

Conservation Agriculture

Getting Agriculture to Work for People & the Environment

newsletter

A Brief History of Conservation Agriculture in Latin America, South Asia and Sub-Saharan Africa

Some say it began with the Mayans, who utilized a stick to plant maize in unprepared soil. Others trace its principles as far back as the Egyptians. But it is clear that conservation agriculture (CA) in a modern sense began in the mid-20th century, with the introduction of effective herbicides. No-till, direct-sowing of crops was first successfully demonstrated in the US in the 1950s. At first adoption was slow, but began to accelerate as experience accumulated and better planters and herbicides were developed.

“Conservation Agriculture”, however, is more than direct sowing using no-till. It has come to mean agriculture that features: little or no soil disturbance; no burning; direct seeding into previously untilled soil; crop rotations; and permanent soil cover, particularly through the retention of crop residues. In recent decades, CA, or elements thereof, has made progress in the US, the Southern Cone of Latin America, Australia, China, and South and Central Asia. It has made less progress in other parts of the world, notably sub-Saharan Africa. This brief history focuses on experiences with CA in Latin America and South Asia, and on issues in getting CA to work in sub-Saharan Africa.

CA emerged from events that occurred in Brazil, during the 1970s and 80s. The story begins with a government policy, a farmer response, and an ensuing crisis. The government policy was a decision in the 1960s to promote a shift from livestock-based farming systems to crop-based systems in the sloping, high-rainfall areas of southern Brazil. The farmer response was to take plow up the pastures and plant soybeans.

The crisis was a disquieting increase in soil erosion and land degradation. In some instances, erosion so reduced productivity that farmers were unable to repay bank loans. Many people felt that the answer lay in terracing. Others, however, felt that by maintaining soil cover and avoiding soil disturbance, land degradation could be controlled and crop productivity sustained. Achieving this in practice, however, depended on the development of implements and management practices for no-till direct sowing. Early champions of CA in Brazil established links with no-till specialists at the University of Kentucky, who facilitated access to early prototype no-till implements. Ultimately, a dynamic “innovation system” began to unfold characterized by iterative improvements in implements, crop management practices, and selection of crop rotations. By the end of the 1970s, an efficient no till/CA package had been developed and began to be adopted by the larger farmers and later, in the 1990s, by a large number of smaller farmers.



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CA proved to be surprisingly effective in overcoming the land degradation crisis. By avoiding intensive soil tillage and maintaining soil cover, positive results were obtained: improved soil organic matter, reduced soil erosion and loss of nutrients, improved soil structure, higher rainwater productivity, a richer soil biology, and improved crop yields. By increasing near-term on-farm profitability and by dramatically and visibly reducing land degradation, CA proved attractive to farmers in ever-increasing numbers. In recent years, the area under has CA in Brazil

has reached nearly 25m ha, with an additional 18m ha in Argentina and nearly 2m ha in adjoining Paraguay.

As it happens, however, the underlying shape of CA was heavily influenced by the local farming environment: abundant rainfall allowing two crops per year; the absence of a marked dry season or winter freeze; sloping lands with erodible soils; and disease pressure that intensifies when unsuitable crop rotations are used. In this environment, some things are taken for granted, for example, the presence of abundant biomass from crop residues. Other things have a higher profile than might be the case in a drier environment, for example, disease incidence. And then, there is little if any puddled rice.

While the tale of CA in Brazil is well known, the story of CA in South Asia – or more accurately the first steps towards CA – is less well known. I refer to the recent success of wheat zero tillage after puddled rice, now covering several million ha in the Indo-Gangetic Plains. Initial work on wheat zero tillage for South Asia began at Punjab Agricultural University as early as the 1970s. On-farm research with zero till began in the early 1980s in Pakistan, when CIMMYT and NARES partners imported Aitcheson zero till drills from New Zealand for testing in farmers’ fields. The intention was to advance wheat sowing dates and thereby increase wheat yields. In the Pakistan Punjab, the importance of timely wheat sowing in rice-wheat systems was confirmed by farm surveys conducted. These surveys also quantified the extended time and considerable expense required to prepare paddy rice fields for wheat sowing.

Progress in farmer experimentation with wheat-no till was however hindered by the fact that imported drills were expensive, few in number, heavy, and in general not well suited for use by farmers. Local designs were commissioned, manufactured and placed for testing

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Tigra Village – Promoting Self Dependency to Make Conservation Agriculture a Reality

Tigra village, located within 5 kms from Ateli on the Rewari-Narnaul road, in the state of Haryana, 150 kms to the South-West of New Delhi is a typical location as would be found in many locations in India. There is waning expectation from agriculture on account of resource degradation, motivation of youth being low with migration as an option, market systems not working in their favour, and productivity declining with the weather taking a fair share of the blame. The village forms part of a region that is pronounced by its dryland-rainfed farming approach, with desertification looming large. Over the last decade, groundwater resource has been dwindling with its availability at 80-100 feet, and going down by 5-6 feet every year. There is not much support by way of rainfall with less than 400 mm of rainfall experienced over the last decade. Summer temperature can rise beyond 45°C with soils rendered unfertile with ill effects of continued nutrient and organic matter depletion. Finally rising input costs had led to a higher cost of production, and increased logistics costs coupled with open market mechanisms all contributed to creating increased problems for farmers.

It is in this scenario that the zero-till initiative made an entry in 2005 with farmers of Tigra being convinced to try on a pilot basis the approach of minimal soil disturbance. On an average farmers were spending Rs. 250-300/acre on one operation and usually 4-5 tillage operations were being carried out in the fields.

Ten progressive farmers agreed to devote a small section of their land (roughly an acre each) to try the new approach. The ensuing practice entailed causing minimal disturbance to the soil surface with seeding and fertiliser application done through mechanised means with the help of an indigenous piece of equipment. The “No Till Seed-cum-Fertilizer Drill” costing approx. Rs. 40,000 is useful to seed crop and apply fertiliser in an unploughed field. The results at harvest time convinced the willing practitioners that the system worked and this led to the zero-till seeding of wheat being increased to 25 acres in 2006 and 100 acres in 2007. Most farmers in Tigra are now willing to defend the practice, and at a public hearing organised by the PACA team, there was unanimous support that they would bring under zero-till the entire 1,000 acres sown area in the village next year. However they would need the requisite equipment, Drills in particular to

make this a reality.

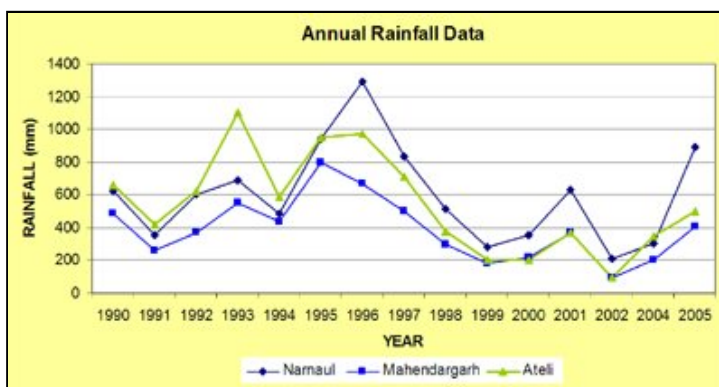
What convinced farmers was a saving of Rs. 1,000/acre on tillage related tractor costs with no loss of productivity. Moreover this led to more time being available to farmers, now relieved of the tilling responsibility and women were relieved of the drudgery of their post-seeding tilling responsibility. The credit for this effort goes to the Krishi Vigyan Kendra (KVK) located at Mahendergarh, ably managed and supported by the Haryana Agricultural University, Hissar. KVKs are farmer science centres belonging to Haryana Agriculture University, supported by the ICAR, Ministry of Agriculture, Govt. of India. Other than playing a very effective extension role, they also helped provide a Drill machine (picture below) that facilitated the seeding and fertiliser placement process in an untilled land. The efforts in Tigra were encouraged by the ATMA initiative taken up by the Haryana Government agriculture officials.



An indigenously produced “No Till Seed-cum-Fertilizer Drill”

However, we need to be cautious to understand that zero-till in itself can not bring lasting benefits to the farmer on a sustained basis, and it functions at best as sweet bait. There are indications from experts involved with the subject internationally that the impact of zero-till will not sustain over the years if an

entire set of supplementary measures are not applied progressively in its totality. Such efforts require maintaining crop residues on the field, planning and practicing crop rotation, and other practices integral to the dynamics of CA



approach, apart from conservation practices adopted to improve water availability and other constraints.

While all rejoiced it also became clear at the same time that this was only a beginning and Tigra would have to move to inducting other practices forming part of the CA concept to reap full benefits. It would also need to address needs of economic returns if it had to find acceptance among the farming community. In the initial stages, short term benefits would have to be shown to farmers to commit themselves to bringing about the required shift in their agriculture approach. Later this could pave the way for them to participate in measures that would address long-term benefits.

It is also clear that for CA to succeed, the role of the scientific community would be very important with experts from different specialities being able to address needs of farmers on a collective and joint basis. This is where PACA sees a role for itself in days to come.



Little did farmers of Tigra know that what they had practiced was but one step that had emerged from widespread trials conducted in various parts of the world and the success had increased the coverage area to more than 100 m ha. globally. USA, Australia, Brazil, Argentina and Canada were the prominent nations to have taken a frontal position in adoption of CA practices. In South Asia, efforts of the Rice Wheat Consortium for the Indo-Genetic Plains (RWC) has made a measurable difference wherever taken up. Little too was known to the farmers that while operational cost savings motivated them to adopt zero-till measures, it also helped the cause of the environment through reduced fossil fuel utilisation and resultant emissions, benefits of which would be shared beyond the village.

Presented below are some key points that emerged from the interaction at a public hearing initiated by PACA that was well attended by over 45 farmers at Tigra in May 2008:

1. Crop residue availability posed the major challenge with pressure on its use for livestock needs or promised cash returns being given by traders selling the residue to brick kiln owners. Farmers reported that in other regions of the State, the traders were even willing to pay the farmers to allow them to remove the residue. However conviction was developed within the group to allow a few inches of

residue to be allowed to remain on the surface while the top layer could be removed for purposes already identified. The economics of leaving the crop residue on the farm field or utilising it for immediate cash gain will however pose a big challenge to CA efforts given the farm dynamics in India.

2. There was an apparent demand for more Drill machines with expectations that the government department should initiate such a step. Based on interactions with the farmers, receptivity could be found to the idea that machines could be procured privately by the more resourceful and hire charges recovered from those wishing to use it. On the other hand, a co-operative based ownership and recovery system could also be initiated but serious thought will have to go into aspects of maintenance and replacement of the equipment.
3. There were apprehensions about weed control and these were well founded. The PACA team informed the gathering that while efforts were underway to address this issue in other parts of the world, the same would be taken up in India and it was crucial to do so if CA was to be pursued seriously.
4. While efforts had been applied to the wheat crop during *Rabi* cropping, there was confusion in minds of farmers if zero-till technique could be applied to other crops such as Bajra during *Kharif* season or with Mustard. The farmers were not clear whether the Drill machine used for seeding wheat could also be used for other crops or a new equipment or adaptation to the current Drill would be required, leading to the confusion. By the end of the meeting they were convinced that the solution lay within adaptive efforts and that too could be carried out at the village level itself.
5. The need to back farmer's expectations through dedicated extension and research efforts became apparent and this will be one of the important areas that PACA will focus on with the help of the State Department and the ICAR system.
6. The PACA team convinced the farmers to run "round-the-year" successive crop trials based on zero till practices and the village farmers have agreed to devote land for such trials.
7. Many farmers reported reduction in number of pesticide sprays and this was contrary to expectations, though heartening to note. Reasons for such results are to be studied.
8. Zero-till crop was prone to lesser lodging compared to conventional sown wheat, apparently due to greater penetration of roots in untilled conditions.

A beginning has been made and efforts of farmers at Tigra village have inspired PACA to take up CA efforts in the region in a scientific manner and on a larger scale. We look forward to supplementing farmer's efforts through a package of scientific practices to bring about the desired change in their mindset and the research-extension system supporting them. This will help Tigra become a CA Village impacting lives of 350 farmer households with over 1,000 acres of land.

A Brief History of Conservation Agriculture

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with farmer groups, but these drills were also too heavy, tines broke too easily, and the drill became frequently blocked with loose straw. Further progress with no-till in Pakistan was stalled by a perceived danger that stubble retention in no-till systems might exacerbate problems with rice stemborers (*Scirpophaga incertulas*)¹.

With progress held up in Pakistan, attention shifted to India. In the second half of 1988, an additional four Aitcheson drills were shipped by CIMMYT from New Zealand to India. One of these was sent to the Department of Farm Machinery and Power Engineering at Pantnagar University. On-farm testing of zero tillage with the Aitcheson drill began in the 1990-91 season, led by two university scientists. Zero till wheat performed well, with good crop establishment, higher yields and lower costs when compared with conventional till. Despite this promising beginning, progress in fostering farmer testing was slow: There was only one drill available for testing, and even that one was not well adapted to sowing wheat into standing rice stubble.

In the following season, one of the scientists took a simple but momentous step. He took the “inverted-t” openers for seed placement from the Aitcheson drill and fastened them onto a drill frame of his own design. This was the original Pantnagar drill. As it happened, there was a dealership near Pantnagar of a Ludhiana-based farm implement company. The dealer became aware of the Pantnagar drill and in 1992 introduced the scientist to one of the company owners. The company soon learned to forge its own inverted-t openers, installing them on the frame of a conventional-till drill. By 1994, after a series of improvements, an adapted implement was ready for large scale manufacture.

Adoption of this implement was accelerated by the problem of herbicide-tolerant *Phalaris minor* that emerged in 1994-96. By the 1995-96 wheat season it had been transformed into a crisis. Scientists began to feel that “desperate times call for desperate measures”, with zero tillage being one of the “desperate measures”. Initially, it was hypothesized that zero-tillage might reduce production costs and free up cash for herbicide purchase. Later it was found that fewer weeds germinated in zero-till plots.

Farmer testing of zero tillage for weed control was organized by Haryana Agricultural University. But for this, drills were needed. Fortunately, the Pantnagar no-till drill as refined by private companies had just become available. The combination of the new herbicides and zero tillage worked well. Crop emergence was good, *Phalaris* populations fell dramatically, and yields were excellent. Participatory methods were used in early farmer trials of no-till. Researchers left drills with farmer communities for an entire cropping season. This enabled many farmers to

become acquainted with the drills’ performance so they could decide whether or not to purchase the implement for themselves. Of greatest interest to farmers was the significant reduction in production costs, with no yield penalty.

By the 1999-00 wheat season, zero-till wheat had exceeded 10,000 hectares. A system of custom hiring for zero-till drills allowed resource poorer farmers who did not own tractors to adopt the technology. By 2006-07, the area under wheat zero till was estimated at around three million hectares and several dozen companies were kept busy manufacturing no-till drills. Such widespread adoption can be traced to high near-term on-farm profitability; ready availability of reasonably-priced, high quality implements; substantial technical support from extension officers (especially in India); a favorable policy environment, including some subsidies for drill purchase, a good understanding from research on how to make zero tillage work; and traveling seminars in which stakeholders from different states and countries shared their experiences. For many years, much of this research and these traveling seminars were coordinated or otherwise supported by the Rice Wheat Consortium for the Indo-Gangetic Plains.

From wheat zero tillage, research and extension began to expand towards a broader range of resource-conserving technologies (RCTs) including: laser leveling of fields; surface seeding of wheat in low-lying, poorly-drained areas; site-specific nutrient management in rice; bed planting (fresh and permanent) for establishment of rice, wheat and other crops; and several others.

Despite this progress, the story is incomplete. There are few instances of complete CA being used in South Asia. Given the presence of puddled rice in the rotation, permanent residue retention is not feasible. Until sustainable and highly productive aerobic rice varieties and management practices become available, the potential for full CA in South Asia will remain unfulfilled.

The story of CA in sub-Saharan Africa (SSA) is one of frustrated hope, with only the occasional glimmers of success (for example, in Ghana). Interest in applying CA to the conditions of SSA goes back several decades. But the issues and problems that sparked this interest – and the ways in which CA innovation systems have evolved – have varied across different regions of the continent.

A major champion of CA in southern Africa has been the Africa Conservation Tillage Network (ACT), established in 1998. It recently has evolved into a Pan African network with global links, and is active in technology development, networking, information exchange, and policy advocacy.

Smallholder agroecosystems in southern Africa are affected by a multitude of problems. In many areas of western, eastern and southern Africa, soils are light-textured and thin, low in fertility and with little moisture-holding capacity. While annual average total rainfall is often sufficient for obtaining good single-season yields, this rain comes in a relatively small number of erratically spaced, high intensity events.

¹ Research since then has found that in wheat zero till fields, stemborer populations decline to very low levels. The act of fertilizing and irrigating these fields fosters residue breakdown, exposure of the larvae and predation.

Early- and late-season drought is not uncommon and cropping is risky. One important risk management strategy used by farmers is to integrate extensively-grazed livestock with cropping. Crop residues are typically used for livestock fodder. The challenge for CA is how to implement the three principles in such an unfavorable environment.

One of the CA principles calls for the use of sensible, profitable rotations. In many parts of SSA, maize-legume rotations and green manure cover crops have been a major topic of research, and some farmer adoption of maize - pigeon pea rotations has been observed in systems without livestock, in Malawi. The beneficial effects and practicality of crop residue mulches have been well researched in Africa, and they are widely used by farmers in wetter, more productive areas – largely, however, where animals form only a minor component of the system.

Another principle of CA, reduced or zero tillage, seems feasible. Direct sowing with zero tillage can help circumvent the common problem of late planting, allowing more farmers to plant on time, reducing the need for draft animals, and freeing up crop residues for use as mulch. Much research has been done on this topic, especially on the replacement of moldboard plow tillage with shallow

tine tillage, the latter requiring only 14% of the draft power requirement of the former – and resulting in far less soil disturbance. However, a frequent constraint with tine tillage is increased weed competition and weeding requirements in the initial seasons.

One apparent success story may be found in Zambia. The manual preparation and sowing of crops in “potholes” for water retention, combined with crop residue retention in these potholes, is said to have been taken up by 50,000-75,000 farm families. However, adoption has largely taken place in areas where only about 15% of the population own animal draft power.

The main constraint to widespread use of CA in SSA lies in achieving permanent soil cover with crop residues, in an environment where biomass production is low, rainfall is only adequate for one crop per year, residual moisture for cover crops is insufficient, uncontrolled livestock grazing of residues is common, adapted implements for direct sowing are not available, weeds are a major yield constraint, herbicides are either unavailable or enormously expensive. Until these constraints can be overcome, adoption of CA in SSA will be slow. The history of CA adoption in this continent remains to be written. ■

UN-APCAEM International Seminar on Promoting CA Techniques in Asia-Pacific

The seminar organized by United Nations Asian and Pacific Centre for Agricultural Engineering and Machinery (APCAEM) and co-sponsored by the Ministry of Agriculture of China, and China Agricultural University was held between 24 and 26 October 2007 in Zhengzhou, Henan Province, China.

Around 150 policy makers, experts, researchers and CA specialists from more than 10 countries, and international organizations participated in the seminar. The objective of the seminar was to promote the extension of CA techniques and enhance the awareness of agronomic, economic and environmental benefits of new developments and progress of CA through interaction among agricultural experts, administrators/policy makers, advisor and farmers.

To ensure wider adoption of CA, facilitation of extension, and full involvement of all concerned stakeholders, including farmers, researchers, technicians, extension specialists, manufacturers, governmental officials, agronomists and NGO's would need to be ensured.

The following recommendations emerged as being important to the sector:

- (1) Government Policy: An institutional framework of government services would be needed to play a pivotal role. Governments of member countries in Asia and the Pacific were encouraged to mainstream CA, sustainable agriculture development, and climate change into their national policies, laws, investment strategies, and education and extension programmes.
- (2) Public Awareness: Practice had shown that the

main impediment to accelerated adoption of CA were mindset related that favored a status quo on tillage backed by the fear of failure. Demonstration through pilot projects and good practices were needed to bring the change in farmer's thinking towards adoption of CA.

- (3) Extension Service: Establishment of an effective extension mechanism was needed. Extension specialists were needed to provide advice through various means including training and education through location specific knowledge. They also needed to study what were specific limitations in adopting CA under differing conditions.
- (4) Information Sharing: Knowledge dissemination needed to be carried out through website and printed publication means with adequate, practical, and useful information on CA being made available to farmers and extension specialists. The establishment of an Asian Network on Extension of CA (ANCA) has been recommended.
- (5) Financing and Institutional Support Service: Policy support from government, as well as support through initial financial assistance/subsidy, for purchase of CA related equipment was required to speed up adoption of CA.
- (6) Manufacture of agriculture related machines: Enhancing the research and development through manufacture of suited direct seeding implements, straw and cover crop management equipment, and other related implements needed to be supported by both public and private sectors. Cost-effective and efficient direct seeding machines suitable for

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PACA Inaugural Meet June 17, 2008, New Delhi

Combating Land Degradation for Sustainable Agriculture - Is Conservation Agriculture the Way Forward for India?

There are increasing concerns on account of conventional mode of agriculture resulting in undue exploitation of natural resources, land degradation, and uneconomical pursuit of agriculture given rising cost of inputs. With the growing importance of agriculture and the number of lives dependent on its pursuit, the key challenge today is to develop and promote strategies that can address needs of natural resource enrichment and agricultural productivity hand in hand.



Dr. R.S. Paroda, Chairman of the Meet addressing the gathering

June 17th, 2008 observed by the United Nations Convention to Combat Desertification (UNCCD) as World Day to Combat Desertification offered a perfect occasion for PACA to bring together concerned professionals keen to promote a renewed form of agriculture pursuit. Conservation Agriculture offers a way forward though as would be the case in any renewed pursuit, there were challenges to be faced in its adoption. The meet thus focused on deliberations to establish if conservation agriculture could indeed be the way forward to address needs of the farming community and environment. The half day meet maintained a focused approach bringing together professionals such as policy makers, scientists, development professionals, farmers and other key stakeholders to discuss their experiences and concerns pointing to problems and challenges likely to be encountered while pursuing this form of agriculture.

The opening session had presentations from eminent scientists of the agricultural research system with Dr. R.S. Paroda, (former DG ICAR), President TAAS chairing the session. After a brief introduction by PACA functionary Sanjeev Vasudev, the first session began with a presentation by Dr. R.S. Paroda on the concerns facing Indian agriculture. He highlighted the fact that of the Millenium Development Goals, those relating to Goals 1, 7, and 8, viz. "Eradicating extreme poverty and hunger", "Ensuring environmental sustainability", and "Developing a global partnership for development" had relevance to agriculture and its adoption in a sustainable manner. He later elaborated on the need to bring about a shift in thinking and evolve a new strategy to meet needs of productivity and the environment. This was followed by a presentation made by Dr. R.B. Singh (Ex Director, IARI, Former Asst. DG, FAO) that focused on reforming agriculture to meet needs of climate change with specific reference to land degradation. He dwelled on the emerging food security crisis and emphasized the need to look beyond technology dissemination. Focus thus needed to be on socio-economic factors such as poverty and hunger, specifically for farmers in drylands that had resulted in land degradation and desertification with or without intent. The final presentation was made by Dr. I.P. Abrol (Former DDG, NRM, ICAR, Director CASA) who set the stage for the context and concerns that are important for making Conservation Agriculture work for India. He also highlighted major issues likely to be faced while pursuing CA and requested the Chair to have the panel discussion focus on them to give direction to the way ahead.

The second session commenced by way of eminent discussants sharing their views on the subject that was later followed by an interactive panel discussion with responses from the floor. Dr. Sanjeev Chopra, Principal Secretary, Dept. of Agriculture, Govt. of West Bengal, expressed the view that zero tillage was already being practiced in the State of West Bengal and there was a need to strengthen capacity building at the local level for adoption of CA in its totality. He expressed his concerns related to the present mechanism of financing agriculture that was insufficient to cater to needs of majority of farmers specially marginal and small farmers who could not access inputs. With this scenario CA was possibly the only way forward if agriculture had to be pursued sustainably and profitably.

Dr. R.K. Mallik, Director Extension at HAU referred to the issue related to the rigid mindset of scientists as a



A section of the audience

major impediment in adoption of CA though many farmers were happily bringing about a shift in their practices. CA technologies has helped small farmers save on costs and improve on their income as has been reflected in impact assessment studies done by CIMMYT for projects pursued by them. Capacity building of scientists & policymakers, and a bottom-up approach were essential for effective CA adoption. Various technological and institutional problems related to CA adoption were also addressed by Dr. Mallik who had been involved with the Rice-Wheat Consortium that has been pursuing CA efforts for some time. Dr. S.S. Grewal, Director, SPACE, an NGO working in the hill region focused on the challenges related to CA adoption in the hill and foothill ecosystems that were prone to resource degradation. He also stressed on the need for water conservation sharing his experiences with the World Bank funded Integrated Watershed Development Project. Dr. P.K. Joshi, Director, NCAP addressed some of the socio-economic and policy issues pertaining to CA that ranged from issues such as return on investment, profitability, food security, income generation for those involved and other issues that would directly affect farmer participation like, availability of resources, cost of inputs, wage rate of labour, fixed assets, skill of farming community, and capacity building of farmers. He suggested an amalgamation of Technology, Institutions and Policy (TIP) as the way forward.

Dr. M.S. Gill, Director, PDCSR stressed on the availability of multi-location (across 25 states) crop sequencing that used farming systems approach developed by PDCSR, crucial to CA adoption. While pursuing this, the three pillars of CA – minimal-tillage, crop residue retention, and crop diversification had been emphasized. Dr. Ravi Gopal, CIMMYT shared his experiences and success story of CA adoption in Bihar and Jharkhand that was yielding benefits to farmers in the region. CA had been adopted in 9 districts through a farmer participatory programme in the two states. However lack of machinery manufacturers and issues related to repair and maintenance posed major

bottlenecks to CA adoption.

The Panellist's session was followed by discussions being carried out with participation of attendees who expressed views and raised queries that were well responded to by the panel. The Chair, Dr. R.S. Paroda presented the concluding remarks by not only summarizing discussions but also pointing to specific researchable issues as below needed to be taken up through a participatory and convergent approach leading to comprehensive CA adoption:

- Impact on natural resources, such as soil health, organic matter, and water use efficiency
- Impact on cropping systems, such as productivity, diversification and weed control
- Policy support
- Capacity building
- Extension mechanisms and information sharing
- Change in mindset of scientists

He further added that the time was appropriate to take up CA, though not as a blanket approach but one that was specific in eco-regional terms. The immediate need for impact assessment studies that would present specific recommendations for policy makers was reinforced. He concluded his talk by emphasizing the role expected to be played by a body such as PACA and the need for effective functioning to catalyze the process. This he said should be done aggressively without losing time, and incorporating learning from global/regional experiences to form a global partnership program on CA with requisite source of funding positioned to take this forward.

The meet ended with Dr. I.P. Abrol thanking all for the valuable contribution by way of their participation in the useful deliberations and committed on behalf of PACA to promote mainstreaming of conservation agriculture effectively. ■

"There is simply no need for plowing in the first instance. And most of the operations that customarily follow the plowing are entirely unnecessary, if the land has not been plowed."

Edward Faulkner, Plowman's Folly (1943)

SNIPPETS

NEWS

..... National Action Plan on Climate Change Announced

June 30, 2008

Prime Minister Dr. Manmohan Singh released the National Action Plan on Climate Change that hopes to address the urgent and critical concerns of the country through bringing about a directional shift in the development pathway. The Plan outlines a series of simultaneous steps to advance India's development and climate change related objectives through adaptation and mitigation, and hinges on development and use of new technologies that focus on energy efficiency and natural resource conservation.

At the core of the plan are Eight National Missions that represents a multi-pronged, long term and integrated strategy to achieve the goals in the context of climate change. These include: Solar Energy, Enhanced Energy Efficiency, Sustainable Habitat Water, Himalayan Ecosystem, Green India, Sustainable Agriculture and Strategic Knowledge. The Mission on Sustainable Agriculture will particularly focus on problems of Rainfed/Dryland Agriculture through improved methods to conserve soil and water, develop crop varieties resistant to biotic and abiotic stresses through community based activities aimed at information and knowledge sharing. In many ways conservation agriculture addresses the elements of concerns in most of objectives of the Mission and holds specific reference to the agenda for Sustainable Agriculture.

Do you have experiences
related to CA
worthy of being shared?

We look forward to hear of your experiences
and views related to the subject of
conservation agriculture through email at
info@conserveagri.org.

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Do you wish to involve
yourself with field efforts of
PACA?

Should you wish to contribute to efforts in the field as planned, we encourage you to fill the Professional Support Group electronic registration form available on the web page at www.conserveagri.org/links.htm and mail to us. It is easy to fill and takes a few minutes.

RECENT PUBLICATIONS

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1. Goddard, T., Zebisch, M.A., Gan, Y.T., Ellis, W., Watson, A. and Sombatpanit, S. (eds) 2008. No-Till Farming Systems. Special Publication No. 3, World Association of Soil and Water Conservation, Bangkok
 2. Erenstein, O., R.K Malik, and S. Singh. 2007. Adoption and Impacts of Zero Tillage in the Rice-Wheat Zone of Irrigated Haryana, India. New Delhi: CIMMYT and the Rice-Wheat Consortium for the Indo-Gangetic Plains.
 3. Farooq, U., M. Sharif, and O. Erenstein. 2007. Adoption and Impacts of Zero-Tillage in the Rice-Wheat Zone of Irrigated Punjab, Pakistan. New Delhi: CIMMYT and the Rice-Wheat Consortium for the Indo-Gangetic Plains.
 4. Vijay Laxmi, Olaf Erenstein and R.K. Gupta 2007. Impact of Zero Tillage in India's Rice-Wheat Systems . CIMMYT and Rice-Wheat Consortium for the Indo-Gangetic Plains New Delhi, India

UNAPCAEM Meet on CA

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Asian countries, especially those that could be fitted on lower horsepower tractors, were an urgent need. Manufacturers also needed to consider wheel track width and wheel positioning for CTF/PBR use.

- (7) Interdisciplinary research and development: Different disciplines involved in agriculture, namely engineering and agronomy, have to work closely together to develop and further technologies and methods for CA in tandem with social scientists. Efforts that needed special focus were monitoring and research of impacts, soil compaction and its effect on fertilizer efficiency and GHG emissions for one. Soil scientists, engineers, agronomists, plant pathologists and other scientists would have to share a common vision and working platform needing to orient their work accordingly.
- (8) Enhancing knowledge exchange and cooperation: Studies had shown that CDM protocol could be applied to the agricultural sector helping contribute to reduction of GHG emissions, leading to sustainable agriculture development. Related organizations needed to continue their efforts in exploring further the application of the CDM to CA in particular. In this connection, the establishment of Asian Network for Extension of Conservation Agriculture (ANECA) initiated with an aim to promote information sharing and cooperation among the member countries would be a useful step.