

Conservation agriculture for transition to sustainable agriculture*

Conservation agriculture (CA) has the potential to emerge as an effective strategy to the increasing concerns of serious and widespread natural resources' degradation and environmental pollution, which accompanied the adoption and promotion of green revolution technologies since the early seventies. The key challenge today is to adopt strategies that will address the twin concerns of maintaining and enhancing the integrity of natural resources and improved productivity, while improvement of natural resources takes a lead as it forms the very basis for long-term sustained productivity. The term 'Conservation Agriculture' refers to the system of raising crops without tilling the soil while retaining crop residues on the soil surface. Land preparation through precision land levelling and bed and furrow configuration for planting crops further enable improved resource management. Over the past 2–3 decades globally, CA has emerged as a way for transition to the sustainability of intensive production systems. CA permits management of water and soils for agricultural production without excessively disturbing the soil, while protecting it from the processes that contribute to degradation like erosion, compaction, aggregate breakdown, etc. CA has assumed importance in view of the widespread natural resource degradation leading to increased production costs, unsustainable resource use, environmental pollution and health of ecosystems. This conference was in response to these emerging challenges and to help arrive at a shared perception of R&D agenda for CA. A crucial expectation from the workshop was to gain insights for transition to more sustainable agricultural systems.

About 150 participants representing major stakeholders were involved in CA along with participants of an ongoing travelling

seminar organized by Rice–Wheat Consortium for the Indo-Gangetic plains in the region. Participants were from India, Pakistan, Bangladesh and Nepal. The conference offered a common platform to the scientists, farmers, policy makers and other stakeholders to discuss various concerns, experiences, problems and opportunities offered by CA. Keeping this focus in view, sessions began with a clear statement of the conference objectives which were, assessing adoption of CA practices in different agro-ecological regions, identifying the technological, socio-economic, policy and institutional constraints, defining agenda for R&D and identifying institutional mechanisms for promoting and strengthening participation of range of stakeholders as a means of seeking a way forward.

The opening session included presentations on global and South Asian scenarios in respect of CA. The session focused on the current progress and future potential of CA, basically setting a stage for the discussions. Key speakers included J. S. Samra (Deputy Director General (NRM), ICAR), who highlighted how current agricultural practices were leading to declining quality of natural resources. This was followed by a statement of conference objectives by I. P. Abrol (Director, Centre for Advancement of Sustainable Agriculture). Larry Harrington and Olaf Erenstein (International Centre for Maize and Wheat Research (CIMMYT)) provided a global perspective of progress in adoption of CA practices (Brazil, Africa, USA, New Zealand, Australia, Argentina, Canada, South Asia, Central Asia, China, etc.). Raj Gupta (Regional Facilitator, Rice–Wheat Consortium for the Indo-Gangetic Plains) and Mushtaq Gill (Director General Agriculture (Water Management), Pakistan) shared their experiences with resource conservation technologies in India and Pakistan respectively. V. L. Chopra (Member, Planning Commission) pointed to the existence of strong linkages between resource degradation and poverty and that CA must be considered a route to sustainable development. Radha Singh (Secretary, Department of Agriculture and Cooperation) while discussing the overall agricultural scenario in India, emphasized the need for policy and institutional changes for promoting region-

ally differentiated approaches in developing and promoting CA technologies. Mangala Rai (Director General, ICAR) viewed CA as a necessity in the Indian context and was a priority research agenda for the scientific community.

Globally CA systems are being adopted in over 80 million hectares largely in the rainfed areas. The countries where the system is being adopted and promoted extensively include, US, Brazil, Mexico, Australia, etc. Unlike, in the rest of the world, in India and other South Asian countries spread of CA technologies is taking place in the irrigated Indo-Gangetic plains where rice–wheat cropping system (RWCS) dominates. Field experiences of farmers and agriculture officers from the states of Haryana, Punjab, UP and Bihar were part of the second session. They described and discussed the positive aspects of CA and highlighted the problems that require to be addressed for successful adaptation of CA. CA systems have not yet taken roots in other major agro-ecoregions, like rainfed semi-arid tropics, the arid regions or the mountain agro-ecosystems. Experience based on on-station experiments, though not unequivocal, is suggestive of the need to initiate efforts with participation of farmers in these regions (Session 3). S. P. Wani (ICRISAT) highlighted the major constraints both biophysical as well as social in adoption of CA practices for highly variable rainfed semi-arid tropics. While the basic principles, which form the foundation of CA practices, i.e. no tillage and surface managed residues are well understood, adoption of these practices under varying farming situations is the key challenge. Issues related to technology needs and inputs management addressed some of these basic issues for transition to CA (Sessions 4&5). The technological challenges discussed related to development, standardization and adoption of farm machinery for seeding with minimum soil disturbance (R. K. Malik, Haryana Agricultural University (HAU), Hisar), developing crop harvesting and management systems with residues maintained on soil surface and developing and continuously improving site-specific crop, soil, and pest management strategies (Saroj Jaipal, HAU) that will optimize benefits from the new system.

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Panel discussion on policy and institutional requirements flagged some critical issues required to be addressed if CA has to become a way of farming. The session raised farmers concerns with WTO. Arun Bhakoo, a farmer emphasized that in the absence of appropriate incentives farmers were unlikely to get enthused with only 'potential benefits' over long period in terms of resource base quality improvement. This would call for a relook at policy incentives which encourage certain crops and cropping systems, resource use practices and consequent short and long-term impact in terms of productivity and ecosystem health. Joginder Singh (Punjab Agricultural University) emphasized the need for reshaping the price policy, which is encouraging certain crops only (rice/wheat). Diversification to other crops along with effective procurement, infrastructure for providing services for resource conservation technologies at the local level and monitoring of resource base were the main policy and institutional requirements suggested. S. Rajeswari (NISTADS) emphasized that the objectives of agricultural science should shift from increasing yields to enhancing livelihood opportunities. CA marks an evolutionary change through a process of learning that offers the opportunity and a means to achieving policy goals. The session concluded that if CA has to offer a way to address broader livelihood issues the new institutional arrangements must be based on a good understanding of the features that distinguish the principles and practices of CA from the conventional R&D approach. Institutional mechanisms are re-

quired to ensure that CA is seen as a concept beyond agriculture. Institutionalizing the role of research, extension and farmers in such a way that the partnership among these stakeholders might be strengthened right from the beginning of the project, which helps building up sense or enabling of ownership among them. CA must aim at broad livelihood strategies and move towards forming conservation villages, with appropriate agribusiness strategies to increase employment in areas where it is adopted. However, caution must be taken to avoid blanket adoption of CA just everywhere, it should be site-specific and need-based. It is therefore a challenge both for the scientific community and the farmers to overcome the past mindset and explore the opportunities that CA offers for sustained agriculture.

The last session came out with specific recommendations for CA research and development. This represented an integrated view of focused group discussions to define priorities for R&D under the heads, IPM and weed management, machinery and crop management, soil cover-residue management, genetic enhancement, water and nutrient management, social science/policy research and networking, linkages and information exchange in CA systems.

Recommendations for CA research and development

- Promoting CA will call for moving away from the conventional linear, compartmentalized and hierarchical arrangement

from research and extension to the farmers who passively adopt it. All the stakeholders involved would need to be brought together on a common platform to conceive end-to-end strategies.

- The stakeholders, working in partnership mode, will be critical in developing and promoting new technologies. Understanding system interactions and developing management strategies will call for teams of scientists across disciplines working together. This will also call for new ways of managing and funding research.
- There is a need for policy analyses to understand how conservation technologies integrate with other technologies, policy instruments and institutional arrangements that promote or deter conservation agriculture.

As CA practices result in resource improvement only gradually and benefit in terms of crop yields may not come about immediately, evaluation and impact of CA practices therefore needs a longer term and a broader perspective which goes beyond yield increases only. CA is now considered a route to sustainable agriculture. Spread of CA, therefore will call for a greatly strengthened research and linked development efforts.

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India Science Award and Dan David Prize for C. N. R. Rao



C. N. R. Rao, Linus Pauling Research Professor at the Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore,

and former Director, Indian Institute of Science has been awarded the **India Science Award** and the **Dan David Science Prize for 2005**.

The India Science Award, which carries an amount of Rs 25 lakhs, is the highest and most prestigious national recognition for outstanding contribution to science. He is the first recipient of this award.

The Dan David Science prize is one million dollars and is given by an Israel based foundation. Each year, the subject

of the award changes and for 2005, the prize is for research in materials science. Rao shares the Dan David Prize with George Whitesides of Harvard University and Robert Langer of Massachusetts Institute of Technology. The citation states that 'Rao is the world's foremost solid state and materials chemist'. The award ceremony is being held on 23 May 2005 in Tel Aviv. Rao is currently Chairman of the Science Advisory Council to the Prime Minister.