fig 2. Combo Happy Seeder

The sown rows were difficult to see, especially with partial cutting of standing straw. Also, both Combo machines required a minimum of 45 hp to power and lift the machines.

Prototype 3: In 2005, PAU and Dasmesh Mechanical Works, Ahmedgarh (Punjab) developed the variant with a different approach. In the emerging Turbo Happy Seeder there is no chute that greatly reduces the amount of dust (Fig. 3). Instead, the straw is chopped finely with the inclusion of fixed blades on the inside of the rotor volute and concave rotor blades in front of the improved design inverted-T sowing tynes. All the furrow openers (tynes) are now on the same bar and are curved so that there is only a very small clearance (15 mm) between the rotating flails and tynes, which are swept clean twice with every revolution of the rotor and the straw is fed between the tynes. As a result, the sowing lines are now more exposed, and visible. The rotor speed is only marginally higher than in Combo Happy Seeder (1300-1500 rpm). Moreover, the Turbo Seeder does not have a strip-till mechanism and the tynes are on a single toolbar.

Fine Tuning of Turbo Happy Seeder

Fine tuning of Turbo Happy Seeder machine was carried out during years 2007-08 and 2009-10 based on feedback from extension functionaries.

- Choking of Machine Under Heavy Straw Load: The problem of machine choking was solved by increasing the straw management drum diameter from 580 mm to 750 mm which increased the window opening area for straw removal/ passage by 60 %. With this modification any issues emanating from choking of the Happy Seeder with loose rice straw was completely overcome.
- Power Requirement and Weight of Machine: The power requirement of Happy Seeder was reduced by decreasing the number of tynes (furrow openers) from nine to seven (increasing row spacing from 20 cm to 25.7 cm) and changing the shape of rotor flails. The power requirement/ load on tractor was reduced by 20 % for a 7 row machine compared to the 9 row machine. On-farm trials conducted in Sangrur district of Punjab however, showed that average wheat yield for 7-row machine was lower by 0.3 t/ha compared with 9-row machine. Poor performance of 7-row HS was due to 20% less seed-row spacing and this may create hesitation in farmers mind in the adoption of this new machine. Therefore, study was undertaken to reduce the power requirement of 9-row Happy Seeder so it could be run with a 38 hp tractor available in the market.

Fig. 3 Turbo HS sowing wheat in rice residue and wheat crop stand in rice residue

In earlier versions of Happy Seeder 'J' type flails were used for managing residue. New type of serrated gamma flails were developed and tested for load on the tractor. It was observed that load on the tractor (calculated on fuel consumption basis) was reduced by 15 % and 6 % by changing the blade shape from 'J type' to gamma & serrated gamma type flails shapes, respectively (Table 1). It was observed that in case of serrated gamma flails, small pieces of straw got stuck in blades and reduced the cutting ability of flails. This could also be the reason for higher fuel consumption compared to plain gamma blades. The new version of the Happy Seeder with 20 cm row to row spacing can now be operated with a 38 hp double clutch tractor after changing flails from 'J type' to gamma type.

Table 1. Comparative fuel consumption for 'J' gamma and serrated gamma type flails

Location	Straw Load (t/ha)	Fuel consumed (ltr/ha)			% reduction in fuel consumed against 'J' type	
		J type	Gamma	Serrated gamma	Gamma	Serrated gamma
Field 1	Medium	7.85±0.24	6.84±0.08	7.33±0.25	12.8	4
Field 2	High	9.01±0.55	7.46±0.16	8.73±0.28	17.2	7.6

The new version of Happy Seeder with gamma flails, straw management rotor (140 mm), drum diameter (750 mm), and flail tyne overlap of 60 mm were standardised (Table 2). These specifications have now been recommended to all the Happy Seeder manufacturers of the state.

On-farm Evaluation of 9-row Happy Seeder

Punjab Agricultural University, Ludhiana along with Department of Agriculture, Punjab has carried out demonstration and field evaluation trials of 9-row Happy Seeder in different districts from year 2007-08 to 2009-10. A total of about 162 demo sites in 12 districts were established by the Dept. of Agriculture, Govt. of Punjab Happy Seeder project in collaboration with CSISA Hub . Yield trends and farmers' response showed that wheat yields are either similar or higher than the conventionally sown wheat. The average wheat yield was 4.58 and 4.46 t/ha for Happy Seeder and conventional wheat plots, respectively (Table 3). Similar trend was observed for all three years and weighted average wheat yield for Happy Seeder sown plots was 2.7% more than the conventional sown wheat.

Table 2. Specifications of improved version of Turbo Happy Seeder

Horse Power Requirement	40 hp tractor with double clutch
Field Capacity	0.25-0.30 ha/hr
Working width of machine	2.0 m
Row to row distance:	225 mm
Weight of machine	550 kg
No. of rows	9
Rotor drum diameter	750 mm
Rotor diameter	140 mm
Types of flail blades	Reversible straight gamma type
Flails length from rotor surface	240 mm
Blade Overlap with furrow openers	60 mm
Blade cutting width	75 mm
No. of wheels with adjustable depth	2

Table 3. Wheat yields (t/ha) for Happy Seeder and conventional sown plots for years 2007-08 to 2009-10 (Punjab, India)

Districts	Year (locations)	Yield (t/ha)	% increase*	
			CT	HS
4	2007-08 (46)	4.59	4.73	3.02
2	2008-09 (14)	4.34	4.54	4.61
12	2009-10 (94)	4.35	4.48	3.15
	Mean (162)	4.46	4.58	3.2

** Over conventional*

Adoption of Happy Seeder technology in Punjab

With the active participation of Department of Agriculture, Punjab and various Co-operative societies in the state; total area under Happy Seeder sown wheat has increased to 752 ha compared to 280 ha sown during 2008-09, showing an increase of 150% (Fig. 4). It is estimated that 250 Happy Seeders are available in Punjab state that will have sown ~ 2000 ha (an increase by about three times over 2009-10) of wheat in paddy residues during 2010-11.

Kamboj Mechanical Works, Ramdass Amritsar have sold 21 machines to farmers and co-operative societies of the state

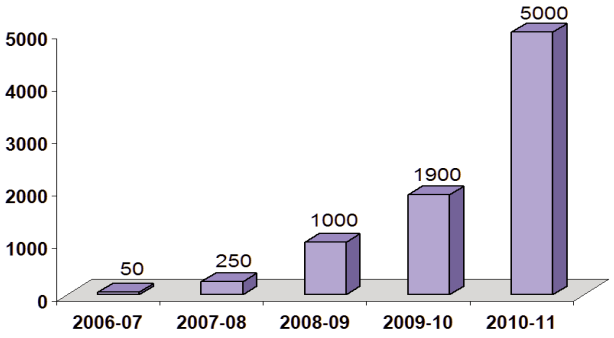

Fig. 4. Growth in Area Covered (acres) Under Happy Seeder in Punjab

during wheat season 2009-10. These famers and societies have used Happy Seeder for sowing wheat; and farmers (at most locations) are happy with the machine's performance and wheat yields. In a major Punjab Govt. initiative to reduce paddy straw burning, the Punjab State Farmers commission has distributed 160 Happy Seeder machines among Primary Agriculture Cooperative Societies (PACS) in the state. Total number of Happy Seeder machines sold during 2009-10 were 31, which has increased to 180 during 2010-11 (Table 4).

Table 4. Number of Happy Seeders sold during 2007-08 to 2010-11

Year	PAU	Dept.	Co-op.	Farmers	CSISA	Exports	Total
2007-08	1	1	0	2	-	7	11
2008-09	7	16	5	8	-	13	49
2009-10	4	6	4	10	7	-	31
2010-11	-	-	160	20	-	-	180
Total	12	23	169	40	7	20	271

Kamboj Mechanical Works, Ramdass (Amritsar) and Dasmesh Mechanical Works, Amargarh (Sangur) have so far supplied 80 Happy Seeder machines each. Dasmesh Agro Works, Moonak (Sangrur) has also commenced manufacture of Happy Seeders.

Use of Happy Seeder for sowing of alternate crops

Short duration variety of mungbean (SML 668) can be directly sown as catch into wheat residue after combine harvesting of wheat. Adaptive trials on mungbean showed that the average pulse yield was 3% higher with Happy Seeder sown crop compared to conventional tillage system. This practice can help save tillage costs, reduce soil temperature as well as evaporation losses. Based on results of these adaptive trials PAU, Ludhiana has recommended direct sowing of mungbean into the crop residue using HS.

Maize fodder can also be successfully sown in the combine harvested wheat fields in the month of April. One progressive farmer in Amritsar district has sown maize (variety J1006) as fodder on an area of 5 ha during 2009-10 that yielded more than 8t/ha providing additional income of about Rs. 56,000.

Summary

Rice residue burning is a serious environmental issue. The Happy Seeder machine developed by PAU is a promising technology to manage paddy residue and promote CA in the rice-wheat system. It is a good example of a productive collaboration between PAU, ACIAR and the private sector. The area under HS Technology is slowly increasing with joint efforts of PAU Ludhiana and Department of Agriculture, Punjab. In order to enhance the adoption of the Happy Seeder technology, it is suggested that a machine along with tractor be provided to cooperative societies in their villages. On account of its high cost (approx. Rs.115,000) and limited use, subsidy for purchase of Happy Seeder may be increased to 50% of its cost so that its use can be extended to large areas to address the problem of straw burning. As part of promotional efforts, instead of penalising farmers who burn residues, it will be better to provide an incentive of Rs. 500 per acre to farmers who do not burn the residue for an initial period of 5 years.

Financial Assessment of Happy Seeder

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India has only 3% of land crop area, whereas it feeds 17% of the world's population. This has become possible because the state of Punjab itself grows nearly 60-70% of wheat and 40-50% of rice procured for the public distribution system. As such there is tremendous pressure to increase production and productivity of field crops to achieve this goal. A fallout of this phenomenon has been that Punjab has had to pay a heavy price in terms of its depleting underground water table, deteriorating soil health, and environmental pollution. Thinking is now shifting to introduce sustainable ways of agriculture to be adopted to prevent soil depletion, water depletion, and serious health risk to the population.

Rice-wheat is the predominant crop system in the state. As a practice, more than 80% of wheat residue is collected by farmers, after combine harvesting using straw combine, and fed to animals. Rice straw is considered poor feed for animals due to its high silica content leading to burning as a cheap and rapid option to clear the field. However it is well known that this action has an adverse effect on organic matter, human and animal health. Realisation is dawning that burning has resulted in giving rise to serious problems of environmental degradation leading to questioning of sustainability of rice-wheat crop system in Punjab. Key impacts can be summed up as below:

1. **Loss of soil nutrients:** In Punjab almost 1.7 mt i.e. 90 per cent of paddy straw is burnt every year and with its burning is lost; carbon, nitrogen, sulphur etc.
2. **Effect of smoke on human health:** The burning of 17 mt of rice residue releases 22t of CO_2, 0.92t of CO and 0.03t of SO_2. More than 60 per cent people of paddy belt in Punjab have been affected from such pollution. Inhaling of fine particulate matter causes lung disease, coughing, shortness of breath and decreased lung function; particularly affecting asthmatic patients, heart patients, children, geriatrics and pregnant women. It has been observed that during 20-25 days of straw burning, the average number of patients reported increases up to 10 per cent and per patient's expenditure increases up to Rs. 250-300.
3. **Impact of smoke on animal health:** Inhaling fine particulate matter (FPM) adversely affects animal health too. It causes corneal irritation and temporary blindness, and chronic bronchitis leading to asthma like conditions. Severe exposure leads to potential decrease in milk yield, and sometimes death of animal due to conversion of normal Hb to deadly Hb because of high level of CO_2 and CO in the blood.
4. **Problems of traffic:** Thick clouds of smoke emerging from burning of rice straw can many a times engulf roads, causing accidents and blocking or slowing down traffic especially on countryside roads. At locations of dense smoke, journey takes approximately 20 per cent more time, impacting on time as well as fuel costs.
5. **Loss of bio-diversity:** Plants and trees standing on bunds, road sides and canal sides of 2-3 meter height are adversely affected due to straw burning. Micro flora and fauna present in the soil are also destroyed due to burning which leads to loss of biodiversity.

On account of very little turn around time between rice harvested and wheat sown, and lack of appropriate technology for residue deployment, management of paddy straw is a serious problem. Until recently, direct drilling of any crop into combine harvested rice stubbles had not been possible without prior burning or removal of paddy straw.

Punjab Agricultural University has worked closely with Punjab farmers and played a major role in sustaining the rich economy of the state. Its technologies were always well appreciated and adopted by progressive farmers of the state. To solve the problem of burning of rice residue, a new machine called Happy Seeder that is capable of direct drilling wheat seed into standing heavy rice residue loads in a single operation has been developed by the PAU Scientists in collaboration with Australian Scientists with the financial support of ACIAR, Australia. Once Happy Seeder Technology (HST) was developed it was refined for wider adoption.

Research Project Initiated by ACIAR

A research project "Fine Tuning of Happy Seeder Technology for Adoption in India" was sponsored by ACIAR, Australia in this context from the years 2007 to 2010. The project was aimed at following major objectives related to economic assessment and impact:

- Collect information from field/farmers' trials regionally
- Study issues related with the use of machinery
- Carry out gross margin analysis of input/output data.

This study was conducted in Punjab and Uttar Pradesh states. Three sites from Punjab representing different agro-climatic conditions w.r.t soil, water and climate were selected viz. Amritsar, Sangrur and Fatehgarh Sahib. Two sites namely Meerut and Ghaziabad were selected from UP, both falling under the jurisdiction of SVP Patel University of Agriculture & Technology, Modipuram (U.P.).

Sampling plan: Total sample of 39, 38 and 38 farmers who have sown their wheat with Happy Seeder was taken in years 2007-08, 2008-09 and 2009-10 respectively for the purpose of the study (Table 1).

Table 1: No. of Farmers Studied

State	2007-08 (Nos.)	2008-09 (Nos.)	2009-10 (Nos.)
Punjab	30	26	26
UP	9	12	12
Total	39	38	38

A specific comprehensive schedule was prepared to collect information from farmers using HST through a personal interview method. Partial budgeting technique was used for carrying out the financial analysis of HST and the realized benefits and problems of HST were determined. Suggestions for fine tuning of HST were also sought from respondents.

Benefits realised from Happy Seeder Technology

By deploying the Happy Seeder, straw can be easily managed without burning and it's retention enhances the productivity of soil. Omitting cultivation operations of land preparation on account of zero-till reduces the cost of cultivation. Wheat can be sown with HST following paddy harvest in residual soil moisture after 20th of October and thus eliminates the need for pre-sowing irrigation. Rice residue mulching too has

a significant effect on soil water conservation by reducing evaporation losses. Apart from this there is a reduction in the time taken for irrigation for the first and second irrigations when wheat is sown with HST. Apart from this, 30% water saving has been estimated and this saving leads to saving in electricity and lower pumping costs.

Paddy straw mulch and zero tillage have potential to control weed growth by more than 65% as compared to tillage without mulch. Hence, paddy residues as mulch help reduce use of weedicides and makes farming more economical and eco-friendly. Surface retention of rice straw mulch also helps in recycling of plant nutrients that otherwise are lost during burning. When practiced over a longer term, this can result in saving of fertilizer in successive crops.

- Effect on atmosphere: Avoidance of burning of rice straw helps in reduction of GHG emission and air quality improves. Biodiversity gets protected and sequestration of carbon helps to reduce CO_2 emissions significantly as well.
- Benefit to society: With the use of HST and reduction in need for straw burning, problems of human health, animal health and hindrance to traffic stand addressed. Saving of water and electricity benefits society and further conserves precious resources such as coal, diesel etc.

Economic value of benefits of Happy Seeder

Assumptions used in economic assessment of the HST are:

- Fertilizer savings: From 10% (after 5 years) to 15% (after 10 years)
- Yield increase: 0-5%
- Weedicide: 50 % (from 1st year)
- Saving of water: 12 cm/ha (30%) (if pre-sowing irrigation is saved)
- Saving of electricity: 168 kWh/ha
- Labour saved: 30 hrs/ha or Rs. 450/ha
- Lower pumping cost: Rs 50-165/ha (centrifug. & submers.)
- Lower machinery use: 7.5 hrs/ha (45 litres of dieselsaved)

Financial Analysis

There was a saving of Rs. 5,912/- per hectare from HST over conventional tillage as shown in Table 2.

Table 2: Cost saving in sowing of wheat with different methods (on contract basis)

Option	Cost (Rs./ha)
Stubble incorporated Conventional Tillage (CT)	22,350
Stubble mulch using Happy Seeder Technology (HST)	16,338
Annual Net Savings from HST over stubble based CT	5,912

Among methods of sowing of wheat, the HST has a clear edge over other methods as it yielded the highest net return of Rs. 45,890/ha as depicted in Table 3.

Table 3: Wheat comparative economics with different sowing (Punjab)

Sowing Method	Yield t/ha	GR (Rs.)	VC (Rs.)	ROVC (Rs./ha)
HST	4.99	62,228	16,338	45,890
CT	4.72	59,108	19,975	39,133
ZT	4.54	59,250	17,405	41,845
Rotavator	4.67	59,250	17,405	41,845

HST = Happy Seeder Technology, CT = Conventional tillage, ZT = Zero tillage, GR Gross return, VC = Variable costs, ROVC = Return over variable costs

The ROVC was higher in Punjab than in UP with HST. It was highest in Sangrur and Fatehgarh Sahib as compared to other districts of the state is shown in Table 4.

Table 4: Comparative economics of wheat sown with HS - various sites

Sites	Yield t/ha	GR (Rs.)	VC (Rs.)	ROVC (Rs./ha)
Amritsar	4.89	59,500	16,458	43,043
Sangrur	5.23	65,868	16,110	49,760
Fatehgarh	5.13	65,958	16,873	49,088
Modipuram (UP)	4.56	57,128	17,558	39,570
Punjab	4.99	62,228	16,338	45,890
Overall	4.86	60,628	16,658	43,970

It can be observed from Table 5 that net returns were quite high from Mungbean when sown with HST as compared to Conventional Tillage.

Table 5: Comparative economics of Mungbean with different method of sowing (Punjab)

Sowing Method	Yield t/ha	GR (Rs.)	VC (Rs.)	ROVC (Rs./ha)
HST	0.98	58500	14452.5	44,048
CT	0.79	49768	18150	31,620

Comparative economics were better when wheat was sown with Happy Seeder as HST brought about improvement in physical condition of soil and improvement in it's pH. It also reduced the terminal heat stress and saved on pre-sowing irrigation leading to reduction in time taken for first and second irrigation.

Key issues reported by farmers w.r.t. Happy Seeder

It is difficult for small farmers to afford this expensive technology as the machine cost is Rs 115,000 and its use is for a limited period. On another count, lack of availability of Happy Seeders becomes an impediment in its wider adoption. Without the attachment of the Straw Management System (SMS) to Combines, it is difficult to spread straw uniformly. The look of the crop stand in the initial growth phases also discourages farmers for its adoption.

Suggestions emerging from farmers' viewpoints:

- Detailed training is needed prior to sowing wheat with HST.
- Compatibility of every machine with all the types of tractors is still to be achieved.
- Much scope exists for modifications to increase efficiency.
- Subsidy to increase its adoption is required.
- It was observed that slightly higher dose of seeds than administered by conventional tillage gave better results.

To popularise the Happy Seeder technology the Directorate of Extension Education, PAU, Ludhiana has organized several field days to popularize HST through out the state.

Summary and Conclusion: HST is a cost saving technology with particularly higher saving in wheat. There was a variation in profitability on wheat from different sites. Saving in Mungbean sown with HST was higher. Water saving upto 30% was observed along with saving in weedicide input cost. Since land preparation operations were omitted, savings accrued on account of labour and machinery costs.

To make success of HST, following efforts need to be pursued:

- Training of the operators before sowing should be carried.
- Ensure 60% anchored straw and 40% loose straw with combine harvester.
- Rice straw should be uniformly spread.
- Optimum soil moisture content should be present in soil.
- Land leveling and rodent control measures needed.
- Machine is costly and has limited use, therefore, incentive in the form of subsidy is required.
- Custom hiring units should also be encouraged to purchase this machine.
- HST may be provided on subsidised basis to the Co-operative Societies to increase its adoption.

Vidarbha Smallholder Farmers Reinforce Faith in CA with Rabi Sowing of Wheat and Gram with PACA Support

You may recall our earlier report of cotton sowing in rainfed region of Vidarbha covered in the 15th issue of PACA newsletter published in September 2010. The successful sowing, germination and healthy crop stand of cotton has proved quiet encouraging to farmers at Hingna village, Maharashtra, India and has gladdened the hearts of PACA members. As is said, nothing succeeds like success and the demonstration field is being regularly visited by many neighboring farmers and discussions on benefit noticed from Conservation Agriculture practices have begun within the farming community as well. The positive response of farmers and the status of the CA sown cotton field has helped give a boost to PACA's plans to move ahead in the Rabi season too.

Crops mainly grown in the Rabi season at Vidarbha are Wheat, Gram, and *Jowar* (Cholam - Great Millet). Rainfed fields tend to be brought under cultivation of Gram whereas those having irrigation facility grow all three crops. These crops are however grown as mono crops, though some farmers intercrop Gram with *Tur* (Red Gram/Pigeion Pea). Vegetables like coriander, fenugreek, tomato, brinjal and chilly too are cultivated on irrigated fields to get quicker cash returns.

Fuelling Farmer Interest for Rabi

Initially an informal gathering of farmers located close to the cotton field was arranged in order to make them aware of CA's relevance to Rabi crops and how PACA wished to move ahead with plans for Rabi sowing. A larger meeting of 35 farmers was arranged in the beginning of November 2010. By now the success of the CA based cotton farmer had already started percolating to neighboring villages and the meeting was attended by farmers from neighboring districts of Yavatmal as well as Wardha.

The meeting began with experience being shared by the cotton farmer who had experienced benefits by adopting CA practices with during the Kharif season gone past. He shared highlights about his effort, difficulties faced, his initial fears, and resistance he encountered from his family members. He then went on to share how the crop yield had made him a more confident farmer[1]. Most of the farmers attending the meeting had visited his field and seen the 4 month old healthy plants bearing an average of 35 buds. It was agreed that Cotton could be successfully grown under zero-till conditions and on residue retained land. Discussions later took an interesting turn with a discussion on input reduction taking place initiated by farmers themselves.

The PACA team then discussed plans for Rabi by elaborating on how Rice-Wheat cropping was being successfully done following principles of CA in other parts of the country. They shared how the field would be ready for sowing after a round of weedicide spray, and a modified implement was proposed to be used to sow directly with minimum disturbance of soil. This is where events took a turn to the surprise of all! The cotton farmer who was the success icon for CA advocacy indicated his lack of confidence to pursue no-till based effort for his wheat sowing plans during Rabi. He went on to share his views and this led to nervousness developing in other farmers present at the meeting. Doubts were raised on the following lines:

- Wheat crop needs well prepared land for sowing and germination, so minimal soil disturbance would not help in any way.
- According to farmers, since the root system of wheat was very delicate it would not germinate well on an untilled and residue retained field.
- Irrigation would not be possible unless 20-25 channels were first made on an acre of land, and since this was necessary on one hand and would lead to soil disturbance on the other, the principle of CA would not work, and if followed the crop would fail.
- Weed growth on the Gram field would pose a great problem as harrowing was not advisable under CA. According to the farmers, the Gram plant would not grow at all unless the field was thoroughly cleaned first.
- Gram needs to be sown at a depth of 6 inches and it would not be possible to reach this depth in an unploughed land.

The Benefit of Participative Consultation

An intense discussion followed on how irrigation of Wheat would be difficult to achieve under minimal soil disturbance conditions. The farmers were of the opinion that even if sowing were to be achieved without tilling and germination did take place, the plant growth would be hampered due to lack of appropriate irrigation and crop failure was a foregone conclusion. They felt that irrigation was crucial and any deviation from the original practice of digging 20-25 channels would never suffice. However, problems generally have solutions

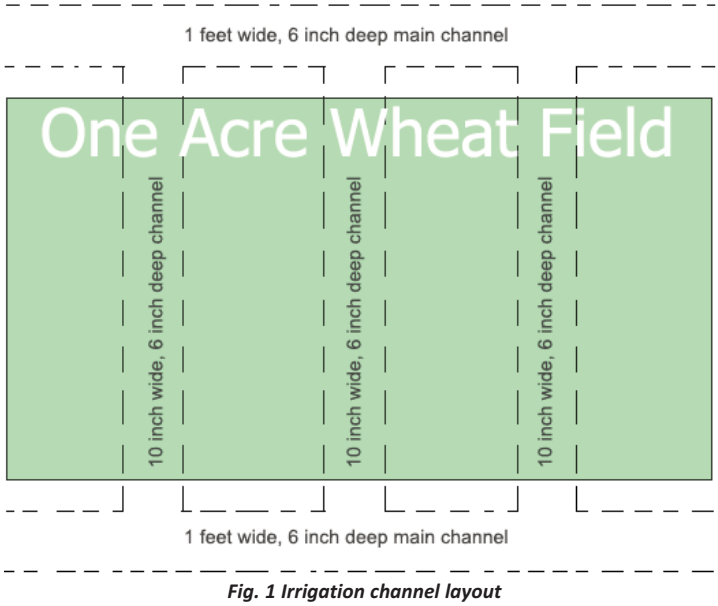


Fig. 1 Irrigation channel layout

[1] At the time of going to press he has picked 0.575 t/acre of cotton from his 2 acre field and hopes to do two more pickings yielding another 0.25 t/acre bringing the total yield to approx. 0.8 t/acre.

that follow at a short distance behind. This came in the form of a young farmer who PACA had been in touch with to come forward with his solution. He suggested that the task could be achieved with only five channels being positioned (see Fig. 1). Two main channels of 1 feet width and 6 inches deep needed to be dug outside along the longer side of the rectangular field. Three smaller channels, 10 inches wide and 6 inches deep would be dug perpendicular to the main channels and inside the fields at equal distance. This network of five channels would suffice to meet needs of irrigation. Murmers followed with the explanation having been understood and accepted, and it would seem that a new approach had emerged on irrigating a wheat field.

With the discussion on the irrigation issue accepted as having been resolved, the PACA team dealt with other issues one by one. Many other issues were resolved among discussion within farmers themselves, eg., reducing the row spacing in Gram would take care of weed growth, and seed depth could be managed by increasing the weight of the implement. The farmers were then assured of timely technical help for needs of sowing, de-weeding, and PACA getting ready a suitable implement for sowing. As an implement had already been provided by PACA during Kharif sowing, the farmers had faith in the promise made to address such a need in the future. PACA also promised to get their soil tested for macro and micro nutrients that in any case would serve as a control sample data for future comparison. The meeting then concluded but not before a general consensus had been formed that based on success of trials on the farmers fields this year, many more farmers would definitely sow cotton and soya under no-till mulch covered conditions in the next Kharif season.

Farmers Show Faith in Pursuing CA Practice During Rabi

At the concluded meeting, three farmers as below volunteered to practice CA in their fields for Wheat and Gram sowing during the Rabi season:

Farmer 1: Domaji Masram is a 50 year old Adivasi farmer belonging to village Mondha, 25 km away from Nagpur and has expressed his desire to practice CA on 2 acres of land, one each for Wheat and Gram. Farming is his only means of livelihood that supports a family of six members and he cultivates 8-10 acres of land every year. He does not own the land on which he works but has been regularly renting these fields. The rented field has a dug well that has enough water to irrigate 8 acres of land and while he owns a pair of bullocks, he has to borrow the sowing implement from neighboring farmers. He and his son work on the land and they have retained its possession for many years in the past and will continue to do so in the years ahead.

Farmer 2: Manohar Masram, a 35 yr old farmer from Mondha village too agreed to try CA on two acres of land, one each for Wheat and Gram. He owns 6 acres of land and works on it in partnership with one of his fellow farmers and owns a pair of bullocks and a few sowing implements. He also rents 6-8 acres of land on rental basis for farming and his fields have irrigation facilities by way of two dug wells. Manohar is an educated farmer and is at present a representative of Hingna block of the All India Adivasi Farmers Association.

Farmer 3: Dhundiraj Deshmukh is a 45 yr old farmer belonging to Mangli village situated 28 km away from Nagpur. He owns 8 acres of rain fed land and owns a pair of bullocks and thus uses only bullock drawn implements for various farm operations. In the Kharif season he grows Cotton, *Toor* (red gram) and Soybean on his farm. In the Rabi season he wished to sow Gram as an intercrop with *Toor* and agreed to do this using the CA approach.

Pre-sowing Scenario

Due to excess monsoon rains there was tremendous weed growth in all the fields including the PACA demonstration plots. By end of October all farmers had started to clean their lands. The unclean PACA demo fields covered with residue once again became a topic of discussion and as in Kharif, these farmers became the target of all other farmers who were pursuing traditional means of farming. Other farmers tried to convince PACA farmers to stick to old methods of farming, and it was only the timely handholding by PACA that made the farmers stick to their decision to follow CA.

A weedicide spray was done on all fields on the 20th of November and a few large sized weeds had to be uprooted, the rest perished within 6 days.

Sowing of Wheat

Wheat was sown on 27th November on one of the fields that had standing residue of Cotton and *Toor* on it. Due to heavy rains the cotton and *toor* crop had failed on this piece of land hence the farmer decided to switch to Wheat during Rabi. The field also had ample residue of the perished weeds too. PACA team was nervous since the failed Cotton crop could be an indicator of other problems related to the field.

A traditional bullock drawn sowing implement, *Tifan* - a traditional local sowing implement, that had five removable

Fig. 2 Tifan used for wheat sowing

and adjustable teeth was used for sowing. Seed was dropped manually by the farmer in a funnel attached on top of the implement that was fitted with five tubes ending near the tip of the teeth. 40 kg “Lokwan“ variety seeds were sown in one acre of land, keeping the row spacing at 9 inches and seed depth at 3-4 inches that is a standard practice in this region. 40 kg fertiliser (18; 18; 10 NPK) was simultaneously added by women labourers following the sowing effort.

Roughly 5 hours was required to complete the sowing on the one acre plot. Generally, 3 hours are enough to complete the sowing by conventional means but the

residue was getting entangled with the teeth of the implement and had to be removed time to time by the farmer. As the field was a bit harder than the tilled fields, weight adjustment had to be done to deliver the seed at the right depth. This was achieved with the farmer finding it best to stand on the implement. By the end of the day the farmer was tired but very happy and satisfied, and though he had spent two extra hours for his effort at removing entangled weeds, he drew satisfaction from a job well done and saving of
Rs. 2,000/- from not preparing the land prior to sowing.

Sowing on the second plot was done on 30th of November. As the news of successful zero till sowing had already spread in the neighborhood there was a group of 5 curious farmers present on the field at the time of the second sowing. The sowing was done using the same implement and even the amount of seeds, row spacing, and depth of seeds was maintained as on the first field.

As the sowing was being done, the farmers gathered information about CA from the PACA representative and the first farmer who also was present. They tried to understand the principles of CA, as well as short and long term benefits from it. Interest was shown by some of the farmers to read the education booklets prepared by PACA in Hindi.

The sowing took almost 4 hours, with the earlier days experience regarding teeth angle and weight adjustment of the implement helping save time. By the end of sowing activity the PACA farmers were more learned on aspects of zero-till mulch covered sowing practice, and other curious farmers had turned into enlightened ones. Farmers later dispersed with a positive thought that Conservation Agriculture could be a way out of the problems being faced.

Sowing of Gram

Sowing of 20 kg of Gram was done on one acre of land with the same implement as was used for sowing Wheat though the angle of teeth was adjusted to get the required depth of 6 inches. The farmer decided to reduce the row spacing from 12 inches to 9 inches since he believed that less row spacing would help in covering the land more efficiently and restrict weed growth. However he increased the distance between the plants in a row by sowing intermittently at a distance of 12" instead of a continuous basis as pursued traditionally. This was done to give the plants enough space to grow and spread. This was possible only because harrowing was not to be done and the space could thus be utilised to improve plant growth.

Sowing of Gram in the second field was done on 21st December. This was done using a tractor driven seed drill available locally. The row spacing and seed spacing in a row were both maintained at 12 inches and the seed was sown at a depth of 6 inches. Sowing this time did not take as much time given the higher level of mechnisation and was accomplished in one hour for the one acre plot. The field had a lot of soybean and weed residue but it got released easily through the teeth of the seed drill on account of increased haulage power. This was followed by spraying of a pre emergence weedicide the next day. The farmer expects germination within 9-10 days.

Present status of the fields

The post emergence stage of the wheat field is very encouraging (see picture alongside). Germination rate is very high on both wheat fields. The plants are healthy and the five channel irrigation pattern has proven to be successful in irrigating the field. There is hardly any difference between the crop stand on ploughed fields on plots nearby and the no-till mulch covered PACA fields. The plants are almost four weeks old at the time of writing and have grown up to 8 inches height.

Similarly, the Gram germination too has been good. The plants have grown to a height of 4 inches and have 3-4 branches showing that growth is as expected (see Fig. 3). The Gram field did show some weed growth in patches but

Fig. 3 Gram stand on the PACA demonstration field

they were removed using the hand sickle keeping in mind that minimal soil disturbance was to be done. As a follow up activity, residue of Wheat and Soy (*kutar*) is being spread in between the Gram plants as mulch and also to prevent weed growth.

All the apprehensions are now a thing of the past for the PACA supported farmers and they are satisfied with the sowing as well as the germination and growth of their crops. Visits of other farmers too have increased in the past fortnight, and the PACA farmers are being sought for knowledge and experience sharing, and their self-esteem within their community members is at a high.

Impact of Confidence Building Among farmers

Given the experience of Kharif with Cotton and Soya and with Wheat and Gram in Rabi, interesting initiatives have been undertaken by involved farmers on their own accord. PACA was happy to support their decision and we must remember that however small these initiatives may be, it has been made possible only due to the conviction and

Fig. 4 Wheat stand on PACA demonstration field

renewed spirit being experienced by these farmers. Here are three instances that have been experienced by us in Rabi 2010:

Gram Sown as Intercrop with *Toor* on Rainfed Field

The third farmer, Dhundiraj Deshmukh got inspired to pursue CA practice on his one acre rainfed field on which he

Fig. 5 Gram stand in Toor fields

had intercropped *Toor* and Soybean in the kharif season. The *toor* plant rows were spaced 9 feet apart from each other and the space in between had enough residue of Soybean on it and this was the space he decided to use for sowing Gram in Rabi. After harvesting Soybean in October he decided to go for Gram cultivation and the sowing was done on 25th October using a bullock drawn single tooth implement. 20 kg Gram seed was sown keeping the row spacing at 9 inches and seeding depth at 5-6 inches. The time needed for sowing was higher as the residue interfered in movement of bullocks as well as the implement but the farmer remained confident that germination would take place within 7days as there was enough moisture in the soil.

He did have certain fears regarding the growth of the plants as well as flowering, since harrowing was not to be done. Earlier thinking had taught him that soil aeration was necessary for appropriate growth of plants, and thus he was worried on account of land not being harrowed.

At present the Gram plants sown are 60 days old and at the stage of flowering. The crop health is as good as that in the farmer's other fields where he prepared the land conventionally and also did harrowing and deweeding

Fig. 6 Wheat stand on women farmer's self-initiated field

operations, spending about Rs. 2,500/acre of land. Saving in input cost is surely a source of happiness to the farmer and his determination to take the route of Conservation Agriculture in the next season too has become firm. All his doubts and fears regarding sowing, germination and flowering have vanished and he is now enjoying his iconic status among community members.

Woman Farmer Proves CA Not Very Difficult for Initial Understanding and Adoption

One of the farmers of Hingna having 10 acres of land in Mangli village had attended farmer meetings arranged by PACA. He and his farmer wife had also visited the Cotton demonstration field and had gone through the literature circulated by PACA. They were willing to adopt CA in their fields but had to earlier back out as there was a strong resistance from their family elders. However the woman farmer had developed some level of conviction and decided to retain a piece of land as is and not allow anyone to plough or clean it. The lady farmer Pushpa Manghale sowed Wheat on this half acre plot on 25th November according to principles of Conservation Agriculture for which the traditional bullock drawn sowing implement was used. The field had enough soy residue on it but that did not pose any problem while sowing.

The farmer then requested the PACA Field Coordinator to visit her farm. The wheat growth is as good as that on the neighboring field (see Fig. 6) where the land had been harrowed and leveled twice, spending three days in terms of time and incurring a cost of Rs. 2,000/acre. There were three other farmers on the field at the time of the visit and they realised that they too could have saved time, money and effort by directly seeding wheat on no-till basis.

The efforts of the woman farmer motivated others to know more about CA and the result in the form of almost 100% germination shows that CA if understood on the basis of its underlying principles is not difficult to adopt.

Farmer shows increased faith in CA

The second farmer, Manohar Masram, after observing his three week old wheat crop felt reassured that germination did not depend on whether the land was prepared or not. Also, he felt that CA could be adopted for all kinds of crops. His old father who was earlier reluctant to go for CA too felt the same. As a result, the father son duo decided to sow Rabi *Jowar* in a half acre plot which had soybean residue and was to be kept fallow till the next Kharif season. They brought 3 kg Rabi Jowar seeds from neighboring Wardha district and used the *Tifan* to do direct sowing on this unploughed half acre plot. *Jowar* was sown in rows 9 inches apart and seed depth was kept at 2-3 inches. The farmer is confident that the germination would be satisfactory and a single irrigation would be enough for this crop as the residue would take care of moisture content later.

These instances have endorsed PACA's belief that small farmers once shown the way and effectively supported scientifically are willing to work for their change. While it is a progressive farmer who will always take the first step, as more and more farmers adopt it the smaller farmers too will develop confidence to tried the renewed method. This hopefully will be the direction that PACA's efforts will take in Vidarbha and at another 4-5 states where PACA hopes to introduce CA practices in rainfed areas.

Happenings

Regional Conservation Agriculture Symposium, Johannesburg, South Africa, 8-9 February 2011

CARWG with support from the Food and Agriculture Organization of the United Nations (FAO), The Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN), The African Conservation Tillage Network (ACT) and the African Union's New Partnership for Africa's Development (NEPAD) is hosting a regional symposium on Conservation Agriculture in Johannesburg South Africa, 8-9 February 2011. The symposium has the following objectives:

- To share and document information on the biophysical, social and economic impacts of Conservation Agriculture technologies in the region;
- To share and document experiences on Conservation Agriculture scale up approaches and impacts; and
- To identify key areas for research and development and explore institutional and policy innovations for Conservation Agriculture scale up.

To view details on call for papers for the symposium click here http://livestockprog.files.wordpress.com/2010/10/ca_symposium_call_for_papers_october_2010.pdf

No-Till 2011 Conference

No-Till 2011 is a conference designed to bring the latest developments in no-till cropping systems to interested farmers and ranchers from Oklahoma and surrounding states. It is a program of innovative speakers providing for maximum interaction between agriculture professionals ranging from producers to industry experts. Some of the topics to be covered in this year's conference are soil fertility, cover crops, no-till cotton production, intensifying the rotation with double-crops, on-farm research session, weed management, corn and soybean production, no-till wheat grazing systems, weed science, soils, intensified management with grid soil sampling and/or management zones, dedicated absentee landowners session and soil conservation. For more details, view the conference brochure by clicking here.

Training on CA concludes at PAU

The two-week regional training on "Conservation Agriculture: Nurturing Sustainable Production Systems in South Asia" organised by Cereal Systems Initiative for South Asia (CSISA), Punjab Agricultural University (PAU) and International Maize and Wheat Improvement Centre (CIMMYT) concluded on December 4, 2010 at the College of Agricultural Engineering and Technology (COAE&T). The training had participation of scientists and policy makers from Bangladesh, Nepal, Uzbekistan and different states of India - Tamil Nadu, Karnataka, Bihar, Uttar Pradesh and Punjab.

Speaking on the occasion, the Chief Guest Dr. B.S. Sidhu, Director Agriculture, Punjab stated that conservation agriculture is picking up in the country. He shared that Punjab was Asia's biggest grain market and added that the issues on water management and residue burning were attracting attention of scientists. Residue burning is a serious problem prevalent in widespread areas of the state and needs to be addressed through an alternative approach. He lauded efforts of PAU in organising such a training that will be helpful for propagation of conservation agriculture.

Dr. S.S. Gosal, Director of Research, PAU, the guest of honour, remarked that Punjab contributes 35% rice and 55% wheat to India's public distribution system, and added that PAU was spending more than 60% of its budget on research. Farmers were reposing full faith in PAU technology and kept regular contact with experts for the latest techniques. Dr. P.P.S. Lubana, Dean, College of Agricultural Engineering and Technology also interacted with the experts and participants.

Dr. M.L. Jat, Senior Cropping System Agronomist, CIMMYT and Dr. Ken D. Sayre, a consultant of CIMMYT from Mexico said that trainees were educated about impact of CA on climate change, soil health, water, labour, and farm profitability. The participants were given practical training about machineries, such as the Laser Leveler and Happy Seeder. Six progressive farmers namely Vikram Ahuja, Gurdial Singh, Amandeep Singh, Jagmohan Singh, Sukhwinder Singh, Avtar Singh, were honoured for promoting CA. Dr. H.S. Sidhu, Project Coordinator, CSISA Project Punjab, proposed a vote of thanks.

Agriculture and Rural Development Day 2010 – A side event at the Sixteenth Conference of the Parties (COP16) to the UNFCCC

According to CGIAR if climate change is like a runaway train, then only forestry and agriculture, including livestock, fisheries and aquaculture, can do much about its potentially catastrophic consequences for rural people. But are agriculture and forestry converging with sufficient force to stop the runaway train in time?

This was the question occupying the minds of those who gathered for an official side event at the Sixteenth Conference of the Parties (COP16) to the United Nations Framework Convention on Climate Change (UNFCCC) on December 4 and 5.

The event gave neither a clear "yes" or "no" to the question posed above but rather sought a formula for how forestry and agriculture might come together to prevent disaster.

Wide agreement emerged several years ago on the potential of REDD+ as a low-cost and effective option for climate change mitigation. But this will require clear alignment of REDD+ with poverty reduction and other key development objectives as well as strong safeguards to ensure good governance and respect for the rights of rural communities and indigenous people.

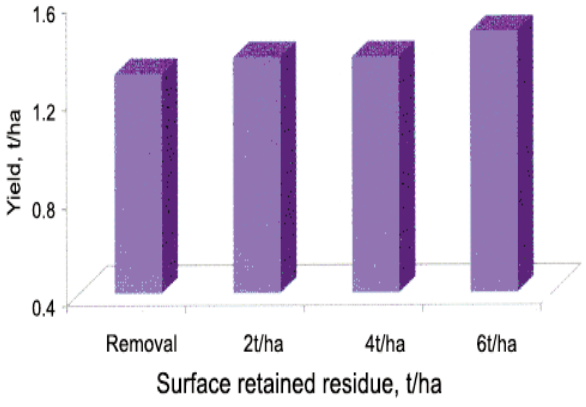
In support of such initiatives, the organisers of Agriculture and Rural Development 2010 called for much more local action to help the rural poor adapt to climate change impacts and use of climate finance to realise agriculture's substantial potential for capturing carbon and reducing greenhouse gas emissions. They also appealed to climate change negotiators to recognise explicitly the critical links between agriculture and forestry and to create an agricultural work program under the Subsidiary Body for Scientific and Technological Advice as a first step toward meaningful inclusion of food security in any post-2012 agreement.

However, to ensure that agriculture and forestry can converge powerfully, the two sectors must overcome various conceptual and practical obstacles. Discussions on this issue concluded that efforts to produce more food from less land must form part of an integrated package of interventions (including practices such as conservation agriculture, agroforestry and integrated pest management) aimed at achieving multiple benefits in rural landscapes.
Source:
http://cgiarinaction.wordpress.com/2010/12/10/stopping-the-runaway-train-of-climate-change/

Performance of Summer Moong Bean in the Presence of Surface Retained Residues

Rice-wheat cropping system in the Indo-Gangetic plains is a highly remunerative cropping sequence. The sustainability of this system has been threatened by the deterioration of soil and water resources due to cereal-cereal mono-cropping coupled with wet tillage (puddling) for growing rice. The situation is further complicated by summer rice which in addition to soil deterioration also leads to excessive exploitation of ground water resources resulting in falling ground water level. Under such situations, it is a must to replace summer rice with summer green gram that seems to be profitable as well as an environment friendly option. Inclusion of green gram will help in improving soil and water resources by converting the cereal-cereal mono-cropping to cereal-pulse-cereal cropping system.

The results of summer moong bean, cultivar SML 668, grown after wheat harvest in the direct seeded rice-wheat system under different residue loads of zero to 6 t/ha, indicated the possibility of diversifying the system coupled with enhanced productivity and profitability to farmers. The moong grain yield recorded without surface retained residue was 1.298 t/ha that increased to 1.468 t/ha with 6 t/ha surface residue retention. This difference in surface retained wheat residue can be attributed to temperature moderation and water conservation compared to the treatment where wheat crop residue was removed from the plots.



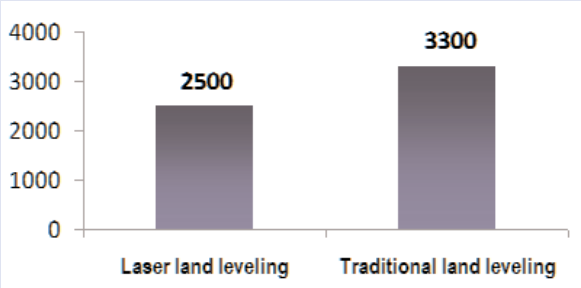
Surface retained wheat residue effect on Moong bean

Source: RK Sharma, RS Chhokar, Subhash Chander Gill, and RK Singh DWR, Karnal; January – June, 2010, Wheat & Barley Newsletter

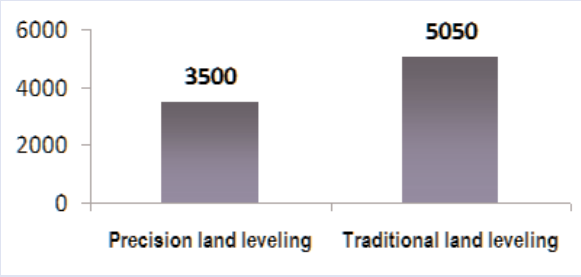
INFOPIX

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

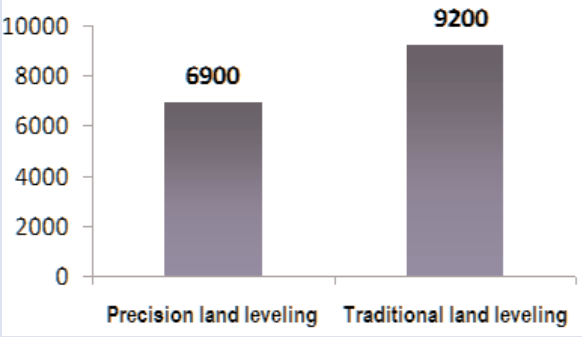
Laser Land Leveling: Saving in Irrigation Water



Total water use (m^3 ha^{-1}) in wheat under precision and traditional land leveling



Effect of laser land leveling on total water use (m^3 ha^{-1}) in raised bed planted wheat



Effect of land leveling on total water use (m^3 ha^{-1}) of rice in a sandy loam soil

In a study on laser land leveling, the authors noted a significant reduction in total water use in wheat as well as rice due to precision land leveling compared to traditional land leveling. The total water use in wheat and rice in laser-leveled field was reduced to 49.5 per cent and 31.5 per cent *(Jat et al. 2003)*. In raised bed planted wheat, about 26 per cent water can be saved through laser land leveling. In rice, total water use was estimated as 6950 m^3 ha^{-1} and 9150 m^3 ha^{-1} under precision land leveling and traditional land leveling respectively. The study also observed that the distribution efficiency of applied water in wheat in sandy loam soil was significantly higher under precision land leveling compared to traditional leveling.

Source: M. L. Jat, Parvesh Chandna, Raj Gupta, S. K. Sharma and M. A. Gill. 2006. Laser Land Leveling: A Precursor Technology for Resource Conservation. Rice-Wheat Consortium Technical Bulletin Series 7. New Delhi, India: Rice-Wheat Consortium for the Indo-Gangetic Plains. pp 48.

SNIPPETS

Vacancy at SANREM CRSP

The Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program (SANREM CRSP) is seeking candidates for the Program Director position. Reporting to OIRED Director, the Program Director provides overall intellectual and programmatic leadership to the broad-based consortium of U.S. and host country partners and the OIRED-based Management Entity (ME) team including the Associate and Assistant Program Directors and support staff. He or she works under the direction of the project Administrative PI and Director of OIRED (who also serves as Associate President for International Affairs) to oversee the proper functioning of the SANREM CRSP system of governance, supervise project quality control and reporting, and liaise with USAID Washington, participation USAID field missions, and the CRSP Council. The job posting may be viewed on Virginia Tech's employment page http://www.hr.vt.edu/employment/ under posting number 0101016.

Vacancy at CIRAD

The 'Centre de Coopération Internationale en Recherche Agronomique pour le Développement' (CIRAD) is seeking a Research Agronomist in Modeling for its EU-funded project CA2Africa -Conservation Agriculture in Africa- www.CA2Africa.eu. The project seeks to better understand the reasons for the limited adoption of Conservation Agriculture (CA) in Africa. It believes that a better understanding to what extent and under which conditions CA improves the livelihoods of smallholders is a pre-requisite to know where and how to promote large-scale CA adoption. The goal of the project is, therefore, to examine the agro-ecological, socio-economic and institutional conditions that determine success or failure of CA. The successful candidate will work closely with the scientific teams executing the four work packages of the project, which range from testing existing bio-physical and economic models, analysing CA case-studies and disseminating the results of the project. This post doctoral position calls for a PhD in agronomy or equivalent apart from a strong background in inter-disciplinary research, especially linking agricultural and social sciences within innovation systems. The position is based at Montpellier (with overseas travels) and is for a duration of 24 months. Read more by clicking here.

Vacancy at CARE, Liberia

CARE Liberia is implementing conservation agriculture activities and operates a complementary project in sustainable access to water and sanitation (SAWS) in bong County. The goal of the Conservation Project is to revitalise agriculture; to improve food security and income, in an environmentally sustainable way, for 4,000 directly benefiting farming households in Bong County, Liberia; and that of the SAWS ensure a health environment for farmers. Under the Programme Manager, the Design, Monitoring and Evaluation Officer (DMEO) will support program activities in development of M&E Systems and revision, facilitate and support M&E processes, baseline Survey and evaluations; develop the capacity of program team on M&E Program, and on documentation & dissemination. He/She will be responsible for assisting the Program/Project Managers and the Designed Monitoring and Evaluation Manager in the areas of planning, implementation, monitoring and evaluation to ensure that CARE's programs make a significant contribution to reducing poverty in Liberia. Read more at http://www.emansion.gov.lr/doc/DME%20Officer.pdf

Village surveys for technology uptake and monitoring: Case of tillage dynamics in the Trans-Gangetic plains

A recent study by Olaf Erenstein of International Maize and Wheat Improvement Centre (CIMMYT) suggests that agricultural research and development (R&D) would benefit from reliable yet cheap technology uptake indicators to guide decision making. It explores the use of village surveys to monitor technology use and illustrates this through two empirical case studies into tillage dynamics in the Trans-Gangetic Plains in North-West India. The first case study is a revisit of 50 communities surveyed earlier in Haryana State. The second case study is a new and wider representative sample of 120 villages across Haryana and Punjab States. The case studies illustrate that after an initial rapid spread of tractor-drawn zero tillage drills for wheat seeding in these intensive systems, the zero plus reduced tillage area seems to have stabilised there at between a fifth and a quarter of the wheat area. Conventional tillage for wheat continues to decline, with an increased use of rotavators making up the difference – but its intensive shallow tillage goes against the conservation agriculture tenets. The paper illustrates the potential of village surveys to provide timely and cost-effective feedback to agricultural R&D. This priced publication can be downloaded by clicking here.

Cover Crops and Conservation Tillage Reduce Nonpoint Source Pollution

The Conservation Technology Information Center's (CTIC) project, funded by EPA's Great Lakes Restoration Initiative, demonstrates the effectiveness of cover crops and conservation tillage systems to decrease agricultural nonpoint source pollution and inform producers about the economic benefits of the systems. CTIC and partners will assist agricultural producers in the Lake Michigan, Lake Erie, and Lake Huron watersheds with implementation of cover crops and conservation tillage systems on 15,000 acres by April 2013. Producers will receive technical, educational and social support to fully understand the benefits of cover crops and conservation tillage, to correctly incorporate the practices into their operation, to evaluate the changes and adapt management to optimise yield and resource protection. By providing this three-tiered support, this project builds producer capacity to effectively manage, adapt and commit to the long-term implementation of these conservation practices.

PACA Newsletter Digest

We have combined past issues of PACA Newsletter on an annual basis and these can be downloaded from the content page of our website. We have also provided a link to an indexed page of articles that you can refer to that indicates the issue carrying your article of interest. Visit www.conserveagri.org/content.htm to download the two digests that have been uploaded.

PACA Wishes its Readers the Very Best of 2011!