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RESEARCH ARTICLE :

Socio-economic factors influencing the different paddy residue management practices TBP command area in Karnataka

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SUMMARY : In Tunga Bhadra Project (TBP) command area of Karnataka, paddy-paddy cropping system is the predominant higher system. Paddy residues include any biomass left in the field after grains and other economic components have been harvested. In High Livestock Density Area (HLDA) average age of respondents was 43.34 years, among different practices of paddy residue burning of straw and stubbles is having average age of respondent is 45.89 years, followed by removal straw and burning of stubbles (43.2), incorporation of straw and stubbles (42.83) and removal of straw and incorporation stubbles (41.30). Whereas, in Low Livestock Density Area (LLDA) average age of respondent was 42.17 years, among different practices incorporation of straw and stubbles is having average age of respondent was 47.20 years, followed by burning of straw and stubbles (43.08), removal of straw and burning stubbles (40.68) and removal of straw and incorporation stubbles (37.70) years. Constraints analysis indicated that, among availability of short time between *Kharif* paddy harvesting and sowing of *Rabi* paddy was identified as major constraints and it stands Rank- I (71.54 mean Garret score) followed by scarcity of labour for residue collection after use of combine harvesters Rank - II (60.70) in High Livestock Density Area (HLDA) whereas, in case of Low Livestock Density Area (LLDA), among this availability of short time between *Kharif* paddy harvesting (late October and early November) and sowing of *Rabi* paddy was identified as major constraints and it stands Rank- I (73.22 mean Garret score) followed by high cost of residue management compared to burning Rank - II (56.70).

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BACKGROUND AND OBJECTIVES

Paddy residue with its connotations of something left over that nobody wants, gives a false impression of the value of the straw, stubbles and other vegetative parts of crop that remain after harvest, especially since many farmers burn them or otherwise dispose of them. These paddy residues are used as animal feed, for thatching of homes and as

source of domestic and industrial fuel. A large portion of unused crop residues are burnt in the fields primarily to clear the left-over straw and stubbles after the harvest. In recent years non-availability of labour, high cost of residue removal from the field and increasing use of combine harvesters are main reasons behind burning of crop residues in the fields. Burning of crop residues is economic loss in addition to cause's environmental pollution, is hazardous to human health, produces greenhouse gases causing global warming and results in loss of plant nutrients like N, P, K and S. Therefore, appropriate management of crop residues assumes a great significance.

A large amount of paddy residue is annually produced in the paddy growing region of the country. Moreover, the adoption of mechanized farming has resulted in leaving a sizeable amount of paddy straw in the field after harvesting the grain. There is enormous potential of recycling this residue in the crop production system. In Tunga Bhadra Project (TBP) command area of Karnataka, paddy-paddy cropping system is the predominant one. Paddy residues include any biomass left in the field after grains and other economic components have been harvested. Crop residues are also a principal source of carbon, which constitutes about 40 per cent of the total biomass on dry weight basis.

Paddy residue management is important in paddy-paddy based cropping system as machines are increasingly used for harvest. Residue burning is a traditional way, paddy straw are removed from the fields for use as cattle feed and other purpose. Recently, with advent of mechanized harvesting, farmers have been burning in-situ large quantities of crop residues left in the field as crop residues interfere with tillage and seeding operations for the subsequent crop, causing loss of nutrients and soil organic matter.

A major constraint in the paddy-paddy cropping system in the study area the availability of short time between *Kharif* paddy harvesting (late October and early November) and sowing of *Rabi*/summer paddy. But in recent days, the burning of paddy crop residue is being increased due to labour scarcity and mechanical harvesting of paddy, lack of knowledge about the residue management, decreased livestock population and non availability of sufficient water in TBP reservoir etc. Paddy residue includes stalk and stubbles are being burnt on the farm itself which causes environmental, human and animal health problems in addition to loss of economic value of fodder.

RESOURCES AND METHODS

The stratified multistage random sampling technique was used for selection of sample farmers from TBP command area. In the first stage, three districts of TBP area namely Koppal, Ballari and Raichur were selected. In the second stage, the five taluks namely Gangavati, Siruguppa, Hospet, Sindhanur and Manvi from selected districts were selected. In the third stage four villages from each taluka were selected based on density of livestock population *i.e.*, two villages having highest livestock density and two from lowest livestock density. The livestock density was estimated from the data and information obtained from veterinary offices of the respective taluks. In fourth stage five samples from each village were selected. Thus, the total sample size comprised 100 farmers. The descriptive statistics was employed to analyse the socio-economic characteristics of sample farmers and Garrett ranking technique was used to capture the constraints in paddy crop residue management practices.

OBSERVATIONS AND ANALYSIS

The socio-economic characteristics of the sample farmers having different paddy residue management practices in TBP command areas are presented in Table 1. In High Livestock Density Area (HLDA) average age of respondents is 43.34 years, among different practices burning of straw and stubbles was having average age of respondent was 45.89 years, followed by removal straw and burning of stubbles (43.2), incorporation of straw and stubbles (42.83) and removal of straw and incorporation stubbles (41.30). In average family size was 5.9 among the different practicing farmers removal straw and burning of stubbles having average family size of 6.62 followed by incorporation of straw and stubbles (6.50), removal of straw and incorporation stubbles (5.40) and burning of straw and stubbles (5.11). An average farming experience of family 10.51 years, among the different practicing farmers removal of straw and burning stubbles having experience of 11.24 years, followed by incorporation of straw and stubbles (10.83), burning of straw and stubbles (10.67) and removal of straw and incorporation stubbles (9.30).

The average area under paddy was found 7.71 acre, among the different practices, removal of straw and incorporation stubbles having the average area of 9.44 acre followed by burning of straw and stubbles (7.64), incorporation of straw and stubbles (7.06) and removal of straw and burning stubbles (6.69).

A average family income of respondent of farmers is (Rs.90,698), among the different practices, incorporation of straw and stubbles is having the (Rs. 92153) income followed by removal of straw and burning stubbles (Rs. 91974), removal of straw and incorporation stubbles (Rs. 89734) and burning of straw and stubbles (Rs. 88931).

In Low Livestock Density Area (LLDA) average age of respondent is 42.17 years, among different practices incorporation of straw and stubbles is having average age of respondent is 47.20 years, followed by burning of straw and stubbles (43.08), removal of straw and burning stubbles (40.68) and removal of straw and incorporation stubbles (37.70) years. An average family size 5.88 among the different practicing farmers removal straw and incorporation stubbles having average family size of 6.33 followed by burning of straw and stubbles (6.33), removal of straw and burning stubbles (5.84) and incorporation of straw and stubbles (5.00). In average farming experience of family 10.81 years, among the different practicing, farmers incorporation of straw and stubbles having experience of 13.20 years, followed by burning of straw and stubbles (10.92), removal of straw and burning stubbles (9.73) and removal of straw and incorporation stubbles (9.70). The average area under paddy was 7.19 acre, among the different practicing, burning of straw and stubbles having the average area of 9.13 acre followed by removal of straw and incorporation stubbles (7.32), removal of straw and burning stubbles (7.18) and incorporation of straw and stubbles (5.12).

A average family income of farmers was (Rs. 90,417), among the different practices, incorporation of straw and stubbles was having the (Rs. 92153) higher income followed by removal of straw and burning stubbles (Rs. 91433), removal of straw and incorporation stubbles (Rs. 89374) and burning of straw and stubbles (Rs. 88785) income, respectively (Chahal *et al.*, 2015).

Table 1: Socio-economic characteristics of sample farmers in TBP command area

Sr. No.	Particulars	RS and BS	BS and S	RS and IS	IS and S	Overall
A	**High livestock density area (1.98/ha)**					
i	Age (Years)	43.32	45.89	41.30	42.83	43.34
ii	Family size (No.)	6.62	5.11	5.40	6.50	5.91
iii	Farming experience of family (years)	11.24	10.67	9.30	10.83	10.51
iv	Area under paddy (acre)	6.69	7.64	9.44	7.06	7.71
v	Family income per year (Rs.)	91974.80	88931.66	89734.50	92153.33	90698.57
B	**Low livestock density area (0.68/ha)**					
a	Age (Years)	40.68	43.08	37.70	47.20	42.17
b	Family size (No.)	5.84	6.33	6.33	5.00	5.88
c	Farming experience of family (years)	9.73	10.92	9.70	13.20	10.89
d	Area under paddy (acre)	7.18	9.13	7.32	5.12	7.19
e	Family income per year (Rs.)	91433.04	88785.83	89374.00	92076.00	90417.22
C	**Pooled**					
1	Age (Years)	42.00	44.49	39.50	45.02	42.75
2	Family size (No.)	6.23	5.72	5.87	5.75	5.89
3	Farming experience of family (years)	10.49	10.80	9.50	12.02	10.70
4	Area under paddy (acre)	6.94	8.39	8.38	6.09	7.45
5	Family income per year (Rs.)	91703.92	88858.75	89554.25	92114.67	90557.90

Note: Figures in the parentheses indicate percentages to the column sample total
– RS and BS: Removal of straw and burning of stubble
– BS and S: Burning of straw and stubble
– RS and IS: Removal of straw and incorporation of stubble
– IS and S: Incorporation of straw and stubble

In pooled data, average age of respondents was 42.75 years, among different practices incorporation of straw and stubbles is having age of respondents was 45.02 years, followed by burning of straw and stubbles (44.49), removal of straw and burning stubbles (42.00) and removal of straw and incorporation stubbles (39.50). An average family size 5.89, among the different practicing farmers removal of straw and incorporation stubbles having family size of 6.23 followed by removal of straw and incorporation stubbles (5.87), incorporation of straw and stubbles (5.75) and burning of straw and stubbles (5.72), respectively. An average farming experience of family 10.70 years, among the different practices, incorporation of straw and stubbles having experience of 12.02 years, followed by burning of straw and stubbles (10.80), removal of straw and burning stubbles (10.49) and removal of straw and incorporation stubbles (9.50). The average area under paddy was 7.45 acre in pooled data, in that burning of straw and stubbles having the area of 8.39 acre followed by removal of straw and incorporation stubbles (8.32), removal of straw and burning stubbles (6.94) and incorporation of straw and stubbles (6.09) (Kumar, 2014).

A average family income of respondent of farmers was (Rs. 90,557), whereas, case of incorporation of straw and stubbles is having the (Rs. 92114) income followed by removal of straw and burning stubbles (Rs. 91703), removal of straw and incorporation stubbles (Rs. 89554) and burning of straw and stubbles (Rs. 88858) income, respectively.

Major constraints faced by the respondent farmers in high livestock density area (HLDA), among availability of short time between *Kharif* paddy harvesting (late October and early November) and sowing of *Rabi* paddy was identified as major constraints and it stands Rank- I (71.54 mean Garret score) (Tanvir and Bashir, 2013) followed by scarcity of labour for residue collection after use of combine harvesters Rank - II (60.70), land levelling problem after residue incorporation Rank - III (58.26), high cost of residue management compare to burning Rank - IV (54.28), lack of technical knowledge about residue management Rank -V (40.08), inadequate size of landholdings for adoption environment friendly management practices (EFMP) Rank - VI (39.38), non availability of custom hire service especially reaping binder Rank - VII (36.66) and unwilling to put extra effort for a composting straw Rank - VIII (36.66).

Similarly, in case of low livestock density area (LLDA), among this availability of short time between *Kharif* paddy harvesting (late October and early November) and sowing of *Rabi* paddy was identified as major constraints and it stands Rank- I (73.22 mean Garret score) followed by high cost of residue management compare to burning Rank - II (56.70), land levelling problem after residue incorporation Rank - III (56.02), scarcity of labour for residue collection after use of combined harvesters Rank - IV (54.68), lack of technical knowledge about residue management Rank - V (45.54), inadequate size of landholdings for adoption environment friendly management practices (EFMP) Rank - VI (39.86), unwilling to put extra effort for a composting straw Rank - VII (39.30) and non-availability of custom hire service especially reaping binder Rank - VIII (32.68).

Table 2: Constraints for non-adoption of environment friendly paddy residue management practices in TBP command area (n=100)

Sr. No.	Reasons	HLDA (1.98/ha) (n=50)		LLDA (0.68/ha) (n=50)		Pooled data	
		Garret score	Rank	Garret score	Rank	Garret score	Rank
1.	Lack of technical knowledge about residue management	40.08	V	45.54	V	42.81	V
2.	Unwilling to put extra effort for a composting straw	36.66	VIII	39.30	VII	37.98	VIII
3.	Non-availability of custom hire service especially reaping binder	37.10	VII	32.68	VIII	34.89	VII
4.	High cost of residue management compare to burning	54.28	IV	56.70	II	55.39	IV
5.	Inadequate size of land holdings for adoption EFMP	39.38	VI	39.86	VI	39.62	VI
6.	Land leveling problem after residue incorporation	58.26	III	56.02	III	57.06	III
7.	Available short time between *Kharif* paddy harvesting (late October and early November) and sowing of *Rabi* paddy	71.54	I	73.22	I	71.66	I
8.	Scarcity of labour for residue collection after use of combine harvesters	60.70	II	54.68	IV	57.59	II

With regards to pooled data, it was observed that major constraints faced by the respondent farmers, among this availability short time between *Kharif* paddy harvesting (late October and early November) and sowing of *Rabi* paddy was identified as major constraints and it stands Rank- I (71.66 mean Garret score) followed by scarcity of labour for residue collection after use of combined harvesters Rank - II (57.59), land levelling problem after residue incorporation Rank - III (57.06), high cost of residue management compared to burning Rank - IV (55.39), lack of technical knowledge about residue management Rank -V (42.81), inadequate size of landholdings for adoption environment friendly management practices (EFMP) Rank - VI (39.62) and unwilling to put extra effort for a composting straw Rank - VII (37.89) non-availability of custom hire service especially reaping binder Rank- VIII (34.89). (Poungchompu *et al.*, 2013).

Conclusion:

It was observed that major constraints faced by the respondent farmers, among this available short time between *Kharif* paddy harvesting (late October and early November) and sowing of *Rabi* paddy was identified as major constraints and followed by scarcity of labour for residue collection after use of combined harvesters to overcome higher cost for collection of residues compared to burning, Govt. should provide subsidize equipment/ machines required for the making the paddy residue into bales using reaper binder and transport it to fodder scarcity areas. In this connection, the Government could promote the reaper binder by at subsidized price. It helps reduce the cost of collection of residue left over after the harvest and also reduce air pollution.

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