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Impact of KVK interventions in crop residue management in Panipat district of Haryana

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Abstract

The present investigation is conducted in Panipat district of Haryana state during 2018-19 to 2021-22 with the objective to study the impact towards use of Krishi Vigyan Kendras Information and Communication Technology (ICT) interventions on the management of crop residue. The Panipat district was selected intentionally as centrally sponsored scheme "Promotion of Agricultural Mechanization for In-situ Management of Crop Residue" was launched by Ministry of Agriculture and Farmers Welfare, Govt. of India in 2018-19. The district is situated in the high potential rice-wheat belt of the state of Haryana. The area under rice crop is around 78000 ha whereas corresponding figure for wheat crop in Rabi season is around 85000 ha. There is domination of basmati rice. The farmers of the district are accustomed to either manual harvesting of paddy and then go for the sowing of wheat after conventional tillage or they are practicing the undesirable practice of burning of paddy crop stubbles and then sow the wheat crop. In nutshell, the combine harvesting of paddy is reason which create circumstance for residue burning. Keeping in view the importance of this issue Ministry of Agriculture and Farmers Welfare, Govt. of India launched a scheme "Promotion of Agricultural Mechanization for In-situ Management of Crop Residue" in 2018-19 and total number of 12 districts of Haryana having rice wheat cropping system was selected under this scheme. CCS HAU KVK, Panipat took residue burning as a challenge and prepared a road map to sensitize the farmers for proper management of crop residues and to get feedback from the farmers and provide technological solutions to their queries and the efforts were made to develop conservation agriculture based crop management technologies which are more resource efficient than the conventional practices. Both interpersonal communication and mass communication types of IEC were involved in all the adopted villages to generate awareness among the farmers on best use of crop residue management. Various programme & activities including training, awareness camp (District, Block & Village level), Farmer Scientist Interaction, Kisan Mela, mobilisation of school and college students, demonstration on different tillage practices etc. were conducted to create awareness, sense of belongingness and responsibility towards saving of precious soil and environmental resources through sustainable crop residue management. In total 10399 farmer/farm women benefitted from these programme & activities and 479 farmers benefitted through Front line demonstrations.

Keywords: Crop residue management, IEC, frontline demonstration, extension activities

Introduction

Large-scale burning occurs immediately after paddy harvesting in places where farmers produce wheat and vegetable crops. Because harvested rice straw and standing stubbles remains on the field, paddy straw burning is most popular in combine harvested fields. Farmers have additional costs as a result of environmentally friendly paddy crop residue management practices, traditional wheat sowing methods, and other factors. Paddy straw burning was widely practiced in Punjab and Haryana and western U.P. to clear fields for Rabi crops i.e. particularly for wheat and potatoes, because the time window between harvesting the rice crop (second fortnight of September to first fortnight of November, depending on paddy variety) and sowing the next crop is relatively very short (14-21 days), Sahai *et al.* (2011) ^[1]. The most prominent reason for crop residue burning is farmers' inability to manage straw in a short period of time, between rice harvest and wheat sowing. Many farmers argue that burning escalates soil productivity by reducing weed and disease infestations, Lohan *et al.* (2018) ^[2]. The area under paddy cultivation in the state of Haryana during the year 2018-19 is 14.45 lakh hectares (as stated), with 7.95 lakh hectares allocated to the Basmati paddy variety and 6.49 lakh hectares devoted to the Non-Basmati paddy variety. The entire quantity of paddy straw generated throughout 2018-19 is projected to be 79.31 lakh MT and 65.5 Lakh MT managed through all other usage including incorporation and 13.4 Lakh MT burnt by the farmers (Anonymous 2019) ^[3].

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Because Basmati Paddy is mostly harvested using manual labour, there is substantially less crop residue in the field resulting in less burning. In Haryana, basmati straw is also utilized as animal fodder. However, crop residue burning has been found to be damaging 7 per cent to 10 per cent of the Basmati Paddy area. Due to substantial land holdings and a labour constraint in places such as Karnal, Sirsa and Fatehabad, Yumnagar, Panipat combine harvesters are also used to harvest basmati rice fields. As a result, there have been multiple instances of basmati paddy straw burning in these districts. Non-basmati paddy straw is burned on an immense scale because it is very less used for animal consumption. Keeping in view the above said fact, Ministry of Agriculture and Farmers Welfare, Govt. of India launched a centrally sponsored scheme "Promotion of Agricultural Mechanization for In-situ Management of Crop Residue". One of the most key objectives of the scheme is to create awareness among stakeholders through demonstration, capacity building initiatives, and varied Information, Education, and Communication strategies for effective crop residue utilization and management. Agriculture is the most important sector, employing the majority of the rural population in developing countries. ICT (Information and Communication Technology) has the potential to revolutionize the Indian farming sector and benefit all farmers, especially small landholders. ICT in agriculture offer farmers with critical information for sowing, crop protection, irrigation and soil fertility, allowing them to increase agricultural productivity. Weather alerts and notifications assist them in planning for occasional emergencies such as floods, drought, or pest and disease outbreaks, reducing substantial crop loss. It also contributes to the empowerment of rural people through better access to resources and agricultural technologies, Mahajan, S.K. and Mahajan, M.V (2023) [4]. ICT activities play a significant role in awareness generation and encourage farmers on management of crops residues.

Materials and Methods

CCS HAU KVK Panipat has been conducting awareness programmes and frontline demonstrations on in-situ crop residue management. The Department of Agriculture and Farmers Welfare, Government of India, Indian Council of Agricultural Research, New Delhi, and ICAR-ATARI, Zone-2, Jodhpur had assigned a project on "Promotion of Agricultural Mechanization for In-situ Management of Crop

Residue (CRM) in the state of Haryana to the KVKs of Haryanas with the objective to accelerate and speed up the extension efforts for in situ management of rice crops residue. Under this project KVK Panipat had adopted 8 villages i.e. Kait, Urlana, Bahupur, Wasier, Nohra, Goela Kalan, Goela Khurd & Kard. Across the period from 2018–19 to 2021–22, a wide range of extension activities, like training programmers on in situ crop residue management, mobilization programmers for students in colleges and school, farmers fairs, farmer–scientist interactions, etc., have been organized in these adopted villages. Literature on in situ paddy residue management was distributed to people of all ages for educating them on the adverse consequences of residue burning and its management technologies. Furthermore, in the district's adopted villages, frontline demonstrations on crop management were carried out with farm machinery. In order to create awareness among the farmers about the optimum use of crop residue management, both interpersonal communication and mass communication methods of IEC were involved in all of the adopted villages.

Results and Discussion

Crop residues were effectively utilised through conservation agricultural techniques. Attempts were made to figure out the competing usage of crop residues through information, education and communication (IEC) and its devices, as well as providing successful techniques for management for them. The resource conservation technologies (RCTs) comprised minimal or no tillage, direct seeding, bed planting, crop diversification, and improvements in residue management as feasible alternatives to the traditional techniques. KVKs organized awareness camps at the village, block, and district levels to mobilize farmers, farm women, rural youth, and other stakeholders for immediate measures for reducing crop residue burning. The data presented in table 2 indicated that during the study period, the CCS HAU KVK Panipat adopted a total of 8 villages under the programme "Promotion of agricultural Mechanization for in-situ Management of Crop Residues" and organized 52 awareness programmes (district, block, and village levels) on various aspects of crop residue management technologies which were attended by 4172 farmers. The very first step in these awareness camps was Participatory Rural Appraisal (PRA) to identify the primary core issues and strengths of the adopted villages. Farmers were educated about risks of burning paddy straw.

Table 2: IEC Activities conducted under CRM Scheme (2018-19 to 2021-22)

S. No	Name of Activity	2018-19		2019-20		2020-21		2021-22		Grand Total	
		No.	TP	No.	TP	No.	TP	No.	TP	No.	TP
1	Awareness Programme										
i	District Level Awareness Camp	2	350	1	150	2	138	2	223	7	861
ii	Block Level Awareness Camp	5	650	2	154	3	313	3	336	13	1453
iii	Village level awareness camp	8	403	7	469	7	325	10	750	24	1943
2	Skill development Training on In-Situ CRM	2	50	4	100	6	124	2	50	14	324
3	Awareness Programme on CRM technologies for school students	2	200	3	400	0	0	5	321	10	921
4	Farmer Scientist Interaction	2	150	3	175	2	145	4	195	11	665
5	Field Days/Harvest Day organized	3	152	5	202	7	326	5	184	20	764
6	Kisan Mela Organised	2	1650	2	570	2	263	1	500	7	2983
7	Exposure visit organized	2	105	3	180	2	84	2	146	9	485
	Total	28	3710	30	2400	31	1718	34	2705	115	10399
8	Demonstrations conducted using CRM Machinery (ha)	104 ha	104	75 ha	75	150ha	150	60ha	150	389 ha	479

No: Numbers; **TP:** Total Participants

KVK also imparted 11 five days skill development programme on in-situ crop residue management to enhance the knowledge and skill on CRM machinery and different tillage practices which were attended by 349 farmers. Farmers were educated on machinery, implements, and equipment such as happy seeders, straw choppers, shrub masters, super SMS for combine harvesters, zero till seed drills, and reversible M.B. ploughs, among others, and were given live demonstrations of these machines.

Students from schools and colleges were selected as an approach because they are more sensitive to societal problems and have a willingness to speak out against them. They were supposed to encourage their parents, relatives, and other community members to take on environmental responsibilities. Through informational and motivational lectures, students were made aware of the hazards of residue burning and alternative management practices. Essay and slogan writing competitions were held to attract their ideas for strengthening the campaign. Students were also mobilized through essay/painting/slogan competitions etc. in which 1221 students were benefitted.

Frontline Demonstrations were laid out at farmers' field to demonstrate different tillage practices for residue management. Scientists of KVK demonstrated various techniques for operating machines and sowing of wheat crop with effectively managing paddy straw. KVK also conducted 568 demonstrations on different CRM tillage practices

covering area of 343 ha. Majority of the farmers realized that the tillage practices like sowing of wheat with zero tillage machine, happy seeder and super seeder machine minimize the cost of production. Similar observations were reported by Singh *et al.*, 2018^[5].

Farmers were needed to be persuaded about the yield potential of the different tillage practices sown wheat. Farmers were needed to develop confidence with respect to the technology to at least try it once in their field. Thus, KVKs celebrated Field Days at the demonstration sites of wheat sown with different tillage practices to educate and convince farmers about the multiple benefits of the technology. The data in Table showed that a total of 15 Field Days were organized in adopted villages and focused on the outcomes of different tillage practices for CRM. Similarly, Kisan Melas were organized to encourage participation and educate all stakeholders on alternate residue management techniques. Seven Kisan Mela were also organized in its campus and the same were attended by 2983 farmer's/farm women.

For demonstrations, exhibitions, farmer trainings, as well as providing services to the less privileged farmers, machinery banks equipped with the appropriate paddy residue management equipment were established in the campus of KVK. During 2018-19 to 2021-22, KVK Panipat acquired machines for effective management of crop residues. The details machines mentioned in Table 2.

Table 2: Status of Machinery under CRM at KVK

Sr. No.	Name of the equipment	Year of purchase	Number
1.	Happy Seeder	2018-19	2
2.	Zero Tillage Machine	2018-19	3
3.	Paddy Straw Chopper -Trailed	2018-19	1
4.	Rotary Slasher	2018-19	2
5.	Rotary Mulcher	2018-19	1
6.	Reversible MB Plough	2018-19	1
7.	Rotavator	2018-19	1
8.	Zero Tillage Machine	2019-20	5
9.	Rotavator	2019-20	1
10.	Happy Seeder	2019-20	3
11.	Happy Seeder	2020-21	1

In addition to the this, KVK scientists provided guidance and demonstrations on hands-on machinery on every component of CRM to farmers selected by the Agriculture and Farmers Welfare Department, Govt. of Haryana.

KVK also organized four in -sservice' training programme for Agriculture and Farmers Welfare Department, Govt. of Haryana. Panipat and the same was attended by 240 officers.

In order to monitor the project activities particularly the demonstrations field visits were also undertaken. Eleven farmers-scientists interface were also conducted for horizontal expansion of residue management technology, by which more number of farmers were aware about the benefits of no residue burning.

Table 3: Adopted villages under CRM and IEC activities undertaken

Sr. No.	Name of adopted villages	Total Area (ha)	Area under Rice (ha)	Straw burning (%) before KVK Interventions	(%age) increase in CRM Technology
1	Urlana	2492	2120	20	62
2	Kait	357	246	12	48
3	Nohra	615	369	10	45
4	Vasier	1028	758	18	50
5	Goela Kalan	601	330	8	46
6	Goela Khurd	1030	588	11	48
7	Kard	948	580	14	52
8	Bahupar	508	351	18	49

The data in Table 3 highlighted that the percentage increase in use of CRM technologies varies from 45 to 62 per cent in

adopted village. The data also revealed that residue burning before KVKs interventions varies from 8 to 20 percent in

adopted villages and currently the residue burning is almost zero in the entire adopted villages. At present the adopted villages were serving as a role model for the others with regard to utilizing crop residue for a wide range of uses, like compost preparation for mushroom cultivation, thatching, composting and use in power generation. The IEC usage allows resource conservation technologies with enhancements in residue management to avoid straw burning, improve soil organic carbon, and improve input efficiency.

Table 4: Crop Residue burning incidents detected in Panipat district of Haryana (15 September-30 November)

District	2018	2019	2020	2021	2022
Panipat	36	48	55	254	84
Haryana	10286	6544	9898	6987	3661

Table 4 shows the data that was compiled on crop residue burning incidents that were successfully monitored using satellite remote sensing. It is obvious that 84 burning events in total occurred in 2022, which is nearly 66.9 % of the events detected in 2021. Though agricultural residue burning incidents have declined gradually, it is still necessary to educate farmers regarding CRM approaches for improved residue management. According to HSPCB data, Haryana reported 6361 residue burning incidents during the Kharif 2022 harvesting season (September 15-November 30) in comparison to 6987 residue burning incidents in 2021, a reduction of 47.6 percent in one year, Sharma P. (2022) [5].

Impact of IEC Activities organized by KVK Panipat

- All the 324 trainees successfully adopted the CRM technologies and also helped the KVK in convincing other farmers about the ill effects of residue burning and persuade them to adopt the CRM technologies for paddy straw management.
- The paddy area harvested through combines was from 30000 to 35000 ha during the project period but almost complete area was brought under one or the other CRM technologies.
- Almost zero residue burning was achieved in the adopted villages namely Bahupar, vassar, Nohra, Kard, Kait, Urlana, Goela Khurd and Goela Kala.
- All the trainees successfully adopted the CRM technologies and also helped the KVK in convincing other farmers about the ill effects of residue burning and persuade them to adopt the CRM technologies for paddy straw management.
- The paddy straw burning incidents were negligible. Either the paddy was harvested manually wherein the paddy straw was removed for alternative uses or the combine-harvested area was brought under CRM technologies.
- 389 ha demonstration were organized in the study period and under different tillage practice of crop residue management in all the adopted villages.
- All the problems/issues being encountered in CRM technologies during the crop season were successfully resolved through farmer scientist interaction, field visits etc., consequently yield and returns were at par in CRM fields when compared with the conventional practice.
- The entire KVK farm brought under CRM technologies and farmers and farm women participating in the Kisan Mela visited the technology demonstrations. The total

domain of CRM technologies including the machines was explained to the participants.

- There is increased awareness among the farmers and there is attitudinal change towards the CRM technologies.
- The IEC efforts translated in good adoption of residue management technologies in district Panipat. Despite the combine harvesting of paddy in district Panipat.
- Residue burning incidents were very few and district Panipat has been rated as very good rank in the domain of residue management in the state of Haryana. This is corroborated by the HARSAC data providing the satellite based images for rice growing areas.
- Only 37 fire incidents were reported in district Panipat in comparison to 10286 fire incidents reported for the whole state of Haryana (2018). During 2022, total number of 84 actual fire locations was noticed in the district 2021-22.
- The awareness and capacity building of all stake holders would ease the things in the coming years and still better impact is expected with the consolidation of the gains and experience of this year.
- The promotion of early maturing varieties of rice (PB-1509, PB 1692, PR 126) create window of 20-25 days between the harvests of rice and sowing of wheat and integration the residue incorporation CRM technology proved the most successful CRM intervention in the district with yield gain and favourable benefit-cost ratio for the system as whole.

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