

Proceedings of the Meeting on Conservation Agriculture held at the ICAR-Research Complex for Eastern Region, Patna on October 21, 2022

A meeting on Conservation Agriculture (CA) under the chairmanship of Dr. S.K. Chaudhari, DDG, ICAR-Natural Resource Management (NRM) was held at the ICAR-Research Complex for Eastern Region (RCER), Patna, Bihar on October 21, 2022. The list of participants working in CA across the country is annexed. The meeting started with the lighting of the lamp and the ICAR song. Dr. A. Upadhyaya, Director (A), ICAR RCER welcomed the Chief Guest Dr. S. K. Chaudhari, DDG, ICAR-NRM; Dr. P.C. Sharma, Director, ICAR-Central Soil & Salinity Research Institute (CSSRI), Karnal; Dr. J.S. Mishra, Director, ICAR-Directorate of Weed Research (DWR), Jabalpur and other dignitaries present in the meeting.

Dr. A. Upadhyaya, Director ICAR RCER in his welcome address highlighted the agenda for deliberation of this meeting and the importance of why CA needs to be widespread across the country pertaining to its climate change adaptation and mitigation perspective. He briefed about the CA experiments running at the institute since 2009.

In his initial remarks, DDG, NRM expressed gratitude to all the members present in the meeting, and briefly mentioned the background and purpose to call the meeting at this time. He emphasized the role of CA in Indian and global scenarios. He referred to CA as a viable future option considering its monetary and ecological significance. He further underscored the problem of weed management, nutrient management, and greenhouse gas (GHGs) emissions in CA. The technical session started with a series of presentations by the delegates working on CA across India under ICAR and CIMMYT.

In this series, the first presentation was made by Dr. Rakesh Kumar, PI, CSISA & CRP on CA Project; Senior Scientist, ICAR RCER, Patna. In his presentation, Dr. Kumar highlighted the role of long-term CA on soil health and anticipated problems associated with insects, weeds, and nematodes. The impact of no-tillage and non-puddled rice in terms of system productivity, water balance, energy, and profitability were also presented by him. Dr. Kumar reported that there was a problem with rice mealy bugs after 5-6 years in CA-based management practices. In the discussion session after the presentation, Dr. S.K. Chaudhari, DDG, ICAR-NRM suggested to refer the global reference for weed and pest management and coming up with a concrete solution to this problem which can be accepted at the national level and given as recommendations to follow for areas practicing CA. Dr. J.S. Mishra, Director, ICAR-DWR, Jabalpur suggested that there is a

need to incorporate different cropping systems in CA as crop diversification is one of the key elements in CA. Dr. S.P. Poonia, Research Coordinator, CIMMYT, Bihar advocated the importance of tillage in CA after 5 years for proper weed management. He also suggested that conducting further trials in CA while taking tillage after five years as one of the treatments and comparing the results with conventional CA.

Dr. H. S. Jat, PI, CSISA Project and Principal Scientist, CSSRI Karnal, highlighted that through system intensification, CA has the potential to increase system productivity and profitability by 10 and 25% through rice-wheat-mungbean (RWMb) system and by 15 and 50%, respectively through maize-wheat-mungbean (MWMb) system, respectively while reducing the environmental footprints by 20-30% using significantly less irrigation water (RWMb-25-30%; MWMb-70-75%) and energy (RWMb-25%; MWMb-45%) and labour (15-20%). Dr. Jat also reported that less technical knowledge among the farmers for operating the happy seeder, lack of precise irrigation technologies, and yield penalty in rice is a crucial reason for the poor adoption of CA. For this, Hon. DDG, ICAR-NRM suggested documenting the major constraints in the adoption of CA in Western Indo-Gangetic Plains and to put more effort to bring technology from the lab to land for benefitting the farmers and society.

The third presentation in the series was made by Dr. A.K. Biswas, Consortium Leader, Conservation Agriculture Platform, PS & Head, Soil Chemistry & Fertility Division, ICAR-Indian Institute of Soil Science (IISS), Bhopal where he presented the salient findings of different projects running under CRP on CA across the country. Dr. Biswas stressed on the role of farm machinery, especially for CA. He also suggested that power requirement for operation of a happy seeder in Vertisols is high and tractors with high power are often not available with the farmers. Hon. DDG-NRM suggested adopting CA for other non-cereal crops like sugarcane. He also emphasized the role of machinery development for CA and asked to document the constraints of machinery design and repair process i.e., custom hiring centre (CHC).

In the presentation made by Dr. T. K. Das, Professor & PS, ICAR-Indian Agricultural Research Institute, New Delhi made a detailed presentation on the impact of CA on soil properties including its resilience and porosity which was applauded by the Hon. DDG, ICAR-NRM. In the discussion, it came out that lack of farmers' education, improper technical knowledge, fragmented and small

land holdings as well as low purchasing power of the farmers to invest in machinery are the major constraints for CA adoption at the farmers' fields in Indo Gangetic Plains (IGP).

Dr. R. K. Jat, Senior Agronomist, Borlaug Institute for South Asia (BISA) in his presentation showed developing, adapting, and scaling up CA-based climate smart agriculture technologies in South Asia. During the discussion few points of concern which emerged were quality seed, skill development of farmers and role of other stakeholders in CA are required for wider adoption of CA in MIGP. Furthermore, Hon. DDG, ICAR-NRM suggested finding out and reporting the ground-level problems which hinder the wider adoption of CA.

The last presentation was made by Dr. G. Pratibha, PS, ICAR-CRIDA, Hyderabad which falls under the rainfed agricultural production system. She reported that integration of complementary practices along with CA principles like *in-situ* moisture conservation, nutrient and weed management fetched higher productivity under a diversified production system of pigeon pea, maize, and cotton. Dr. Pratibha highlighted that soil, nutrient loss, and enrichment ratio were lower in zero tillage with residues. She reported the termite as one of the major problems in CA-based production system. Hon. DDG, ICAR-NRM congratulated all the presenters for meta genomics of bacteria and advised them to move ahead and go for termite diversity analysis affecting CA. Hon. DDG, ICAR-NRM emphasized the risk associated with CA adoption in rainfed conditions and ways to popularize it amongst the farmers.

During the discussion session, Shri Anil Kumar Jha, Deputy Director of Agriculture, Government of Bihar (GOB), emphasized the risk associated with the adoption of CA in Bihar. He further emphasized that the availability of machinery and lack of proper advisory is a major concerns for lack of adoption in CA. He also explained the role of village-level institutional management, provision of seed and forage, and custom hiring centre (CHC) in CA. He concluded that risk management in the adoption of CA in Bihar is an important factor for the proper management of CA. Hon. DDG, ICAR-NRM emphasized that farmers need a better resilient farming system. He highlighted that Bihar Government has Climate Resilient Agriculture Programme (CRAP) where they are working towards CA across the state. Dr. J. S. Mishra, Director, ICAR-DWR, Jabalpur again asked for one component of CA which is neglected crop diversification and residue mulching can play a huge difference in the long run. Dr. P.C. Sharma, Director, ICAR-CSSRI, Karnal suggested further irrigation methods, sub-surface drainage and weed management interaction

studies under CA and the need for special varieties to be developed for CA-based production systems. He further stressed the role of nutrient saving in CA should be precisely studied.

Dr. Ashutosh Upadhyaya, Director (A), ICAR-RCER Patna has given emphasis to work on water productivity and related attributes in detail under CA-based production system.

In the concluding remarks, Dr. S. K. Chaudhari, DDG, ICAR-NRM asked all the project team leaders and team members working on CA to work on the following aspects:

- Constraint Analysis: ability of the farmers to cover the risk to cope with adversity under conventional and CA provided with alternatives like animals, fisheries, and horticultural crops if CA fails
- Need to identify the hotspots for CA and different crops suitable for these ecological regions
- Expand the scope of CA from cereal-based systems to other agricultural systems including sugarcane
- Institutional mechanism at the village level for CA feasible practices
- Provision for seed bank, forage, and custom hiring centre (CHC) is needed
- Integrate fisheries sector, especially for small ruminants with CA
- Compilation of a document of scientific findings associated with CA done so far and publish it in the form of a compendium at national levels.

Hon. DDG, ICAR-NRM further suggested forming a group for pooling the information from different CA practices under diverse agroecological regions. From this, a broad contour will be drawn as to what needs to be done. Based on learning from CA over the last 3 decades decisions will be taken on recommending policy changes that need to be given to policymakers. Overall, the focus of the meeting was to make CA productive, profitable, and sustainable. The meeting ended with a formal vote of thanks.

The following members were presented during the meeting at ICAR-RCER Patna

| S. No. | Name | Designation |
|--------|---------------------|----------------------------------|
| 1. | Dr. S. K Chaudhari | DDG, ICAR-NRM, New Delhi |
| 2. | Dr. A. Upadhyaya | Director (A), ICAR-RCER, Patna |
| 3. | Dr. P.C. Shrama | Director, ICAR-CSSRI, Karnal |
| 4. | Dr. J.S. Mishra | Director, ICAR-DWR, Jabalpur |
| 5. | Dr. B.P. Bhatt | PS, NRM-Division, New Delhi |
| 6. | Dr. H.S. Jat | PS, ICAR-CSSRI, Karnal |
| 7. | Dr. R. K. Jat | Senior Agronomist, BISA, Pusa |
| 8. | Dr S.P. Poonia | Platform Coordinator, CIMMYT |
| 9. | Dr. A.K. Biswas | PS& Head, CRP Leader, IISS |
| 10. | Dr. T.K. Das | Professor & PS, IARI, New Delhi |
| 11. | Dr. G. Pratibha | PS, ICAR-CRIDA, New Delhi |
| 12. | Dr. Bikash Das | PS, ICAR-RCER, Patna |
| 13. | Dr. Anil Jha | Deputy Director Agriculture, GOB |
| 14. | Dr A.K Choudhary | PS & Head, DCR-RCER, Patna |
| 15. | Dr. Ujjwal Kumar | PS & Head, DSEE-RCER, Patna |
| 16. | Dr. Kamal Sarma | PS & Head, DLFM-RCER, Patna |
| 17. | Dr. Sanjeev Kumar | PS, DCR-RCER, Patna |
| 18. | Dr. A.K. Singh | PS, DLWM-RCER, Patna |
| 19. | Dr. Shivani | PS, DCR-RCER, Patna |
| 20. | Dr. N. Bhakta | PS, DCR-RCER, Patna |
| 21. | Dr. A. Dey | PS, DLFM-RCER, Patna |
| 22. | Dr. Shankar Dayal | PS, DLFM-RCER, Patna |
| 23. | Dr. Abhay Kumar | PS, DSEE-RCER, Patna |
| 24. | Dr. Ajay Kumar | PS, DLFM-RCER, Patna |
| 25. | Dr Bikas Sarkar | PS, DLWM-RCER, Patna |
| 26. | Dr. A. Rahman | PS, DLWM-RCER, Patna |
| 27. | Dr. Dhiraj K. Singh | SS, DSEE-RCER, Patna |
| 28. | Dr. A.K. Dubey | Scientist, DCR-RCER Patna |
| 29. | Dr. Kumari Shubha | Scientist, DCR-RCER Patna |
| 30. | Dr. Santosh Kumar | SS, DCR-RCER, Patna |
| 31. | Dr. Surajit Mondal, | SS, DCR-RCER, Patna |
| 32. | Dr. Rachana Dubey | Scientist, DCR-RCER, Patna |
| 33. | Dr. Saurabh Kumar | Scientist, DCR-RCER, Patna |
| 34. | Dr. Rakesh Kumar | SS, DCR-RCER, Patna |
| 36. | Dr. T.K. Koley | SS, DSEE-RCER, Patna |
| 37. | Dr. A. Mukherjee | Scientist, DSEE-RCER, Patna |
| 38. | Dr R. K. Raman | Scientist, DSEE-RCER, Patna |
| 39. | Dr. Akram | Scientist, DLWM, RCER Patna |
| 40. | Dr. Pawan Jeet | Scientist, DLWM, RCER Patna |

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| 41. | Dr P.K. Sundaram | Scientist, DLWM, RCER Patna |
| 42. | Mr. Sarafraj | Technical Officer, RCER, Patna |
| 43. | Sh. Anil Kumar | Technical Officer, RCER, Patna |
| 44. | Sh. S.K. Rajput | Technical Officer, RCER, Patna |
| 45. | Sh. Prem Pal | PPS, Director, ICAR-RCER, Patna |
| 46. | Mr. Hansraj | SRF, CRP on CA, DCR RCER |
| 47. | Mr. Barun | SRF, NASF, DCR RCER |