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HAPPY SEEDER - A PROMISING TECHNOLOGY IN CONSERVATION AGRICULTURE

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Adopting the fundamental principles of “conservation agriculture” has vast potential for nursing depleted arable soils back to health and correct implementation is key to its success. Conservation agriculture is defined as a way of achieving sustainable and profitable farming using three core principles namely minimal soil disturbance, permanent soil cover and crop rotations. There has been mass adoption of conservation agriculture around the world and it has been particularly more successful in arid regions such as Australia and North and South America, helping to conserve moisture, maintain or improve organic matter and reduce soil erosion (Farmers Weekly, 2018).

In India, dissemination of conservation-based agricultural technologies have been underway for nearly two decades that made significant progress in agriculture even though there are several constraints that affect its adoption. Particularly, tremendous efforts have been made on no-till in wheat under a rice-wheat rotation in the Indo-Gangetic plains. There are more payoffs than tradeoffs for adoption of conservation agriculture but the equilibrium among the two was understood by both adopters and promoters. The technologies of conservation agriculture provide opportunities to reduce the cost of

production, save water and nutrients, increase yields, increase crop diversification, improve efficient use of resources, and benefit the environment. However, there are lot of constraints for promotion of conservation agriculture technologies, such as lack of appropriate seeders especially for small and medium scale farmers, competition of crop residues between conservation agriculture use and livestock feeding, burning of crop residues, availability of skilled and scientific manpower and overcoming the bias or mindset about tillage (Bhan and Behera 2014).

HAZARDOUSEFFECTS PADDY STUBBLE BURNING

An acre of paddy field produces around 2.5 tonnes of stubble which, on burning, releases 7.5 kg of particulate matter, 150 kg of carbon monoxide, 3,650 kg of carbon dioxide, 498 kg of ash and 5 kg of sulphur dioxide. These gases and aerosols consisting of carbonaceous matter contribute to global climate change. For sowing wheat on-time the burning of rice residue decreases the soil fertility and is harmful for human beings, animals and environment (TheHinduBusinessline, 2018).

On other hand, burning of paddy stubbles leads to the loss of precious nutrients, as nearly 25% nitrogen and phosphorus, 50% sulphur and 75% potassium. It is estimated that burning of 1 tonne of stubble or paddy straw accounts for loss of 5.5 kg N, 2.3 kg P, 25 kg K and 1.2 kg S, besides organic carbon. Husk has high productive value. Rice husk is unusually high in ash, which contain 92-95% silica, highly porous and light in weight, with a very high surface area. Its absorbent and insulating properties are useful in many industrial applications, such as acting as strengthening agent in building materials. Husk is also produced as fuel for processing paddy, production through direct combustion or gasification. It is also used as cattle feed. Burning stubble would be a waste of such utility (Ballotboxindia, 2018).



HAPPY SEEDER IS A HAPPY SOLUTION

Happy Seeder is one of the promising technologies which is used for sowing wheat without any burning of rice residue. This technology is eco-friendly and improves the soil health as well as saves water. (Land force, 2018).

ECONOMIC VALUES & BENEFITS OF HAPPY SEEDER

Assumptions used in economic assessment of Happy Seeder

- Fertilizer savings 10% (after 5 years), 15% (after 10 years)
- Yield increase 0-5%. Weedicide 50% (from 1st year)
- Saving of water 12cm/ha (30%) (if rauni saved)
- Saving of electricity 168 kWh/ha
- Labour saved 30hrs/ha or Rs. 450/ha
- Lower pumping costs Rs.50-165/ha (centrifugal & submersible)
- Lower machinery use 7.5 hrs /ha

The economic value of all these savings is Rs.3600 - 7300 /ha per annum from wheat sown with Happy Seeder over the wheat sown with conventional tillage after burning rice stubbles and Rs. 545 - 3400/ha over wheat sown with zero till after burning stubbles. Also, the cost of field preparation for stubble burnt conventional tillage is Rs. 5250/ha, stubble burnt zero tillage Rs. 1375/ha, stubble incorporated conventional tillage Rs. 8375/ha, Rs. 2500/ha with Rota Seeder and Rs.2250/ha for wheat sown with Happy Seeder (it also includes Rs. 65/ha for control of rodents) (Yadvinder Singh et al., 2009).

Evaluation of the technology over three years in replicated experiments and farmers' fields in Punjab, India, showed that establishment of wheat sown into rice residues with the Happy Seeder was comparable with establishment using conventional methods (straw burnt followed by direct drilling or cultivation before sowing) for sowings around the optimum time into stubbles up to 7.5 t/ha. For late sowings, plant density declined significantly at straw loads above 5 t/ha. The mulch also reduced weed biomass by ~60%, and reduced soil evaporation. Yield of wheat sown around the optimum time into rice residues, using the Happy Seeder, was comparable with or higher than yield after straw removal or burning, in replicated experiments and farmers' fields, for straw loads up to 9 t/ha. In farmers' fields there was an average yield increase of 9 and 11% in 2004–05 and 2005–06, respectively, compared with farmer practice. For sowings after the optimum time, yield declined significantly at straw loads greater than 7.5 t/ha. The Happy Seeder offers the means of drilling wheat into rice stubble without burning, eliminating air pollution and loss of nutrients and organic carbon

due to burning, at the same time as maintaining or increasing yield (Sidhuet al. 2007).

EXPERIENCE UNDER FARMER FIRST PROGRAMME, ICAR-NIBSM, RAIPUR

Under the Farmer FIRST Project about 85 acres of cultivable land covered under ricefallow wheat and pulses cropping system through zero tillage with the help of happy seeder. Improved varieties of Lathyrus, Chick pea, Lentil, Mustard and Black gram introduce first in kind at tribal villages of Kasdol block of Baloda Bazar district, Chhattisgarh. Farmers got bumper yield and expressed to adopt the technology in the coming season. In economic terms, farmer obtained the yield in Chick Pea (5.92 Ql/ac), Lathyrus (4.5Ql/ac), Black Gram (3.48Ql/ac), Lentil (3.44Ql/ac) Mustard(3.2Ql/ac). Happy Seeder is the most promising technology available to manage paddy residues and promote conservation agriculture in rice-wheat and rice fallow pulse cropping system. Adoption of Happy Seeder technology will help to recycle the plant nutrients present in the paddy residues leading to improve soil health. High capital cost and the availability of Happy Seeder to the small farmers is the main impediments. Hence, the line departments should facilitate through contractual services, custom hiring centers and government subsidies.



Adoptability of Happy Seeder in rice-fallow system modified to rice-pulse system



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