

Happy seeder

– A game changer technology

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Paddy is the most important kharif crop of Punjab which produces more than 20 million tonnes of biomass. There is a very narrow window for sowing of succeeding wheat crop. Consequently, farmers burn the paddy residue in the field itself which causes serious environmental problems and adversely affects soil health. Therefore, paddy straw management is a burning problem and needs to be tackled. Happy seeder provides an economically viable alternative to residue burning. It allows farmers to sow wheat immediately after their paddy is harvested without burning paddy residue for land preparation.

Keywords: Happy seeder, KVK Mohali, Paddy residue burning

Scenario of Paddy residue burning

The air quality in north India, particularly along the Indo-Gangetic plains, stoops to dangerously low levels between October and November every year due to the paddy residue burning. This is also the time when farmers in the region burn the agricultural waste after harvesting their paddy fields. Combine harvesting of paddy and wheat predominates in Punjab, with a large amounts of loose and anchored crop residues left in the fields after harvest. Left with a heap of unwanted rice stubble, with little time to dispose of it, farmers set fire to the heaps and use the ash as a fertiliser. However, stubble burning emits greenhouse gases and harmful particulate matter into the air, which leads to pollution. Further, paddy residue burning has been identified as a major health hazard coupled with loss of vital nutrients such as nitrogen, phosphorus, potassium and sulphur from the topsoil layer, making the land less fertile and unviable for agriculture in the long run. Finding ways to dispose of agriculture waste with minimal impact on the environment is one of today's greatest challenges.

Therefore, a new Centrally Sponsored Scheme on 'Promotion of Agricultural Mechanization for In-

Situ Management of Crop Residue in the States of Punjab, Haryana, Uttar Pradesh and NCT of Delhi' for the period from 2018-19 to 2020-21 has been implemented to promote Happy seeder machine for management of crop residue. Keeping this in view, ICAR-ATARI, Ludhiana advised Krishi Vigyan Kendra (KVKs) of Punjab to conduct demonstrations on wheat sown with Happy seeder at KVK farm subsequently up-scale this technology at farmers' field to nearby villages in their respective districts. However, farmers should know the technical part associated with happy seeder to achieve maximum yield and profit in wheat cultivation done with this machinery.

Happy seeder technology

Happy seeder has been recognized as one such key technological innovation developed and validated over several years under diverse conditions to establish its significance. It is a key innovative planter capable of direct drilling of wheat after rice harvest and under residual moisture in the fields, saving pre-sowing irrigation, with surface retention of residues as mulch and without any preparatory tillage and avoids burning. It is a PTO driven machine operated by 45 HP tractor

and it covers about 0.75-0.80 acre per hour. The loose straw needs to be spread uniformly in the field for the proper working of Happy seeder. It can be done manually or harvest the paddy by combining harvester fitted with PAU super straw management system (SMS). After the harvesting of paddy with combine fitted with Super SMS, wheat can be sown with Happy seeder or Spatial Zero Till Drill, without straw burning. The paddy straw acts as mulch which adversely affects the weed population.

Efforts of KVK Mohali for technology demonstration and adoption

ICAR-ATARI, Ludhiana through Krishi Vigyan Kendras (KVKs) decided to promote Happy seeder technology amongst farmers. Krishi Vigyan Kendra Mohali with its relentless efforts have been able to transform two cluster villages into residue burning free zones. Cluster 1 comprised of Badanpur, Shahpur and Rakoli and Cluster 2 comprised of Mundho Sangatia, Bhajoli and Sohali villages. KVK organized many awareness programs, exposure visits and farmer-scientist interfaces to make farmers try the latest machines. Results demonstrations and fields days helped convince farmers to adopt *in-situ* residue management practices.



Sowing of wheat crop through Happy seeder.



Happy seeder wheat demonstration field at village Badanpur, Mohali.

Kisan melas and *Kisan gothis*, Question-answer sessions etc. dealt with farmers queries to clarify doubts. Sustained efforts of KVK Mohali helped to establish a few custom hiring groups to enable easy access to machines and entrepreneurship development. Live demonstrations of crops sown after retention or incorporation of paddy residue have driven them to follow fellow farmers. In about 95% area of these six villages, paddy residue burning was not followed. Out of this 95% burning free area, wheat sowing with Happy seeder was carried out on 9% area. Results of these demonstrations indicate that Happy seeder technology resulted in a sharp decline in weed population, specially *Phalaris minor* population to the tune of 60-70%, reduced soil evaporation, improved soil health, and enhanced nutrient use efficiency (8-10%) and water savings (up to 1 million litres per ha) through reduced evaporation and elimination of pre-sowing irrigation. Average increase in wheat yield was around 3-4% in these demonstration plots as compared to non-crop residue management (burning) plots. The biggest advantage of using these technologies was decrease in the cost of field preparation to the extent of ₹ 4500/ha saving water, saving of spray cost on agrochemicals (insecticides) and herbicides, which has resulted in higher profit and increase in net returns of the wheat crop, leading towards achieving the goal of environmental sustainability.

Advantages of Happy seeder technology

- **Water saving:** This innovative

planter takes advantage of existing moisture in the fields for direct drilling of wheat after the rice harvest saving pre-sowing irrigation. This practice saves water equivalent to 1 million litres per hectare by conserving soil moisture due to mulch effect and needlessness of field preparation.

- **Heat stress mitigation:** The residual mulch in wheat fields helps in reducing evaporative losses, buffering soil moisture and temperature including crop canopy temperature, and efficiently mitigating terminal heat effects.
- **Soil fertility improvement:** Residual mulch promotes higher microbial and enzyme activities in terms of microbial biomass C and N, soil dehydrogenase and alkaline phosphatase activities which leads to better soil quality index and improves soil, plant and water interactions.

Precautions taken while sowing wheat with Happy seeder

- **Fertilizer for wheat:** The fertilizer dose should be based on recommendation. In Punjab, 55 kg of DAP per acre is drilled at sowing. Urea is applied in two equal splits each of 44 kg per acre before first and second irrigation. Irrigation should be followed immediately after urea application on heavy soils to avoid the risk for delay in second irrigation, 33 kg urea is broadcasted before sowing of wheat and the remaining 55 kg before first irrigation.
- **Baiting in wheat fields sown with Happy seeder:** Two burrow baitings

at an interval of 15 days with zinc phosphide in November/December followed by paper baiting with Bromadiolone in February-March may be used for rodent control in Happy seeder sown wheat.

- **Laser leveling:** Farmers must get the fields laser levelled before transplanting paddy crop thereafter wheat is sown with Happy seeder.
- **Soil moisture management:** Last irrigation to paddy crop should be applied in such a way that wheat can be sown with Happy seeder in the residual moisture which eliminates the need for pre-sowing irrigation.

CONCLUSION

After the operation of Super Straw Management System, it has been a game changer for *in-situ* management of residue in the field. Regular improvement and up-gradation in this technology has been done by scientists of Punjab Agricultural University based on the feedback given by KVK Scientists while learning from the field with fellow farmers. The Central Government's support has given a huge boost to the 'paddy residue management movement'. Happy seeder has been recommended to sow wheat in a combined harvest paddy field without any straw burning and farmers responded well to adopt this technology.

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