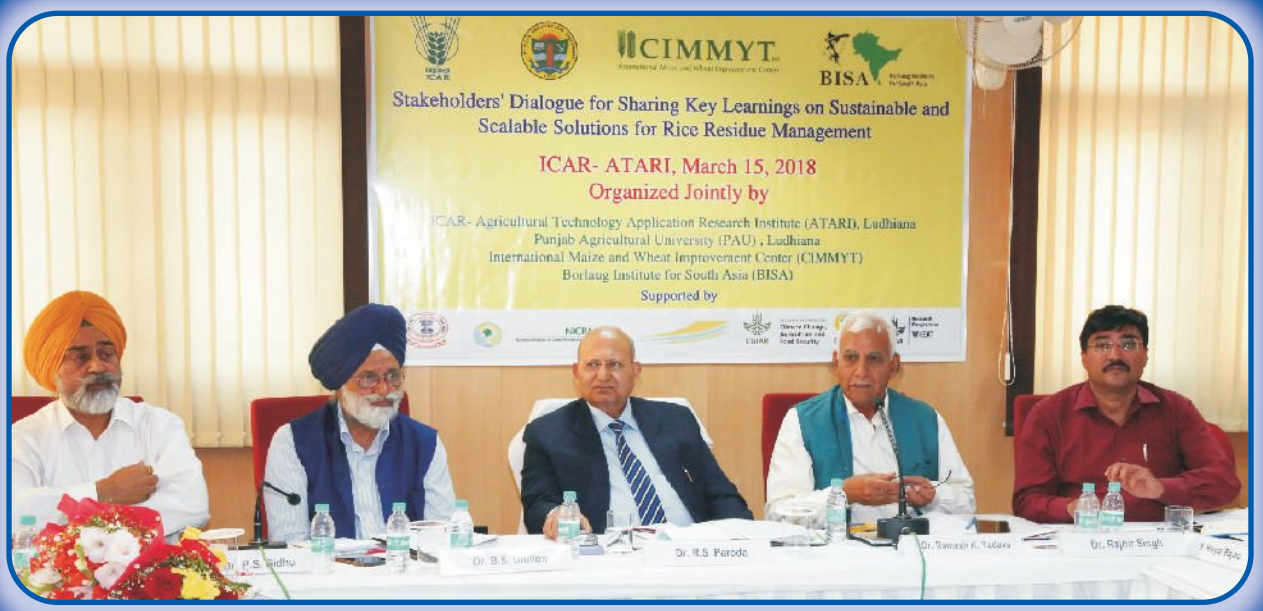
Stakeholders' Dialogue on Sustainable and Scalable Solutions for Rice Residue Management

March 15, 2018

ICAR-ATARI, Ludhiana

Proceedings and Recommendations



Jointly Organized by

ICAR-Agricultural Technology Application Research Institute (ATARI), Ludhiana, Punjab
Punjab Agricultural University (PAU), Ludhiana, Punjab
International Maize and Wheat Improvement Center (CIMMYT), New Delhi
Borlaug Institute for South Asia (BISA), Ludhiana, Punjab

Preamble

Needless to mention that crop residue burning in north-west India is one of the major concerns for researchers, change agents, policy planners, farmers and civil society not only in farming but also for *"one-health"*; soil, plant, human, animal & environment. Several management options have been developed and advocated to address the issue. However, from a long-term sustainability perspective of agriculture and soil health; the Govt of India have taken a very intelligent policy decision for *"In-Situ"* management of rice residues. Accordingly, a new scheme of Rs 1152 crore has already been launched by the Government of India. There are different ways and means for *"In-Situ"* management of crop (Rice) residues. However, farmer need scalable and sustainable solutions adapted to their socio-economic and bio-physical settings. Considering the pressure from National Green Tribunal (NGT), Hon'ble Supreme Court and the civil society, significant efforts were made by range of stakeholders to promote "No-Burn Farming" during winter 2017-18 and are quite successful in reducing the burning incidence. A "Stock-Taking" exercise involving all the stakeholders and learning from

experiences on the issues pertaining to crop residue management using different option would help in developing the future action plan for large scale adoption of the no-burning agriculture on a sustainable basis. In order to outline an action plan, a one-day stakeholder dialogue on **"Sharing Key Learnings on Sustainable and Scalable Solutions for Rice Residue Management"** was organized on 15th March, 2018 at ICAR-ATARI, Ludhiana, Punjab.

The specific objectives of the dialogue were-

- Deliberate on different in-situ residue management solutions and sharing learnings
- Identify the major bottlenecks and suggest most viable and scalable business model of potential ***in-situ*** **management solution i.e.** concurrent use of Super SMS and Happy Seeder technology
- Devise strategy for capacity development and identification of knowledge gaps at different levels and scales for *In-Situ* residue management technologies

The dialogue was organized by ICAR-Agricultural Technology Application Research Institute (ICAR-ATARI), Ludhiana in collaboration with Punjab Agricultural University (PAU), International Maize and Wheat Improvement Centre (CIMMYT), Borlaug Institute of South Asia (BISA) & supported by ICAR-NICRA, Government of Punjab, CGIAR Research Programs on Climate Change, Agriculture & Food Security and Wheat Agri-Food Systems. Around 150 key stakeholders including researchers, farm innovators, progressive farmers, manufacturers, senior officials of Governments of Punjab and Haryana; farmer commissions of Punjab and Haryana, , NABARD, Punjab Pollution Control Board (PPBC), ICAR institutes (IIMR, Ludhiana, CIPHET, Ludhiana, CSSRI, Karnal, IIWBR, Karnal, NDRI, Karnal, DMR, Solan, CPRI, Jalandhar), CIMMYT, BISA, Program Coordinators of KVKs, private companies etc. participated in the dialogue and shared their key learnings to make the robust strategies, action plans and implementation for out scaling sustainable residue management solutions. **Padma Bhushan Dr R S Paroda**, Ex Secretary, DARE and DG, ICAR & Chairman TAAS graced the dialogue as Chief Guest

and Dr B S Dhillon, Vice Chancellor, PAU was chair while Dr Ramesh Yadav, Chairman Haryana Farmer Commission and Dr BS Sidhu, Commissioner Agriculture, Punjab were Guests of Honour.

At the outset, Dr. Rajbir Singh, Director, ICAR-ATARI, Ludhiana formally welcomed the dignitaries and participants of the dialogue. He also narrated the background of residue burning and cause of concern of this serious problem at such a large scale. While setting the context of the Dialogue, Dr. Singh highlighted the current situation of residue burning and the potential technological interventions available for proliferation. He also reminded the repeated call of Hon'ble Prime Minister to curb this ill practices and the decision of Finance Ministry to initiate a special scheme **"*In-situ***

management of crop residue" to tackle this menace. He briefed the house about efforts made by ICAR-ATARI, KVKs, PAU, CCSHAU and other organizations like CIMMYT, BISA etc in association with agriculture and line departments in curbing residue burning. He requested Dr. B. S. Dhillon, Vice Chancellor, PAU, Ludhiana & Chairman of the programme to conduct the deliberations.

Dr. B. S. Dhillon, VC, PAU, Ludhiana and Chairman of the Stakeholders' Dialogue expressed his sincere gratitude to the Punjab farmers for taking agricultural production to the new heights and stressed upon the need of proper management of rice straw. He appreciated the efforts of organizers specially ICAR-ATARI for conducting this Dialogue which is very timely with focussed objectives. While emphasising the need of curbing this menace, he urged all the stakeholders to discuss various issue raised in a systematic manner to address the key objectives of the dialogue.

He opined the group to suggest some strong and practical recommendations which will pave way to a clear-cut roadmap so that we can move forward having all the stakeholders at same frequency. He also urged all the stakeholders to join hand with KVKs in campaign against residue burning and become ambassador of this campaign. He defined the timeline of the discussion and invited the participants with bottom approach and hence, invited the farmers first to share their experiences and learning in tackling the paddy straw. In view of the time constraint, one to two farmers from each district were requested for sharing their experiences and suggestions for "Zero-Burning" efforts.

Farmers' Experiences:

Sh. Gurbachan Singh from Burj Deva Singh village of Hari-ke-Pattan in **Tarantaran** district of Punjab shared unique initiative of curbing the menace of crop residue burning. Sh Singh strongly emphasized that

the technology comes second, first we have to create awareness among society for their commitments for no burning. He shared the example of his own indicating

that during the marriage fixation of his son, he put condition before the parents of expected bride that they (bride's parents) will also not burn crop residue on their farms. After the consent of the girl's parents Sh. Gurbachan Singh organized extremely simple marriage without accepting any dowry and big celebrations on either side. He informed that he never put his field to fire and have been using happy seeder for last many years to manage the residues. It is my own experience that the machine is quite good and has many advantages like timely sowing, saving of at least one irrigation, better weed control particularly *Phalaris minor* and good crop growth and yield, Mr Singh added.

S. Gurpreet Singh from Khoso Pando village of **Moga** district informed that Saint Gurmeet Singh of our village motivated the farmers for non-burning of paddy straw and even provided financial assistance to the needy farmers for the management of paddy straw. In our village, farmers managed the paddy straw under the technical guidance of Krishi Vigyan Kendra, Moga. We incorporated the paddy straw (*In-situ*) by mulcher and disc harrow/ mould board plough, some

farmers also used baler for removal of paddy straw. KVK came forward to provide us Happy seeder and the results are very good in terms of cost & time saving and growth of wheat. Many farmers are coming to observe the results of happy seeder and told that this technology has a bright future and the farmers are looking forward for the wheat yields so that they can plan to adopt the happy seeder.

Sh. Jaswinder Singh Gill from Bhagwanpur village of **Amritsar** district requested that scientists should guide us on the soil nutrient status between paddy straw incorporation into soil versus mulching on soil by happy seeder. Efforts should be made to observer long term effect on soil health and environment. The production economics also need to be compared for different *in-situ* residue management options.

Sh. Jagtar Singh Brar of Mehma Sarja village of **Bhatinda district**, an innovative farmer who never ever burnt paddy straw and shared his experiences on residue management. Mr Brar is a vegetable grower and hence used the rice residues as mulch in his vegetable fields which not only enhanced the earliness but save vegetables from frost damage which fetched impressive profit. He also opined that “travelling seminars” should be organized to showcase these results to the farmers so that they are convinced as 'seeing is believing'. **Sh. Darshan Singh** of Rampur village of same district is a potato grower and informed that incorporation of residue results into better potato crop with better quality of tuber which fetch higher prices in market but the cost of incorporation is high. He urged to provide reversible ploughs either on

subsidised rate or make available through cooperative societies for the potato/vegetable farmers as they have only one option of incorporating the residues.

Sh. Amrik Singh of village Fatehgarh Viran of **Ropar** district shared that he is practicing happy seeder technology for last five years. He shared his experiences as how happy seeder helps in adapting to climatic risks. During 2014-15, untimely and continuous excess rains during March and April resulted into huge losses due to lodging and discoloration of grain. The wheat sown with happy seeder at my farm had very less lodging and there was a negligible loss which may be due to better water infiltration and robust root system. In totality, there was saving in irrigation water, reduction in weed population besides good soil health and better wheat crop and economic returns.

Sh. Jagdish Singh of Chattiana village of **Muktsar** district emphasized to have a mechanism for seed cover in happy seeder. He suggested a simple solution to fix some pipe/small iron rod behind the tynes of happy seeder to cover the naked wheat seed in soil. He also emphasized that since demand for happy seeder is increasing, the availability of more number of happy seeder should be arranged by Government at village cooperative societies and KVK before the coming season so that more and more farmers can be benefited with this technology.

S. Baljinder Singh of Bhajouri village of **Mohali** district shared his experiences regarding paddy residue management. He is not burning paddy straw for last three years and incorporated all the residues in his field itself with the use of disc harrow and rotavator before sowing wheat. The extra cost incurred in all these operations is about Rs. 5000/- per acre mainly due to increase cost of diesel. He urged Government to give some incentive or develop some mechanism to compensate the extra cost.

Sh. Surjit Singh of Sadhugarh village of **Fatehgarh Sahib** district shared his experiences about happy seeder in very heavy soils of his village. He informed that it is very difficult to grow wheat in such heavy textured soils as flood irrigation resulted into water stagnation which affects the wheat crop adversely. On the advice of KVK, I am using Happy seeder for last ten years with some innovation as flood irrigation can be disastrous for wheat crop so introduced 'rain gun' for irrigation purposes. Use of happy seeder followed by irrigation with rain gun is an effective method of wheat cultivation in very heavy soils which can be observed on his farm. **Sh. Gurpreet Singh** of Boran

village of same district also endorsed the success of happy seeder and irrigation by rain gun; however, he suggested that after sale service of machinery should made mandatory for the manufacturers.

Sh. Jasandip Singh of Badhni Gulab Singhwala of **Ferozepur** district shared his experiences of incorporating paddy residue in his fields for last many years but the cost of incorporation is increasing day by day. This year he has observed the results of happy seeder sown wheat in KVK and convinced that the technology has many advantages but efforts should be made to make available such machines to farmers particularly in remote areas and farmers should also be trained on such machines. KVKs and extension persons of state department of agriculture can play a great role in such endeavour and every KVK should be provided some machine for the use of farmers

Sh. Sukhjit Singh of Diwala village of **Ludhiana** shared his experience on residue management and informed the participants that paddy residue is a valuable resource which can be used effectively for enriching the soil. He expressed his pleasure to incorporate residue and cultivating potato with very impressive results in terms higher yield and good quality tubers. Similarly, **Sh. Sawarnjit Singh** of Ghulal village of same district explained his views that he was having many questions on the use of happy seeder and visited KVK demonstrations many times at different intervals to observe the results of wheat sown with happy seeder. Even though I was convinced with results but soil of KVK is having light texture so I thought that this will not be applicable in heavy soil of our village. KVK motivated me to adopt the technology and I dared and now fully convinced that this is the future technology.

S. Mohinder Singh Dosanjh, **Fellow of PAU** & a progressive farmer of Jagatpura village in **Fatehgarh Sahib** district, informed the house that he is quite optimistic about the burning free scenario with efforts

made during last many years by the scientists in the direction of developing machines and demonstrating the package of technologies. The combo of super SMS and happy seeder is complete assembly to tackle the residue problem in an effective manner. The farmers are convinced with the technology and PAU has also included this package in the Package of Practices. He visualized the future Punjab as fire free Punjab and urged everybody to contribute significantly in this direction.

Sh. Gurinder Singh of Kanoi village of **Sangrur** district shared his view and informed that he is using happy seeder for last five years and organic carbon of his fields has become more than 1% besides the problem of weeds particularly *Phalaris minor* has reduced to threshold level. He opined that machines should be made available to farmers and GST on machine should be waived-off. He also suggested that the market price of happy seeder will increase with the declaration of subsidy mainly due to Clairton made by the manufacturers and ultimately farmers are sufferers out of this. Government should fix the price of such machines so that interested farmers can purchase this machine on affordable prices. He emphasized that rather than subsidy, farmers should be provided "incentives for ecosystem services" as subsidy mechanism is not an effective use of the public money.

S. Harpal Singh Bajwa, renowned mushroom grower from **Kurukshetra** and Member of Board of Management of CCSHAU, Hisar shared his rich experience on use of paddy straw in mushroom cultivation which has vast scope in the field of entrepreneurship. He cited example of Sonipat district of Haryana where there is less burning of paddy straw mainly because farmers are using the straw for mushroom cultivation. He urged that Government should make a policy on this and incentives should be a part of this policy.

Key reflections from farmers:

- **Community awareness is one of the best ways to raise awareness wherein the community/religious leaders can play great role. Hence, the support of community/religious leader should be mobilized**
- **There are several options for residue management but based on the stakeholder feedback and experiences, Happy Seeder is most potential scalable and sustainable solution**
- **Residue incorporation has been found effective for vegetables/potato farmers but has limitations of cost effectiveness**
- **Mushroom farming is another alternate option for managing residues and promoting organic farming in high value crops**
- **Machinery quality and availability is one of the key challenge which need to be addressed through effective mechanism for maintaining quality standards**
- **Cost comparisons for different in-situ management options should be made to provide evidence base as what option is effective where and under what circumstance**
- **Farmer to farmer learning is most effective way of extension and in that process travelling seminar is very effective approach**
- **Happy seeder supplemented by rain-gun/sprinkler irrigation is very effective approach in managing residue while harvesting high yields in heavy textured soils**
- **A proper analysis should be made on understating synergies and trade-offs for subsidy v/s incentives on different residue management technologies/schemes**
- **Capacity development is key to success of all the technologies and hence clientele targeted training modules and programs should be developed and executed**

Machine manufacturers' perspective:

Sh. Jogender Singh from **Kamboj Mechanical Works**, Ramdas, Amritsar urged the house that order of number of happy seeder to be manufactured should be placed well in advance allowing them for timely delivery of the quality machines.

S. Manmohan Singh from **National Agro-Industry Pvt. Ltd**, Ludhiana informed that our company is fully equipped with state of art facilities to develop machinery as per specifications approved by PAU, Ludhiana. He also assured that every care is taken to address any deficiency or malfunctioned part of machinery and after sale care is well attended.

Er. Kulwinder Singh from **Precision Cultivation Aids Pvt. Ltd** suggested that PAU approved designs of Super SMS and happy seeder should be allowed to fabricate by the manufacturers. He also suggested expediting the testing process for the machinery.

Er. Sarbjit Singh from **Land Force Pvt Ltd/Dasmesh Mechanical Works**, Amargarh, Sangrur informed the house that the capacity of Land Force Industry is to develop 5000 happy seeders/year. The only requirement is that the subsidy part to be paid by Government should be released before ordering the prototypes. Also there is need to make sure that all the manufacturers get the purchase orders in advance. He also suggested that Govt should develop a mechanism for release of subsidy directly to manufacturers. The company is providing all the basic training and information to all the buyers.

Key reflections from manufacturers:

- **There exists sufficient manufacturing capacity within north-west India. However, there is a need for placing the indents well in advance so that manufacturers get sufficient time for fabrication and supply of machine as well as to impart minimum needed training to the respective buyers.**
- **If possible, there is a need to explore a mechanism for direct subsidy transfer to the respective manufacturers**
- **For the new start-up manufacturers of the residue management machinery, the testing process of machinery should be expedited**

Finance Institutions' perspective:

Mr. J P S Bindra, Regional Manager, **NABARD**, Chandigarh informed the house about various projects NABARD is working with other agencies in the field of sustainability. He suggested that diversification is the need of hour in Punjab for addressing the issue of water, residue burning and farmer income. He also explained that there is a separate allocation of Rs 100 crore (channelled through NABARD) under National Adaptation Fund of Ministry of Environment, Forest and Climate Change, GoI for the Punjab, Haryana,

Western UP states. In this project, there is major focus on diversification and also creating awareness to curb residue burning and hence there is prospects of financing some of the projects under this grant. He showed willingness to work in tandem to address the issue of residue burning.

Developmental department/extension perspective:

Dr Rajbir Singh, Director, ICAR-ATARI, Ludhiana shared the KVK experiences on behalf of all the Program Coordinators of the KVKs regarding demonstrations conducted on Happy Seeder sown wheat during last two years. In 2015-16, KVKs of Punjab conducted demonstrations at 200 farmers' fields in 87 villages; whereas, 255 demonstrations were conducted in 133 different villages during 2016-17. On an average 20% irrigation water was saved in demonstration plots as compared to control. Around 65% less weed infestation was observed in demonstration plots without using herbicides. Demonstration yield was found to be 2.23% higher as compared control plots in both years. Cost of cultivation of demonstrations was reported to be Rs.4417/ha lower (14.3%) in comparison to control plot. Consequently, the net income earned by the farmers was Rs.5838/ha (11.1%) from the demonstrations. Subsequently; slightly better performance of demonstrations on happy seeder sown wheat was reported during 2016-17.He also highlighted the efforts taken by KVKs of Punjab to curb the menace of residue burning. He reported that, during 2015-16, six NICRA villages were made completely residue burning free and 42 nearby villages observed negligible burning. Similarly; during 2016-17, 26 villages were made residue burning free and 120 other villages reported nearly zero burning.

Dr. Anil K. Rana, **Additional Director** (Soils & Engg.), Government of Haryana explained various approaches Haryana Government have adopted for addressing the issue of residue burning. He emphasised that KVKs, ATMA and agriculture department should work in close collaboration as an integrated team to tackle the problem. He also cited some examples of residue management in Haryana

like collection (baling or manual) of basmati rice straw and transport to fodder scare areas in adjoining states like Rajasthan & Gujrat. He also suggested that subsidy should be given for transportation in the form of expenditure incurred on diesel. He also suggested that KVKs should come forward to train the farmers and field functionaries on the use of happy seeder and other machineries.

Dr. Jagdip Singh Brar, **Managing Director, HLRDC & Additional Director**, Government of Haryana also suggested that all our efforts should be to bring all stakeholders on single platform and address the issue in a holistic manner.

Researchers' perspective:

Dr. P C Sharma, Director, **ICAR-Central Soil Salinity Research Institute (CSSRI)**, Karnal expressed his pleasure to participate in the Dialogue as its very timely and preparedness has to be done well in time to address the issue holistically. He shared his experience of making zero burning 'Sambhli' village of Karnal district through an integrated approach and multi-stakeholder (ICAR-CSSRI, CIMMYT-CCAFS, State Department of Agriculture, KVK, farmers cooperatives, service providers, farmers) and such model can be replicated in other villages. He also shared the multiple benefits of the conservation

agriculture that essentially include happy seeder from the long term research platform at ICAR-CSSRI in collaboration with CIMMYT and the evidence clearly indicated that happy seeder technology has multiple wins and a path towards sustainability of intensive agriculture in north-west India.

Dr. Sujay Rakshit, Director, **ICAR-Indian Institute of Maize Research (IIMR)**, Ludhiana emphasized that rice residue burning need to be seen from a whole systems context. Efforts need to be made to reduce the generation of rice straw by diversifying the rice in the system. In this context, maize has a potential role to play as an alternative to rice. During kharif season, however, to ensure maize based crop diversification in North-west India, efforts need to be made to ensure procurement of maize so as to diversify rice. ICAR-IIMR, Ludhiana is making all efforts to ensure maize regain its lost place in Punjab and Haryana agriculture.

Dr. R. K. Sharma, Principal Scientist & Head, Division of Resource Management, Indian Institute of Wheat and Barley Research **(IIWBR), Karnal** shared his experiences on zero tillage and happy seeder and its effective utilization. He also shared that in addition to Happy Seeder, the Rotary Disc Drill is also very effective machine for seeding in presence of residues in rice-wheat system as well as sugarcane system. However, we are in process of getting some good

quality discs and then this can be used effectively. He also cautioned the house about emergence of multiple herbicide resistance in *Phlaris minor* which is a serious concern. In this regards, conservation

agriculture coupled with new herbicide molecules are the practical and cheap solution for managing such problem.

Dr. Shami Kapoor, representing **ICAR-Directorate of Mushroom Research (DMR)**, Solan emphasised that the use of paddy straw for growing mushrooms is one of the provisions to convert inedible negative value lingo-cellulosic wastes into protein rich food of high market value. He informed that for *Dhingri* (mushroom) cultivation (October – March) chopped paddy straw (2"–3" pieces) can be used that makes the mushroom production cheaper in comparison to cultivation using wheat straw. Paddy straw mushroom, grown in summer (April to August) requires exclusively paddy straw for cultivation.

Dr. Ashok Kumar, Head, **ICAR-Central Potato Research Institute (CPRI)**, Jalandhar station also shared finding of experiment which showed that potato mulched with paddy straw has encouraging results and technology is under perfection.

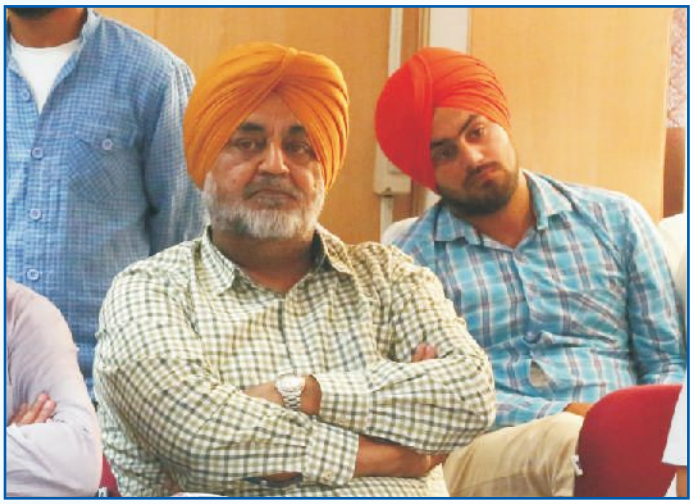
Dr. Sandip Mann, Principal Scientist and Head, TOT, **ICAR-Central Institute of Post-Harvest Engineering & Technology (CIPHET)**, Ludhiana also elaborated the potential use and the beneficial effect of paddy straw in packaging of various perishable items particularly fruits and vegetables.

Dr. M. L. Jat, Principal Scientist and Systems Agronomist from International Maize and Wheat Improvement Center (**CIMMYT**) reiterated that though there are several technological options for managing crop residues but we have to prioritize scalable and sustainable options with multiple wins. In this respect, the science based evidence generated through large number of on-station strategic research as well as on-farm participatory validation trials across Punjab and Haryana suggested that happy seeder technology is the most potential solution. This not only help to curb residue burning but also save water, help adapting to climatic risks (terminal heat, untimely rains etc); reduce GHG emission, save on fertilizer nitrogen and herbicide due to less weed infestation, improve soil health and increase farmers profits & contribute to doubling farmers income. However, we need to develop the technology led business models for timely access and large scale adoption of the technology. He cited the example of technology led business model of laser land leveller and how the technology has been adopted over 4.5 million hectares across small to large farmers. Farmers came forward to purchase laser leveller individually & in groups through cooperative societies and it became the story of every farm. Business model of laser leveller is the testimonial of success which showed the path of sustainability. During initial stages, the technology of laser levelling also had to face lot of criticism but later on it moved like anything. Similarly, happy seeder

technology in concurrence with super SMS has many advantages and has potential to replicate on vast tract of Punjab, Haryana, UP, Bihar and elsewhere. The purpose of this meeting is to discuss the problems faced by farmers and other stakeholders and churning of the new ideas so that the technology moves in a right direction with right perspective.

Dr. H. S Sidhu, Senior Research Engineer Borlaug Institute for South Asia (**BISA)** also highlighted the success of concurrent use of Super SMS and happy seeder in 150 ha at BISA for last four years have clearly indicated multiple gains. We have demonstrated the technology at large scale in climate smart villages

(CSV) for last 2 years and have got excellent response from the farmers. He emphasised that this technology have multiple gains and should reach to the end-users with all-out efforts. He also emphasized that capacity development of stakeholders specially the operators is critical for success of the technology. There is a need to showcase the technology to as much stakeholders as possible right in the field for its faster replication.



Policy Planners' perspective:

Dr. B. S. Sidhu, Commissioner Agriculture, Government of Punjab highlighted that the biggest issue is change in mind-set. The farmers want to have a fully validated risk averse solution. For introduction of any new concept/technology, irrespective of its merits/benefits, the farmers need to be convinced through confidence building with learnings from fellow farmers. Researchers have to generate robust evidence on the soil health build up, analyse them to identify and document the tangible and intangible benefits of the combo technology. The concurrent use of Super SMS and happy seeder have demonstrated win-win situation in terms of cost reduction and saving on inputs without any yield penalty rather higher yield under climatic risks. He lauded the scientists of KVKs and officials of agriculture department to promote Farmers to Farmers Extension (F2FE) as F2F learning is the best and most effective strategy for promoting conservation agriculture. He also emphasized on celebration of Harvest Field Days of happy seeder sown wheat crops to demonstrate the results to the farmers. He also cited the example of how zero tillage and laser levelling technologies were prompted in the Punjab and there is lot to learn from those efforts. He especially highlighted the need to organize the travelling seminars at different levels and scales involving key stakeholders to create awareness about the ill effects of the burning and benefits of technologies like happy seeder for residue management. Dr. Sidhu told that Punjab is likely to get around Rs. 600 crore out of the Rs. 1151 crore earmarked by the Government of India to tackle the problem of stubble burning. He emphasised that with

the help of this money cheaper availability of machinery used in this campaign will be ensured but urged all the stakeholders to come on same platform for its proliferation to the last mile delivery.

Dr. B.S. Dhillon, Vice Chancellor, Punjab Agricultural University (PAU), Ludhiana appreciated the feedback and suggestions given by all the stakeholder, specially famers and enumerated their clarifications. He also thanks the officials from agriculture department, ICAR institutes and other line department for their vibrant participation and suggesting their points. Further, he informed that to effectively and sustainably address the issue of residue burning, we need multi-pronged technologies and

strategies. In this direction, PAU have developed early maturing and short duration varieties of paddy with very good yield potential. Adoption of these varieties not only has the potential to address the issue of water but also help to curb residue burning. He appreciated the scientists who developed Super SMS and happy seeder which have vast scope of spread. He also highlighted that there are other technological solutions available for specific niche areas like vegetables and potato growing regions for addressing the issue. He

emphasized on capacity building of industry in addition to the farmers for bringing desirable results in this direction. He urged KVKs, agriculture department and all other stakeholders to work in convergence mode to reach maximum farmers in this campaign. Some of the specific points emphasized by Dr Dhillon are highlighted in the recommendation section.

Dr Ramesh Yadava, Chairman, Haryana Farmers' Commission and Guest of Honour of the Programme emphasized upon using the services of Ex-army persons in custom hiring services for residue management as they have adequate resources and capability to handle such businesses. He further highlighted the environmental benefits of retaining or incorporating crop residue in the field/ soil. He appreciated the efforts of ICAR-ATARI to organise this programme where official of various departments of Punjab and Haryana, scientists of PAU, CIMMYT, BISA, manufacturers, and farmers have deliberated with full participation. Such stakeholders programmes should also be organised in series so that the feedback can be given to Government in an effective way.

Remarks of the Chief Guest:

Chief Guest of the dialogue, **Padma Bhushan Dr. R. S. Paroda**, Former Secretary, DARE & DG, ICAR, former Chairman, Haryana Kisan Ayog and Chairman, Trust for Advancement of Agricultural Sciences (TAAS), in his address highlighted that the residue burning has twin causes, mechanized harvesting of paddy and growing shortage of labour in farm sector due to other competitive uses. Both these causes will be further intensified over time. He, therefore, emphasized for understanding the problem from farming system approach and hence need solutions from a systems perspective. In this respect, we need value chain mechanization solutions in farming and not just the machinery for sowing, interculture, harvesting etc. in isolation. He emphasized the importance of conservation agriculture in Indo-Gangetic plains and elsewhere especially in Punjab to restore/rejuvenate soil health, halt the speedy falling ground water table and address climate change while increasing farmers' profit. North-west India has contributed heavily to our food basket but in that process our natural resources are at stake and we no longer can take those granted. The wide spread issue of residue burning further adds to these challenges.

Fortunately, policy makers have realized that the problem is really grave and need sustainable solutions. Although government is supporting farmers through various subsidies and incentives schemes even then the problem will have to be sorted out by farmers, only

thing is that we have to guide farmers in appropriate way in terms of solutions. He narrated his own experience on out scaling of zero-tillage technology during late nineties when the Rice-Wheat Consortium (RWC) was initiated. Dr Paroda shared the experiences of other regions and nations for being emulated to derive benefits by the local farmers and policy makers. The importance of youth in providing integrated agricultural solutions to the farmers was also specially emphasized by him indicating that we have to motivate and attract youth in agriculture to make them entrepreneurs and technology providers. He also urged scientists from PAU, CSSRI, IIWBR, IIMR, ATARI, CIMMYT, BISA and other research institutes to share their data, analyse them and draw key learnings on this very important aspect. He further highlighted that such problems are neither created by single person nor can be addressed by a single organization and hence there is an urgent need to develop a common platform/consortium to address this vital issue of national interest in a mission mode approach. He requested the policy makers to look into the GST issues on farm machinery and should be waived-off to make it small farmers friendly. He also stressed upon the participation of rural youth for developing entrepreneurship in machine banks (cited example of Ola and Uber) and has good scope in spraying of weedicides/pesticides. He also urged VC, PAU, Ludhiana that in Package of Practices. PAU should include a separate chapter on Best Agricultural Practices (which have ecosystem benefits/services). At the end, he thanked the organisers and wished the recommendations of this Dialogue will be quite useful and be implemented in letter and spirit. Some of the specific recommendations highlighted by Dr Paroda have been included in the recommendation section.

In the end, Dr. M. L. Jat from CIMMYT presented formal vote of thanks.

Recommendations emerged out of discussion:

During "Stakeholders Dialogue for Sharing Key Learnings on Sustainable and Scalable Solutions for Rice Residue Management", following key **recommendations** have emerged which can provide a way forward in swiftly addressing the problem of residue burning through effectively implementing the special scheme of Govt of India on **"*In-Situ* management of Rice Residues"** .

- **Data sharing:** There is need to develop a mechanism to share data on various aspects of residue management by different state, national and international research institutes to avoid re-invention of wheel and capitalize on investments made on time and resources. This can be facilitated through a common platform or consortium under the command of PAU or ICAR to address this vital issue of national interest. Joint programme should be held regularly to sort out the problems emerged during the joint campaign.
- **Science based robust evidence** on soil health improvement and corresponding adjustments in nutrient management prescriptions using long term research data. Hence, there is a need to

continue/establish benchmark long-term research sites. For example, datasets from such existing sites at ICAR-CSSRI, CIMMYT-BISA, PAU-KVKs, participatory sites managed by ICAR-CSSRI and CIMMYT in Haryana etc can be used for evidence as well as capacity development.

- **Convergence** is the key to success to address the problems of residue burning and all stakeholders should act together in participatory mode in harnessing the full potential of these valuable resources (residue) for sustainability of agricultural production system.
- **Incentivization** should be a part of policy like carbon credits, ecosystem services and other incentives. Farmers who are recycling crop residues back to their fields using environmental friendly technologies should be promoted, encouraged and rewarded to motivate the laggards.
- **Goods and Sales Tax** (GST) on machinery suitable for residue management like Super SMS, happy seeder, reversible plough, chopper should be waived-off so that small and marginal farmers can get benefit of this and contribute in this national initiative of clean air through zero burning.
- Manufacturers should be informed well in advance about the number of machines required and **order** should be placed **well in advance** so that the machines should be supplied before commencement of the season.
- **Pricing of the common machines** (including warranty/guarantee) should be decided by a committee of key stakeholders well in advance and manufacturers should be ordered to supply on this price without any hassle. Similarly, after sale services should be integral part of sale agreement.
- Rural youth should be encouraged to start Custom Hiring Centres (CHCs) as **START UP** and should be suitably supported thorough financing. Youth should be encouraged to start their own machinery banks so that the problem can be sorted out at village level. Similarly, pesticide spraying can emerge as potential area of entrepreneurship development.
- All the stakeholders including public (ICAR, SAUs, KVKs, State Department of Agriculture), international centers (CIMMYT, BISA), as well as private sector should develop a common "Communication Strategy" to spread a unified message. Effective communication materials targeting different stakeholders (farmers, service providers, extension agents, researchers, policy planners, media etc) should be developed in local languages.
- For promotion, the village panchayat which are doing excellent work should be **honoured** with cash price (incentivization) so that the money can be utilized for the welfare of villages and other panchayats can be motivated.
- Regular programmes on Residue Management should be telecasted on DD KISAN, DD DOORDARSHAN, local DD Channels, radio, FM Channels etc. **during harvesting season** to sensitize the farmers. Advertisement through celebrities (cine stars, players) on TV & Radio should be a part of this campaign.
- Efforts should be made to put **effective slogans** on walls in villages to encourage farmers to be part of campaign.
- Since seeding of wheat with happy seeder require **tractor of high power** (more than 45 HP), arrangements should be made to motivate such farmers who own such tractors and their names should be listed for custom hiring for happy seeder.
- KVKs and state department of agriculture should make an **integrated approach** for reaching the last mile farmers thorough F2FE and ICT tools and approaches. Such efforts should be made well in

advance before the season commences. Similarly, training to machine operators, custom hiring owners, field men, service providers should be imparted in the month of September and October so that they can be well versed with the technology without wasting time.

- KVKs should arrange Kisan Melas (district level), Kisan Sammelans (block level), Kisan goshthis (village level) and other such programmes to **exhibits live demonstrations** of technology package to the farmers in a big way. A special awareness programme should be initiated taking all stakeholders, planning for this should be made well in advance.
- A special package amounting **one crore rupees** as a special grant out of scheme "*In-situ* management of residue" announced by central Government should be allotted to each KVK for training, mass mobilization and demonstrations. In this budget, each KVK should also be given 5-7 happy seeders so that each KVK can demonstrate at strategic locations in 5-7 villages.
- The proverb "**Charity begins at home**" should be implemented and all the public representatives like Chairman of Block, Zila Parishad, MLA, MP and other public representatives should come forward and work in their respective villages and declare them zero burning villages.
- Package of Practices (PoP) of SAUs should include a separate chapter on **Best Agricultural Practices** (which have ecosystem services) which are within the domain of PoP. The conservation technologies should be highlighted on system base and co-benefits should be highlighted.
- In each district, all the available extension agents including public, private (including seed/fertilizer dealers), corporates (seed and pesticide companies), cooperatives, panchayats, service providers, agro-industries etc should be mapped well in advance. A special training should be imparted to all these extension agents for creating awareness on residue management technologies. Each extension agent should be assigned the responsibility of one village.
- The KVKs should act as district level nodal agency for creating awareness and all other agencies/ stakeholders involved directly or indirectly should have a good communication arrangement with KVKs so that a district level single window mechanism can be established not only to demonstrate and out scale technologies but also their tracking for effective monitoring.
- The non-government stakeholders including international centers and corporate sectors should make efforts to contribute through additional capital (for example CSR fund) and human resources to complement this initiative of zero burning.

Published :
Director, ICAR-ATARI, Ludhiana, Punjab, India

Edited and compiled :
Rajbir Singh, Jaskaran S. Mahal, M.L. Jat, H.S. Sidhu and Ashish S. Murai

Citation :
Singh, R., Mahal, J.S., Jat, M.L., Sidhu, H.S. and Murai, A.S. (2018) Stakeholders' Dialogue on Sustainable and Scalable Solutions for Rice Residue Management. Proceedings and Recommendations. ICAR-ATARI, Ludhiana, Punjab, India, March 15, 2018.