Study on Seed Replacement Ratio among the Tribal Farmers of Northern Hills Agro-Climatic Zone of Chhattisgarh

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ABSTRACT

The present study was undertaken in Surguja and Surajpur districts of Chhattisgarh to know the seed replacement ratio of tribal farmers. 120 tribal farmers were considered as respondents for this study. Respondents were interviewed through personal interview. About seed replacement ratio among respondents for different crops during year 2010 to 2014, the average seed replacement ratio for rice (52.80%), wheat(23.14%) and maize 48.16 per cent respectively. Regarding seed replacement ratio in the different categories of the respondents for rice crop, small and marginal farmer's average seed replacement ratio was 47.96 per cent, medium farmers 37.92 per cent, and big farmers 76.34 per cent. Therefore, more number of big farmers replaced their seeds in comparison the others. In correlation analysis the finding data revealed that out of 14 independent variables only 5 variables i.e. credit acquisition, source of information, cosmopoliteness, sources of seed, and annual income were found positive and significantly correlated with extent of seed replacement ratio of the respondents at 0.01 and 0.05 level of probability. In multiple regression only 3 variables i.e. sources of information, sources of seed and annual income had positive and significant contribution in the seed replacement ratio of the respondents.

Key words: *Seeds; Replacement ratio; Northern hills;*

Agriculture plays an important role in India's economy. Since the independence, India has made great achievements in agriculture i.e. from import of food grains to self sufficiency and export of major agricultural commodities with a contribution of agriculture and allied sector shares 17.01 percent to nation's GDP (2014-15). An average Indian spends almost half of his/her expenditure on food, while roughly half of India's work force is engaged in agriculture for its livelihood. Seeds are not only a strong symbol for food sovereignty and biodiversity, but also one of the important elements to strengthen farming communities. In India there are two types of seed systems: the formal system, which is market-oriented and is developed by the public and/or private sectors, and the family or community production system which is based mainly on seed self-provisioning exchanges and gifts among neighbors, and the informal market traditionally. Seeds are the reproductive organs representing both continuity and change of the species. Seeds are a means for spatial and temporal dispersion of plant populations. Seed Replacement Ratio is the percentage of area sown out of total area of crop planted in the season by using certified/quality seeds other than the farm saved seed. This is essential for maintaining genetic purity and quality seed production.

Ideally seed should be replaced every year for hybrids and every three to four years for non-hybrids. However, in practice seed is replaced less often especially in case of open pollinated crops. Simple method is to take the ratio of quality seed of a crop produced during the year to the total seed needed to cover the entire area under the crop. This method does not consider the crop produce from F2, F3 and F4 generations distributed as seed among the fellow farmers. The seed replacement ratio (SRR) of different major crops in Chhattisgarh state during 2015-16 is i.e. paddy (44%), wheat (42%), maize (56%), arhar (26%), urd (16%), moong (24%), gram (21%), mustard (32%)

and soybean 51per cent respectively. In the Chhattisgarh state, total seed production area is 53,074 ha and seed production is 10, 46, 245 q (2014-15). The seed distribution of major crops in the state is; rice-528810, wheat-51274, maize-8156, soybean-80338, arhar-2826, gram-45339 and Niger-322 (in quintals). State has achieved desired National SRR (33%) except pulse crops. (Source*: Department of Agriculture C.G. 2014)*. One of the reasons for low replacement of certified seed could be its high price and non-availability at proper place in time. It is particularly true in the case of small farmers who generally have low availability of cash money. In India during the year 2011-12, the seed replacement ratio of different crops are i.e. paddy 40.42, wheat 32.55, maize 56.58, gram 19.35, urd 34.41,moong 30.29, arhar 22.16, groundnut 78.88, Jwar 23.85, bajra 60.4, and soybean are 32.47 per cent respectively (source: *Department of Agriculture, Cooperation and Farmers Welfare, 2014* and Hanchinal 2012). Hence, the present study was undertaken with the following objectives –

i. To asses information regarding seed replacement ratio in different selected crops among the tribal farmers of Chhattisgarh.
ii. To study the extent of seed replacement ratio in selected crops among different categories of farmers.

METHODOLOGY

The present study was conducted in Surguja and Surajpur district of northern hills agro-climatic zone of Chhattisgarh state during the year 2014-2015. Out of total blocks in Surguja and Surajpur district namely, Ambikapur, Batouli, Surajpur and Bhaiyathan were selected for study. Out of the total villages of these blocks total eight villages were selected randomly. From each selected village, 15 tribal farmers were selected randomly for the collection of data. In this way sample of 120 tribal farmers were considered as respondents for the study purpose. The data were collected personally by the researcher in cooperation with RAEOs and other officials of the district by using pre-tested interview schedule. The interview schedule was designed on the basis of objectives and independent and dependent variables in the present investigation. The interview schedule was thoroughly discussed with the concerned scientists and member of advisory committee and their suggestions were incorporated. Pre-testing of interview schedule provided an additional check for improving the instrument. Collected data were analyzed with the help of suitable statistical methods. The seed replacement ratio gives an idea about the quantity of the quality seeds used by the farmers.

$$SRR = \frac{x}{Y} \times 100$$

Where,

X = Net replaced area with the using improved quality seeds

Y = Total cropped area

RESULTS AND DISCUSSION

Seed replacement ratio of the Tribal farmers: On perusal of the data in Table 1 and Fig. 1, 2 it revealed that average seed replacement ratio of selected crops among respondents from the year 2010 to 2014. Most of the respondents (56.16%) were replaces rice seeds, followed by in maize (29.34%) and wheat (21.52%) respectively. Regarding average SRR of selected crops is, rice (52.80%), wheat (23.14%) and 48.16 per cent maize. Some similar findings are revealed by *Beshir and Bedru (2013)* and *Bhandariet et al (2014)*.

Table 1: Seed replacement ratio among respondents about selected crops

Crop/ Year	No. of respondents		Area (ha.)		Replac-ement ratio (%)
	No.	%	CA	RA	
Rice					
2010	58	48.33	206.07	91.90	44.59
2011	59	49.17	231.98	126.72	54.65
2012	69	57.50	229.55	125.50	54.64
2013	70	58.33	233.60	125.50	53.74
2014	81	67.50	294.73	166.39	56.46
Average		56.16	239.19	127.20	52.80
Wheat					
2010	17	14.17	52.22	9.31	17.86
2011	23	19.17	53.84	10.93	20.38
2012	26	21.67	53.84	14.57	27.07
2013	31	25.83	72.87	17.00	23.33
2014	32	26.67	74.89	20.24	27.03
Average		21.52	61.53	14.41	23.14
Maize					
2010	24	20.00	27.12	7.28	26.84
2011	27	22.50	30.36	11.33	37.33
2012	38	31.67	41.70	22.67	54.34
2013	42	35.00	51.01	31.57	61.99
2014	45	37.50	57.48	34.81	60.58
Average		29.34	41.53	21.53	48.16

CA=Cropped area, RA=Replaced area,

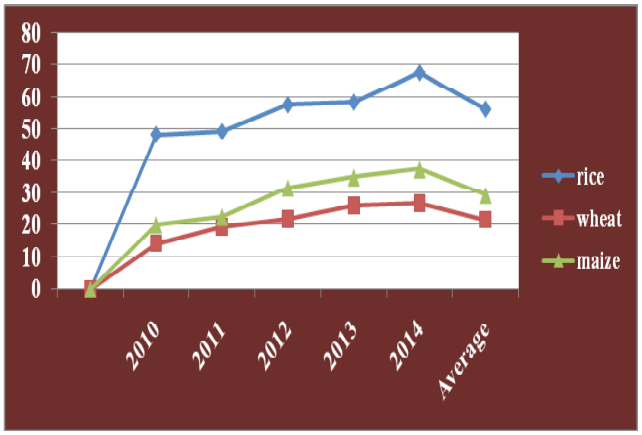

Fig 1: Distribution of respondents about seed replacement ratio among selected crop

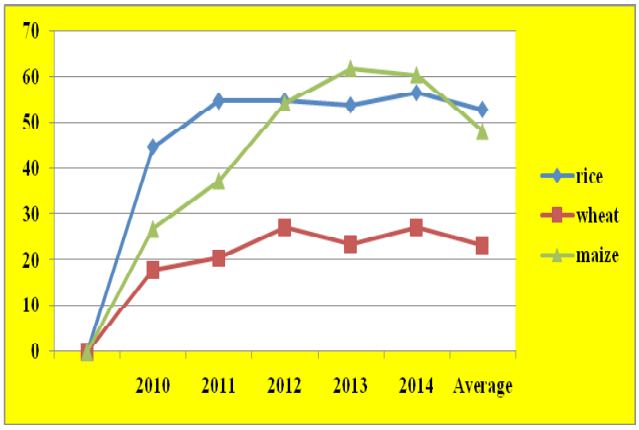

Fig 2: Seed replacement ratio among respondents about selected crops.

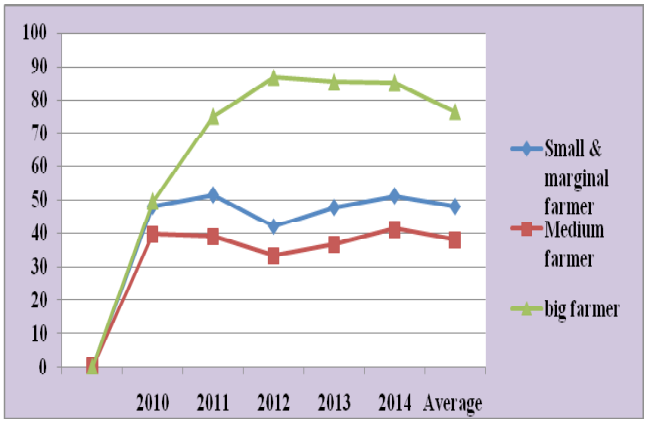

Fig 3: SRR in rice crops among small and marginal, medium and big farmers

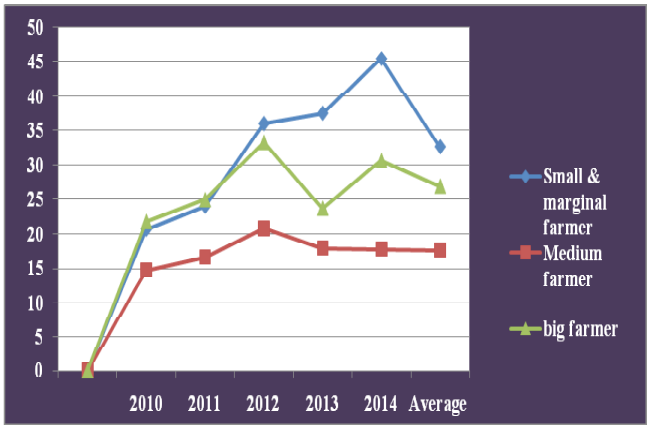

Fig 4: SRR in wheat crops among small and marginal, medium and big farmers

Table 2: Seed replacement ratio during selected years in various crops among different categories of farmers

Crop		Small and marginal farmers			Medium farmers			Big farmers		
	Year	CA	RA	SRR	CA	ReA	SRR	CA	RA	SRR
Rice	2010	30.36	14.57	48.00	100	39.67	39.66	75.70	37.65	49.72
	2011	29.14	14.97	51.39	112.14	43.72	38.98	90.68	68.01	75.0
	2012	39.67	16.59	41.89	104.45	34.81	33.33	85.42	74.08	86.72
	2013	34.81	16.59	47.66	124.69	45.74	36.69	74.08	63.15	85.24
	2014	57.08	29.14	51.09	148.17	61.13	41.26	101.61	76.11	85.03
	Average	38.21	18.37	47.96	117.89	45.01	37.92	85.49	63.8	76.34
Wheat	2010	11.74	2.42	20.67	27.53	4.04	14.75	12.95	2.83	21.85
	2011	10.12	2.42	24.00	29.14	4.85	16.67	14.57	3.64	25.00
	2012	10.12	3.64	36.00	29.14	6.07	20.83	14.57	4.85	33.33
	2013	12.95	4.85	37.5	36.03	6.47	17.99	23.88	5.66	23.76
	2014	13.36	6.07	45.45	36.43	6.47	17.80	25.10	7.69	30.69
	Average	11.65	3.88	32.64	31.65	5.58	17.68	18.21	4.93	26.96
Maize	2010	4.85	2.02	41.67	7.28	1.61	22.22	14.97	3.64	24.32
	2011	4.85	2.02	41.67	8.09	3.23	40.00	17.40	6.07	34.83
	2012	7.69	2.83	36.86	10.52	4.04	38.46	23.48	15.78	67.24
	2013	8.90	4.04	45.45	14.57	7.28	50.00	27.53	20.24	73.56
	2014	8.09	3.23	40.00	17.00	8.09	47.62	32.38	23.48	72.5
	Average	6.87	2.82	41.08	11.49	4.85	39.54	23.15	13.84	54.49

CA=Cropped area, RA=Replaced area, SRR= Seed replacement ratio

It is evident from Table 2, Fig. 3, 4 and 5that the SRR among different categories farmers in selected crops during year 2010 to 2014. The average total area, replaced area and seed replacement ratio for rice crops among small and marginal farmers is 38.21 ha, 18.37 ha, 47.96 per cent, medium farmers 117.8 ha, 45 ha, 38 per cent and big farmers 85.49ha, 63.8 ha, 76.34 per cent respectively. Regarding wheat crop among small and marginal farmers is 11.65 ha, 3.88 ha, 32.64 per cent, medium farmers 31.65 ha, 5.58 ha, 17.68 per cent and big farmers 18.21 ha, 4.93 ha, 26.96 per cent respectively. Further findings regarding maize among small and marginal farmers were 6.87 ha, 2.82 ha, 41.08 per cent, medium farmers 11.49 ha, 4.8 ha, 39.54 per cent and big farmers 23.15ha, 13.84 ha, 54.49 per cent respectively. From the above data it was found that average seed replacement ratio was highest in rice (76.34%) followed by maize (54.49%) among big farmers and lowest in wheat crop (32.64%) among small and marginal farmers. Similar results observed by the Tura *et al.* (2010) in their studies.

Table 3 revealed the respondents involvement in seed replacement ratio for selected crops. In rice crop the highest average SRR was 76.34 per cent among big farmers with involvement (24.17%) followed by small and marginal farmers 47.96 per cent with involvement (30.83%) and the lowest by medium farmers 37.92 per cent with involvement (45%). In case of wheat crop the highest average SRR was 32.64 per cent among small and marginal farmers with involvement (5%) followed by big farmers 26.96 per cent with involvement (15%) and lowest by medium farmers SRR 17.68 per cent with involvement (10.00%). Similarly in maize crop the highest average SRR 54.49per cent among big farmers with involvement (17.5%) followed by small and marginal farmers 41.08 per cent with involvement (11.67%) and the lowest by medium farmers 39.54 per cent with involvement (22.5%).The result corroborates the findings of *Verma* and *Sidhu (2009)* which entails that overall value of SRR was found to be 24.05 per cent. The farm category-wise analysis revealed a direct relationship between SRR and farm-size; it was highest for large farmers (31.5%), followed by medium (21.6 %) and small (18%) farmers.

Extent of seed replacement ratio of the tribal farmers: To determine the extent of seed replacement ratio among different categories of respondents in selected crops, Z-test and T-test was applied and results were presented in Table 4, which revealed that in rice crop marginal and small farmers had significantly higher extent of seed replacement ratio as compared to medium farmers because the Z' value was found significant at 0.01 level of probability. Big farmers had significantly higher extent of seed replacement as compared to medium farmers and also marginal and small farmers because the Z' value was found significant. It may be due to big farmers had higher total cropped area, and all improves techniques and other inputs than the other farmers. In case of wheat crop, small and marginal farmers had significantly higher extent of seed replacement ratio as compared to big and medium

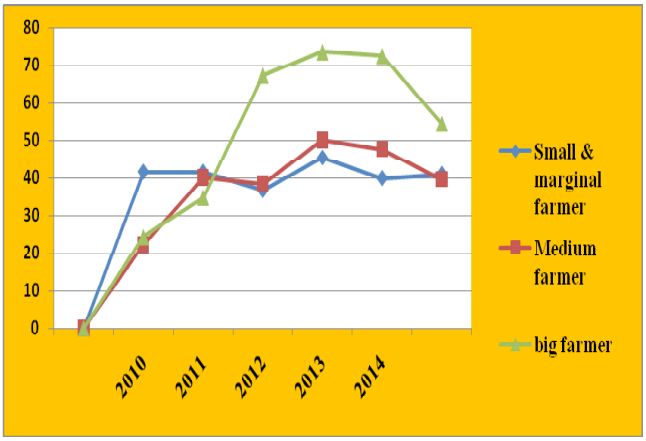

Fig 5: SRR in maize crops among small and marginal, medium and big farmer

Table 3: Seed replacement ratio among different categories of respondents in selected crops

Categories of farmers	No. of respondent		Area (ha.)		SRR (%)
	No.	%	CA	RA	
Rice					
Small & marginal	37	30.83	38.21	18.38	47.96
Medium	54	45.0	117.89	45.02	37.92
Big farmers	29	24.17	85.50	63.80	76.34
Wheat					
Small & marginal	6	5.00	11.65	3.88	32.64
Medium	12	10.0	31.65	5.58	17.68
Big farmers	18	15.0	18.21	4.93	26.96
Maize					
Small & marginal	14	11.67	6.88	2.83	41.08
Medium	27	22.50	11.49	4.85	39.54
Big farmers	21	17.50	23.15	13.84	54.49

CA=Cropped area, RA=Replaced area,
SRR= Seed replacement ratio

Table 4: Test of significance regarding extent of seed replacement ratio in selected crops among different categories of respondents

Particulars	Small & marginal	Medium	Big
Rice			
Frequency	41	50	29
Mean	48.00	37.98	76.34
SD	3.82	3.07	15.59
Z' value			
(small & marginal vs. medium) (medium & big)	3.24**		4.50**
Small marginal vs big farmer)	18.28**		
Wheat			
Frequency	4	12	18
Mean	32.72	17.60	26.92
SD	9.13	1.98	4.35
'T' value			
(small & marginal vs. medium) (medium & big)	5.10**		7.02**
Small marginal & big farmer)	1.82*		
Maize			
Frequency	14	27	21
Mean	41.13	39.66	54.49
SD	3.11	10.90	23.16
'T' value			
(small & marginal vs. medium) (medium & big)	0.56		3.29**
Small marginal & big farmer)	2.17*		

Level of significance 'Z' test 0.01 level of probability (1.96)
Level of significance 'T' test 0.05, 0.01
level of probability and $n_{1+}n_2$-2 (d.f.)

farmers because the 'T' value was found significant and big farmers had significantly higher extent of seed replacement when compared to medium farmers.

While in maize crop big farmers had significantly higher extent of seed replacement ratio as compared to small and marginal farmers and medium farmers because the 'T' value was found significant. And small and marginal farmers had significantly higher extent of seed replacement when compared to big and medium farmers.

Correlation and multiple regression analysis of independent variables with seed replacement ratio of major crops: Correlation and multiple regression analysis was workout to determine the relationship among the variables and to find out the contribution of various independent variables in extent of seed

Table 6: Coefficient of correlation and multiple regression analysis independent variables with the dependent variable seed replacement ratio of rice crops

Variables	Coefficient of correlation	Regression coefficient	
	'r' value	'b' value	't' value
Education	0.141^{NS}	0.424^{NS}	1.134
Family size	0.109^{NS}	-0.170^{NS}	-0.185
Extension participation	-0.055^{NS}	-0.678^{NS}	-0.523
Occupation	0.055^{NS}	0.119^{NS}	0.063
Credit acquisition	0.169*	4.330^{NS}	1.475
Land holding	0.086^{NS}	0.327^{NS}	1.037
Farming experience	0.047^{NS}	-0.22^{NS}	-0.973
Irrigation facility	0.029^{NS}	-0.004^{NS}	-0.001
Source of information	0.194*	2.191**	2.964
Cosmopoliteness	0.195*	2.174^{NS}	1.022
Gender participation	0.123^{NS}	0.139^{NS}	0.515
Availability of seed	0.089^{NS}	1.231^{NS}	0.253
Sources of seed	0.228**	8.356**	2.731
Annual income	0.583**	9.033**	5.367

** Significant at 0.01 level of probability *Significant at 0.05 level of probability NS = Non significant
R^2 = 0.689545 F value of R = 11.58136

replacement ratio of major crops which are presented in Table 5. It is evident from Table 6 that out of 14 independent variables, only 5 variables i.e. credit acquisition, source of information, cosmopoliteness, sources of seed, and annual income were found positive and significantly correlated with extent of seed replacement ratio of the respondents, out of these variables only sources of seed and annual income were found correlated at 0.01 level of probability and other those variables were found significant at 0.05 level of probability. The remaining 9 variables were not indicated significant relationship with seed replacement ratio.

Table 6 also depicted the multiple regressions analysis out of 14 variables, only 3 variables i.e. sources of information, sources of seed and annual income had positive and significant contribution in the extent seed replacement ratio of among the respondents, remaining 11 variables i.e. education, social participation, extension participation, family size, occupation, land holding, farming experience, irrigation facility, cosmopoliteness, gender participation, credit acquisition did not indicate any significant contribution in seed replacement ratio of the farmers. However, all the 14 variables fitted in the model show 68.9 per cent contribution in the SRR among

the respondents. Therefore, it can be concluded that, for increasing the seed replacement ratio among the respondents, focus should be given to increase the annual income by providing various opportunities, and information should be provided at proper time with assured availability of seeds in village.

CONCLUSION

In light from the above findings it can be concluded that the seed replacement ratio of the respondents from year 2010 to 2014in the rice crop was 52.80 per cent, wheat 23.14 per cent and in the maize 48.16 per cent respectively. On the basis of correlation coefficient and multiple regression analysis, it should be concluded that for increasing the SRR among the respondents, need to increase their annual income with provision appropriate opportunities, availability of good quality of seeds nearby their residence as well as information should be provided regularly and at proper time. For uplifting of seed replacement ratio opportunities and facilities should be provided according to their land holding categories because the SRR was found differ in different categories. There is need for special policy from the central and state government to create community seed system across the country to enhance seed replacement ratio through quality seed availability in the cluster approach and study should be conducted among the different categories of the farmers to know their level of knowledge and existing practices of the seed replacement.

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