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# Status of Paddy Straw Management Technologies in Punjab

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## ABSTRACT

Maximum straw burning was practiced in south-western districts of Punjab; Bathinda is the one of them which was selected for the study. Study was conducted to know about awareness and status of paddy straw management technologies in Bathinda district. For this study, 135 respondents were selected from Bathinda district randomly. Result showed that all the respondents were aware about the happy seeder, super straw management system and baler. No respondents had awareness regarding paddy straw management techniques like cutter-cum-spreader, packaging fruits and vegetables etc. So it was essential to create awareness programs for them. Majority of respondents adopted happy seeder and super straw management system. However, from past few years area under these technologies was decreased and area under baler, mulcher and chopper-cum-spreader was increased. Respondents realized that use of baler was highly complex so usage of baler needs to be made simple. Adoption of happy seeder marked some different type of agronomic practices such as difficulty in sowing operation, increase in pesticide spray requirement, decrease irrigation requirement and many more.

**Keywords:** Adoption, Agronomic practices, Awareness, Management technologies, Paddy straw

## INTRODUCTION

In India, highest paddy cultivation was done in West Bengal and Punjab was on second rank (Anonymous, 2020a). With paddy production, approximately 20 million tons of paddy straw was produced in Punjab alone which was not relished by animals because of high silica content, due to which 80 per cent of paddy straw was burnt on the fields for its management (Anonymous, 2019a). It was considered as useful method for the management of paddy straw from the perspective of farmers, which helps to decrease diseases attack and pest population (Bindu *et al*. 2018). But with the burning of paddy straw on the fields, harmful gases were emitted which was one of the reasons for the environmental pollution. In-situ burning of crop residue not only emits greenhouse gases, particulate matter, but also depletes the nutrient content which was essential for the plant growth (Lohan *et al*., 2018). To solve the problem of burning, there were various alternative ways to manage paddy straw which were eco-friendly and also manages paddy straw at proper time without delaying in sowing operation of wheat crop. Punjab Agricultural University recommended some alternate techniques such as happy seeder, baler, chopper-cum-spreader and many more. Cost effective method for management of paddy straw was incorporation of straw in the fields through different technologies; as paddy straw was low in density, so transportation of straw from the fields was not profitable. The in-situ confinement of paddy straw in the fields improves organic matter content and nutrients of the soil (Lohan *et al*., 2018). Happy seeder helps to sow the wheat crop in standing paddy stubbles and manage paddy straw in-situ. Sowing cost was decreased with the use of happy seeder for

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sowing operation (Sidhu *et al*., 2015). Harvesting of crop done by combine harvester with attached super straw management system; spread the chopped straw in fields. Farmers reported that straw was unevenly distributed with super straw management system in the fields which generated problems in sowing of subsequent crop. Biogas generated in an anaerobic digester from the paddy straw was used as fuel for domestic purposes reported by Athira *et al*. (2019).

To motivate the farmers for adoption of eco-friendly management technologies of paddy straw, government has started various schemes. Sub-mission on agriculture mechanization scheme was started by the central government by which 50 per cent of subsidy was set for individual farmers and 80 per cent to a group of farmers or cooperative societies (Anonymous, 2020b). Nowadays, paddy straw burning became a threat to the environment. There are various ways to manage paddy straw in an eco-friendly manner but farmers are not fully aware about these technologies. This paper helps to provide knowledge about awareness and adoption status of paddy straw management technologies in Bathinda district of Punjab state.

## METHODOLOGY

The study was conducted in one of the district of Punjab state. In 2018, survey was conducted by Punjab Agricultural University in which it was found that utmost paddy straw burning cases were noticed in south-western districts of Punjab state (Mahal *et al.,* 2019). From the south-western districts of Punjab, Bathinda was purposively selected for this study. There are nine blocks in Bathinda district and from each block, one village was selected randomly. Nine selected villages were viz. Bibiwala, Balahar Mehma, Bhagibandar, Gurusar, Sangat Kalan, Sukha Singh Wala, Bhagta, Rampura, Phul and Jassi Pauwali. Fifteen respondents from each village were selected randomly, so from nine villages total 135 respondents were nominated for this study. By personally visiting the respondents, data were collected by the researcher. For the unbiased response of the respondents, data were collected by taking proper precautions. Aimed at the comprehensively exploration, discussion was done with respondents. After compiling the data, analysis was done with different statistical tools.

## RESULT AND DISCUSSIONS

Data in Table 1 show about the awareness among the respondents of paddy straw management technologies. All the respondents were aware about the super straw management system, baler and happy seeder. However, half of them had awareness about the chopper-cum-spreader followed by 42 per cent of respondent aware about the usage of mulcher for the in-situ management of paddy straw. It was reported that around 23 and 22 per cent respondents had awareness of practices such as use of paddy straw in biogas plant and mushroom cultivation, respectively. No respondent was aware about managing paddy straw in an eco-friendly way with the use of technologies like cutter-cum-spreader, paddy straw used in geyser, packaging fruits and vegetables and for composting. Finding of Roy (2015) reported that in West Bengal, only 20 per cent of respondents were aware about the use of happy seeder but in Bathinda district of Punjab, all the respondents had awareness about it. In contrast, no respondents were aware about the use of straw for compost making in Bathinda district but in West Bengal half of respondents had awareness about it.

It was reported that state department of agriculture and farmers welfare and KVK scientists played major role in providing awareness regarding various paddy straw management technologies. Progressive farmers and mass media provided awareness regarding only some of management technologies like happy seeder, baler and super straw management system.

**Table 1: Awareness of respondents about paddy straw management technologies (n=135)**

| Techniques | Frequency (f)* | Percentage (%) |
|---|---|---|
| Super straw management system | 135 | 100 |
| Baler | 135 | 100 |
| Happy seeder | 135 | 100 |
| Mulcher | 56 | 41.48 |
| Chopper-cum-spreader | 68 | 50.37 |
| Paddy straw used for Mushroom cultivation | 29 | 21.48 |
| Biogas plant | 31 | 22.96 |

*Multiple Response

**Table 2: Status of various paddy straw management technologies by respondents (n=135)**

| Techniques | Frequency (f)* | Percentage (%) |
|---|---|---|
| Super straw management system | 54 | 40.00 |
| Baler | 31 | 22.96 |
| Happy seeder | 43 | 31.85 |
| Mulcher | 9 | 6.67 |
| Chopper-cum-spreader | 5 | 3.70 |

*Multiple Response

Data in Table 2 show about adoption status of various paddy straw management technologies. It was reported that 40 per cent of respondents adopted super straw management system fitted on combine harvester which harvested paddy and chopped the straw simultaneously which was further spread into the fields. Respondents reported that super straw management system fitted combine had more grain loss problem, which decreased the yield. Slightly less than one-third of respondents adopted happy seeder for sowing wheat crop in the standing stubbles of paddy crop. Adoption of happy seeder helped to improve organic matter of soil through the decomposition of stubbles in the fields. Sowing operation through happy seeder assisted in reducing cost of sowing owed to less tillage operations and weedicide requirements. About 23 per cent of respondents adopted baler for managing paddy straw. After harvesting operation completed with combines, bales were formed with baler and picked from the fields to vacate it for the sowing operation of subsequent crop. Mulcher technology was adopted by seven per cent of respondents to manage paddy straw by making mulch in the fields. Adoption of chopper-cum-spreader was reported by four per cent of respondents. Chopped straw was spreader in the fields and aids the smooth sowing operation of following crop. Findings were in line with findings of Sandhu *et al.* (2019). Respondents had awareness about the use of paddy straw for the mushroom cultivation and biogas plant, yet no respondent adopted these technologies for managing paddy straw. Paddy stubble used in mushroom cultivation was not adopted since it was not widely consumed among the respondents and community.

Presence of lignin and silica content in the paddy straw create difficulties in digestibility, so usage of paddy straw for biogas plant was not adopted by the respondents. In Bathinda district of Punjab, majority of respondents adopted happy seeder and super straw management system, however in West Bengal state, only two per cent of respondents adopted happy seeder for the management of paddy straw (Roy, 2015). Area was decreasing under happy seeder and super straw management system from past few years. On the other hand, area under baler, chopper-cum-spreader and mulcher was increasing. Reasons for non-burning of straw from majority of respondents perspective was ban by government on burning and compensation offered by government on non-burning of paddy straw. Peer pressure was least affected reason for the non-burning of paddy straw. Majority of paddy straw management technologies were adopted by respondents having medium and large operational land holding, whereas, it was least adopted by marginal land holders. Reason behind less adoption by marginal and small land holders was assumption of increasing cost of production by adoption of these technologies. The findings were in line with the findings of Bindu *et al.* (2018).

Adoption of paddy straw management technologies brought shift in agronomic practices as shown in Table 3. It reveals that all the happy seeder adopted respondents required less tillage operation, weedicides spray and number of irrigation. Presence of stubbles covers the field, owing to which weeds growth and evaporation was less. However, pesticide and fungicide spray requirement was increased because of paddy straw in the farms which were carry-over for the insect-pest and diseases and causes re-infection in the next crop. About 90 per cent of respondents stated that straw was choked in the machines which create difficulties in sowing operation owing to which gaps were formed where no or less number of plants was germinated. Presence of straw in the fields and choking of happy seeder leads to less germination of plant; eventually 46.51 per cent of respondents use more seed rate for sowing of wheat crop with happy seeder to optimize the plant population. Similar results were reported by Sidhu *et al.* (2007) and Sidhu *et al*. (2015). About half of the respondents informed that

managing paddy straw with baler by forming bales delayed the sowing operation of wheat crop in the wake of non-availability of baler and removal of bales from their fields at proper time. Near about 94 per cent of respondents found that less tillage operation was required as compared to other practices for management because fields were properly cleaned after forming bales and no or minimal tillage was required to manage remaining stubbles in the field. All the respondents reported that adoption of mulcher technology decreased the irrigation requirement, on the other hand, seed rate, pesticide and fungicide spray requirement had increased. Presence of paddy residue in the fields creates difficulty in germination so high seed rate was consumed to optimize the plant population and it was also the carry-over of insect-pest and fungus that increases spray requirement. Majority of the respondents reported that sowing operation was delayed due to non-availability of machines at proper time and weeds population was also decreased due to presence of mulch in the fields that's why less weedicide spray was required. These findings were in line with findings of Chaudhary *et al.* (2019). With the adoption of super straw

**Table 3: Shift in agronomic practices after adoption of various paddy straw management technologies**

| Shift in agronomic practices | Frequency (f)* | Percentage (%) |
|---|---|---|
| **Happy Seeder (n=43)** | | |
| Tillage operations less required | 43 | 100 |
| More seed rate | 20 | 46.51 |
| Straw choked in the machine during sowing operation | 39 | 90.69 |
| Less weedicides spray required | 43 | 100 |
| Less irrigation required | 43 | 100 |
| More pesticides and fungicides spray required | 43 | 100 |
| **Baler (n=31)** | | |
| Tillage operations less required | 29 | 93.54 |
| Delay in sowing time | 16 | 51.61 |
| **Mulcher (n=9)** | | |
| More seed rate | 9 | 100 |
| Delay in sowing time | 7 | 77.78 |
| More pesticides and fungicides sprays required | 9 | 100 |
| Less weedicides spray required | 7 | 77.78 |
| Less irrigation required | 9 | 100 |
| **Super straw management system (n=54)** | | |
| Difficulty in sowing of subsequent crop due to uneven distribution of paddy straw | 42 | 77.78 |
| Tillage operation more required for sowing of subsequent crop | 39 | 72.22 |
| More pesticides spray required in subsequent crops | 54 | 100 |
| More fungicides spray required in subsequent crops | 39 | 72.22 |
| More seed breakage during harvesting | 42 | 77.78 |
| **Chopper-cum-Spreader (n=5)** | | |
| Tillage operations more required for sowing of subsequent crop | 5 | 100 |
| Delay in sowing time of subsequent crop | 4 | 80.00 |
| More pesticides spray required in subsequent crops | 5 | 100 |
| More fungicides spray required in subsequent crops | 3 | 60.00 |

*Multiple response

management system, 72 per cent of respondents found that more number of tillage operations and fungicide spray was required because of paddy straw in the fields. Since paddy straw was remnant for the pest and reason for the attack on the subsequent crop so all the respondents after adopting super straw management system gave more pesticide spray to the following crops. About 78 per cent of respondents reported that distribution of straw with super straw management system was unevenly in the fields which engender difficulty in sowing operation of next crop and during harvesting time, more breakage of grains were noticed that decreases the yield. By adopting chopper-cum-spreader, all the respondents found that more tillage operation and pesticide spray were required. Stubbles in the fields were the reasons for more attack of insect-pest, as they were carrier of insects. Chopper-cum-spreader was not available to 80 per cent of respondents at proper time, since sowing operation of following crop was delayed. Resting spores of fungus were present in the paddy straw which causes the reinfection in next crop so fungicide sprays was the supplementary requirement noticed by 60 per cent of the respondents. Respondents who had purchased paddy straw management technologies, majority of them procured individually not in group. They wanted to purchase in group but due to lack of knowledge about proper procedure of purchasing machineries in group, they were not able to obtain it. Respondents described that use of baler was highly complex; however, mulcher was simple in use. Happy seeder, super straw management system and chopper-cum-spreader were complex for practice.

## CONCLUSION

Paddy can be used to generate income from it, but farmers thought it was only agricultural waste and burnt it in the fields. There were various alternatives techniques to manage paddy straw, yet respondents were not fully aware about all these techniques. Since more efforts should be focused towards to make farmer aware about these technologies, organize extension or mass media program. Area under baler, mulcher and chopper-cum-spreader is increasing so more exertions services are focused towards these, so full adoption of these technologies and yet the area under paddy straw burning was decreased. There were some shifts in agronomic practices which create difficulty for the adopter so more work was done by researcher to overcome these difficulties.

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