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Socio - Economic Impact of Crop Residue Management through Rotavator on Farming Families

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Abstract

Generally farmers are in a hurry to sow next crop (wheat) after cultivation of kharif crop (rice) and dispose off the straw immediately by burning and without recycling of crop residues. This is a great loss to the farmer as well to the land. Farmers resort to burning of the crop residue as removing it involves higher costs for labour to uproot, chop and mix in the soil. In order to encourage farmers to change this practice, rotavator machine was introduced to chop the harvested crop stalks / stubbles into small pieces and incorporated in-situ into the soil with varying efficiencies depending upon the left over residue. The rotavator prepares the field in single operation. It carries out secondary tillage operations such as harrowing and leveling in single operation. It destroys weeds, incorporates left-over stubbles of previous crop, conserves soil moisture and pulverizes soil. It prepares seed bed in both wet and dry conditions. It saves time, labour and cost. Keeping in view the perspectives of rotavator a study was conducted among 80 rotavator adopters in Kaithal district of Haryana to know socio economic impact of its adoption on farming families in 2017-18. Regarding reasons for adoption of overwhelming majority of the farmers (83.75%) reported that rotavators are capable of tilling large areas of land in a short time period and break up the soil & land leveling followed by eradicating of weeds

(82.50%).Water management, time and fuel saving were also reported by majority of the respondents. Cumulative socio-economic impact of using rotavator like increased in investment on quality education of the children (83.33 %) and social ceremonies (79.16%) by medium land holding farmers were reported while investment on quality education of the children, payment of amount of credit availed from bank increased, extension contacts increased (80% each) were reported by marginal land holding farmers.

Key words: Rotavator, stubbles, socio-economic impact, eradication of weeds.

Introduction

Generally farmers are in a hurry to sow next crop (wheat) after cultivation of kharif crop (rice) and dispose off the straw immediately by burning and without recycling of crop residues because the time line available between the harvesting of paddy crop and the sowing of next crop is extremely short (2-3 weeks).Use of paddy straw is very less as fodder is limited due to high silica content. This is a great loss to the farmer as well to the land. Rice residue burning results is showing extensive impacts both on and off farm for e.g., losses soil nutrients, soil organic matter and its productivity, air and water quality biodiversity and on human and animal health also. In India, air pollution can be severe from residue burning, having impact on human health by directly causing a range of health hazards and significantly reduced visibility contributes the incidence of traumatic road accidents. In the rice-wheat cropping system, the losing of soil organic matter as an effect of burning is one of the recognized threats to the sustainability. The straw collected from the fields is of great economic value as livestock feed, fuel and industrial raw material. In northern India, wheat straw is preferred while in Southern India paddy straw is fed to livestock (Hegde 2010).

The residue generated from the rice-wheat cropping system is of great use and also have many benefits, but this is possible only if the residue is separated from the grain and carried out of the field. Burning decreases the availability of straw to livestock, which is in short supply at present time by more than 40 %. However, in the case of combine harvesting, in great amount residue is left in the field for burning harmfully affect the overall sustainability of the rice-wheat cropping system (Thakur 2013). Now, many farmers have adopted Zero tillage after the stubble

burning. In 2005–2006, around 10 % of the total area was sown under wheat by using zero till machines. Apparently less than 1 % of farmers have incorporation in the case of paddy straw because the incorporation requires more tillage operations than after burning (Singh et al. 2008). The options for crop residue management may include developing systems to plant residue into bailing and removal useful as animal feed or as industry. Enhanced decomposition or disintegration of machine-harvested straw improves nutrients in the soil is useful (Yadav, 2014).

The microbial sprays are useful which can speed up the decomposition of residue is also an option. The option of planting into residue needs additional investigation of inorganic nitrogen and its opposing effect due to nitrogen deficiency. Though numerous studies in the literature have addressed this issue of burning of the crop stubble but none have brought to the forefront adverse implications of this unwarranted run- through on both human and animal health. In order to encourage farmers to change this practice, rotavator machine was introduced to chop the harvested crop stalks / stubbles into small pieces and incorporated in-situ into the soil with varying efficiencies depending upon the left over residue. The rotavator prepares the field in single operation. It carries out secondary tillage operations such as harrowing and levelling in single operation. It destroys weeds, incorporates left-over stubbles of previous crop, conserves soil moisture and pulverizes soil. It prepares seed bed in both wet and dry conditions. It saves time, labour and cost (Kaur, 2016).

The rotavator will produce a perfect seedbed in fewer passes. It is the ideal implement for farmers who need to bury and incorporate crop residues quickly, between crops. Tillage tools direct energy into the soil to cause some desired effect such as cutting, breaking, inversion, or movement of soil. Soil is transferred from an initial condition to a different condition by this process. A rotavator is a mechanical gardening tool with power blades attached to a spinning surface to plough soil and produce optimum tillage. In the aspects of saving power consumption and improving energy saving of agricultural machinery during soil cultivation, many scholars made a lot of research and practice on the influences of turning direction of rotary Rotary tiller or ROTAVATOR (derived from rotary cultivator) is a tillage machine designed for preparing land by breaking the soil with the help of rotating blades suitable for sowing seeds (without overturning of the soil). It also plays a vital role in eradicating weeds, mixing manure or fertilizer

into soil, to break up and renovate pastures for crushing clods etc. It offers an advantage of rapid seedbed preparation and reduced draft compared to conventional tillage.

Methodology

The study was conducted in Kaithal district of Haryana in 2017-18. From the selected district, two blocks namely Pundri and Kaithal were selected randomly for the purpose of the study. From the selected blocks, Jamba, Dera Gadla, Khurana, Tayontha, Habri villages were drawn where more number of farmers were using Rotavator. From the selected villages 80 farmers were selected randomly. Interview Schedule was prepared for collection of data. Data was analyzed and tabulated to draw the inferences.

Results

Contextual matrix of the respondents

The data reported that majority of the respondents (53.75 %) were belonging to middle age group followed by young age group 28.75. The table further indicates that more than three-fourth of the respondents (78.75%) belonged to general caste, had nuclear family type (70.0%) with up to 4 members (65.0%). Regarding education 50 % of the respondents were educated secondary school level followed by senior secondary school level. Sixty percent of the respondents were having medium land holding (10.01-25.00) followed by small land holding. About half of the respondents (48.75%) belonged to medium (2.1 - 4.0 lakh) income group, had medium (40.0%) mass media exposure and social participation (43.75%) and socio economic status (41.25%).

Reasons for adoption of Rotavator by the respondents

Overwhelming majority of the farmers (83.75%) reported that rotavators are capable of tilling large areas of land in a short time period and break up the soil & land leveling followed by eradicating of weeds (82.50%) , higher income (81.25%) and easy to mixing manure or fertilizer into soil (80.0%). Three-fourth per cent (77.50%) easier to operate than other types of

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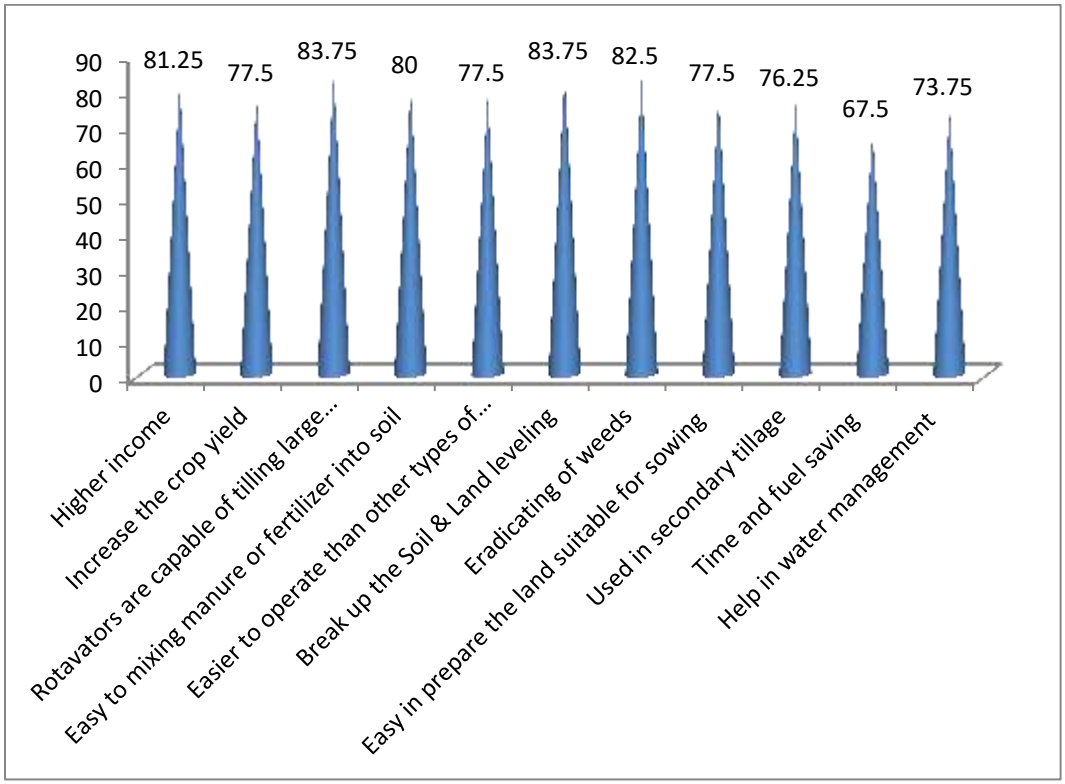

Fig.1: Reasons for adoption of rotavator by the respondents

machinery and easy in preparing the land suitable for sowing while 76.25 per cent of the respondents reported used in secondary tillage .Water management and time and fuel saving was also reported by 73.75% and 67.50% of the respondents. This result with the line of Jain, 2016 who find Surface retention of residue in soil can be managed by the technology of happy seeder and zero tillage. Rotavator is used in the combine harvested paddy fields for planting of wheat. Zero tillage is also used in standing stubbles of combine harvested rice after removing loose straw and easy to mixing manure or fertilizer into soil. Lohan 2018, Shafie 2016 and Jain 2014 also support this study they found the management of residue play significant role in protection of soil surface but also reduce the evaporation losses and water saving by the use of crops. The residue on the soil surface reduces the touching of sunlight and reducing the air exchange which resulted in less use of energy for the loss of water from the surface of soil (evaporation). The water saved with the management of residue is used by the crop for transpiration.

Table 1: Reasons for adoption of rotavator by the respondents in Kaithal district (2017-18)

(n=80)

S. No.	Reasons	Frequency	Percentage
1.	Higher income	65	81.25
2.	Increase the crop yield	62	77.50
3.	Rotavators are capable of tilling large areas of land in a short time period	67	83.75
4.	Easy to mixing manure or fertilizer into soil	64	80.00
5.	Easier to operate than other types of machinery	62	77.50
6.	Break up the Soil & Land leveling	67	83.75
7.	Eradicating of weeds	66	82.50
8.	Easy in prepare the land suitable for sowing	62	77.50
9.	Used in secondary tillage	61	76.25
10	Time and fuel saving	54	67.50
11	Help in water management	59	73.75

Responses were multiple

Cumulative Socio-economic impact of adoption of Rotavators on as farmers per size of holding

Analysis of data revealed cumulative socio-economic impact of using rotavator like increased in investment on quality education of the children (83.33 %) and social ceremonies (79.16%) by medium land holding farmers. Increased in household assets was reported by small (80%) and marginal farmers (60%), increase in land area on lease was reported by medium farmers

(68.75%, increase in quality of medical treatment (60%), no. and quality of dresses increased (80%) and extension contacts increased (80%) were reported by marginal farmers. This study with tune of Kumar, 2016 and Roy 2016 also found in his study that the farmers who use rotavators have a great income and status too. Jain 2016, Yadav et al. 2014 and Kaur and Rani 2014 also support this study.

Table 2: Cumulative Socio-economic impact of adoption of Rotavators on farmers as per size of land holding in Kaithal district (n=80)

S.N.	Socio-economic change	Marignal (2.5Acre)	Small (2.51-50)	Semi-marignal	Medium (10.1-25)
		Freq. (%) (n=5)	Freq. (%) (n=15)	Freq. (%) (n=12)	Freq. (%) (n=48)
10.	Investment on quality education of the children	4(80.00)	7(46.66)	8(66.6)	40(83.33)
11.	Expenditure on social ceremonies increased	2(40.00)	-	6(50.00)	38(79.16)
12.	Household construction increased	3(60.00)	10(66.66)	7(58.33)	12(25.00)
13.	Increase in household assets	3(60.00)	12(80.00)	8(66.66)	24(50.00)
14.	Payment of amount of credit availed from bank increased	4(80.00)	8(53.33)	4(33.33)	10(20.83)
15.	Change in socio-economic status Social mobility increased	3(60.00)	9(60.00)	6(50.00)	12(25.00)
16.	Increase in land area on	2(40.00)	4(26.66)	5(41.66)	33(68.75)

	lease				
17.	Increase in quality of medical treatment	3(60.00)	6(40.00)	6(50.00)	28(58.33)
18.	increased number and quality of dresses	4(80.00)	7(46.66)	4(33.33)	20(41.66)
10	Extension contacts increased	4(80.00)	8(53.33)	6(50.00)	24(50.00)

Conclusion

Farmers resort to burning of the crop residue as removing it involves higher costs for labour to uproot, chop and mix in the soil. In order to encourage farmers to change this practice, rotavator machine was introduced to chop the harvested crop stalks / stubbles into small pieces and incorporated in-situ into the soil with varying efficiencies depending upon the left over residue. The rotavator prepares the field in single operation. It carries out secondary tillage operations such as harrowing and leveling in single operation. It destroys weeds, incorporates left-over stubbles of previous crop, conserves soil moisture and pulverizes soil. It prepares seed bed in both wet and dry conditions. It saves time, labour and cost. Regarding reasons for adoption of overwhelming majority of the farmers (83.75%) reported that rotavators are capable of tilling large areas of land in a short time period and break up the soil & land leveling followed by eradicating of weeds (82.50%).Water management, time and fuel saving were also reported by majority of the respondents. Cumulative socio-economic impact of using rotavator like increased in investment on quality education of the children (83.33 %) and social ceremonies (79.16%) by medium land holding farmers were reported while investment on quality education of the children, payment of amount of credit availed from bank increased, extension contacts increased (80% each) were reported by marginal land holding farmers.

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