

Extent of Adoption of Hybrid Rice and Factors Affecting its Adoption: A Micro Study of Marginal and Small Farmers

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Abstract

The study was conducted on fifty farmers comprising 33 marginal and 17 small farmers located in five villages of Kanke block of Ranchi. The study revealed that adoption level of hybrid rice was nearly 98 per cent on the sample farmers. However, farmers of both groups were very inclined in adoption of hybrid rice on their farms. The reason was mainly due to high yielding capacity of hybrid rice in respect to local varieties and even also improved varieties of rice. The study further revealed that area of hybrid rice on the sample farmers was positively associated with size of operational holding and fund available with the farmers for meeting the expenditure involved in adoption of hybrid rice on the farms.

Keyword: Marginal and small farmers, hybrid rice.

Rice is the most staple food crop for majority of the population of the country. The slogan "Rice is life" is most appropriate for India as this crop plays a vital role in our National Food Security and is a means of livelihood for millions of rural household. India has the largest acreage under rice (44.6 million hectare) with a production of about 90.0 million tones. The high yielding varieties programme was launched in the year 1966-67 with a view to achieving self sufficiently in food production. During 1950-51 to 2001-02, the area under rice has increased by one and half times (31.00 million to 44.6 million hectare), productivity by three times (668 Kg/ hectare to 2086 Kg/ hectare) and production by four and half times (20.58 million tons to 93.08 million tons). This transformation has helped the country not only to become self sufficient but also to have better stocks and export surplus. But this is not sufficient for the country as at the current rate of population growth,

the rice production has to be enhanced to about 125 million tones by 2020 (Mishra, 2005). Keeping the need of the country, government of India has taken several steps in improvement of rice varieties potential leading to establishment of All India Coordinated Rice Improvement Project (AICRIP) in 1965, National seed Project (NSP) and other associated agencies So far (between 1994 to 2009), 43 hybrids have officially been released for commercial cultivation in different parts of the country. Out of these, 25 hybrids have been developed by public sector, while remaining are from private sector. In our country, in 2008, hybrid rice occupied 1.40 million hectares of area and contributed additional rice production of about 1.5 to 2.50 million tones. Hybrid rice with a yield average of 15-20 percent more of the check varieties have become popular in the Jharkhand state. Agricultural practices in the state of Jharkhand are mainly dependent on rain

and a single crop in form of rice is being grown. The state represents 12.76 thousand hectares of rice most of which are rain-fed. Average rice productivity of the state is recorded 1682 Kg/hectare which is below average yield of this crop at national level. For a strong agriculture system of the state, it is necessary to improve productivity of this crop. Increase in productivity brings quantitative rise in food production, more income and overall gain full employment among the peasant class. The present study is being undertaken to evaluate the level of adoption of hybrid rice variety of paddy on marginal and small farmers in different villages of Kanke block of Ranchi district. Besides, attempt has also been made to find out the factors affecting level of adoption on farmers.

MATERIALS AND METHODS

Fifty farmers, consisting thirty three marginal farmers and seventeen small farmers, were selected randomly from five selected villages of Kanke block of Ranchi district. The basic information such as age of farmers, education level of farmers, size of land holding, area in different rice varieties, sources of paddy seed agency, source of credit etc. were collected for crop year 2013-14. Tabular as well as functional analysis was used to obtain the objectives of the study. The Cobb-Douglas production function of multiple nature has been used to determine factors affecting level of adoption of hybrid rice on marginal and small farmers. The following form of the Cobb-Douglas production function was used.

$$Y = aX_1^{b_1} X_2^{b_2} X_3^{b_3} X_4^{b_4}$$

Where,

Y= Total hybrid area in hectare

X_1 = Cultivated area in hectare

X_2 = Level of education

X_3 = Age of farmer

X_4 = Credit amount in rupees

b_1, b_2, b_3 , and b_4 are the coefficient of inputs

RESULTS AND DISCUSSION

Educational status

The sample farmers (marginal and small) were classified according to different level of education and are presented in the Table 1.

Table 1: Educational level of sample farmers

Educational status	Marginal farmers	Small farmers	Total
Illiterate	8(24)	2(12)	13(20)
Class 1 st to Class 5 th	0(0)	1(6)	1(2)
Class 6 th to class 8 th	4(12)	3(17)	7(14)
Class 9 th to class 10 th	13(40)	5(29)	18(36)
Class 11 th to class 12 th	6(18)	4(24)	10(20)
Class 13 th and above	2(6)	2(12)	4(8)
	33(100)	17(100)	50(100)

Note: Figure in parenthesis show percentage

It reveals that out of 33 marginal farmers, 8 farmers (24 %) were illiterate having no education. The table further indicates that six per cent marginal farmers were graduates and above, 18 per cent were having intermediate level education and 52 per cent farmers were having middle level and matriculate level qualification. The level of qualification of small farmers indicates that near about 12 per cent farmers were illiterate, while 12 per cent were graduates and above, 24 per cent intermediate and 46 per cent were middle and secondary/matriculation level qualification respectively. The overall out of total selective farmers, 20 per cent were illiterate and 80 per cent literate respectively. It was further observed that among literate group, nearly 36 per cent farmers were having secondary level qualification followed by intermediate level (20 %), middle level (16%) and graduate and above level (8%) respectively.

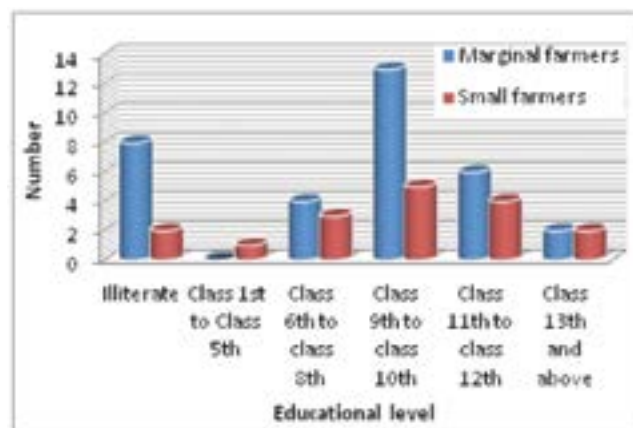


Fig. 1: Educational level of the respondents

Age structure of sample farmers

The heads of the family of sample farmers were classified according to age group on the farms and

is exhibited in Table 2. Out of marginal farmers, near about 60 per cent heads of the family were under age group of 31-50 years, 27 % in age group of 51 and above, 6 per cent between 21-30 year and rest 9 per cent below 20 years age respectively. Similarly nearly 53 per cent heads of family of small farmers were under of 31-50 years, 35 per cent in age group of 21-30 years and 12 per cent in age group of 51 and above respectively on the farm. The overall age structure data shows that 72 per cent heads of the family of sample farmers were under age group of 21-50 years and 22 per cent under age of more than 50 years.

Table 2: Age of heads sample farmers

Age level	Marginal farmers	Small farmers	Total
Up to 20 years	3(9)	0(0)	3(6)
21-30 years	2(6)	6(35)	8(16)
31-50 years	19(58)	9(53)	28(56)
51 and above	9(27)	2(12)	11(22)
	33 (100)	17(100)	50(100)

Note: Figure in parenthesis show percentage

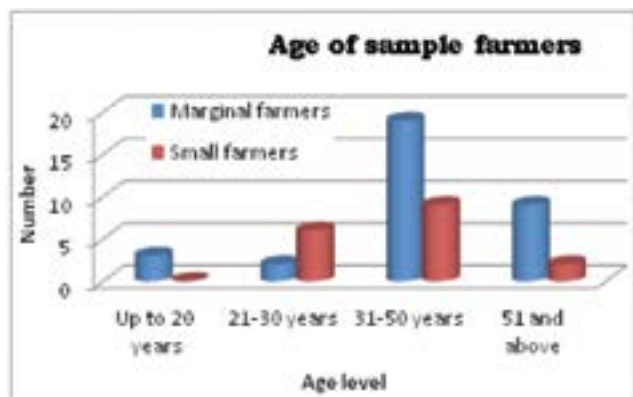


Fig. 2: Age of sampled farmers

Average size of holding

The average size of farm of marginal and small farmers is given in Table 3. The average size of farm of marginal farmers was considerably less as compared to the small farmers in the area. The overall average size of farm of the sample farmers was 0.93 hectare. The proportion of cultivated and uncultivated area was 83 per cent and 17 per cent respectively.

Table 3: Average size of holding of sample farmers (Area in hectare)

Particular	Marginal farmers	Small farmers	Total
Total area	20.50	26.22	46.7
Cultivated area	18.72	22.20	40.92
Average size of holding	0.62	1.54	0.93
Percentage of farmers in each categories	66	34	100

Composition of rice varieties

The composition of improved and hybrid rice varieties on the sample farmers is presented in Table no. 4. It indicates that altogether six different varieties of rice (improved and hybrid) were found on the sample farmers in which five were hybrid rice and one was improved rice variety. The PHB -71 of hybrid rice variety was the most popular among farmers followed by RH -401. The other important varieties were IR -64, Champion and 6444 of hybrid rice on the farmers' field.

Table 4: Status of different varieties of paddy on sample farms (No.)

Name of variety	Marginal farmers	Small farmers	Total
RH -401	14	5	19
F Gold	2	3	5
Champion	11	3	14
PHB -71	17	9	26
6444	7	5	12
IR -64	7	8	15

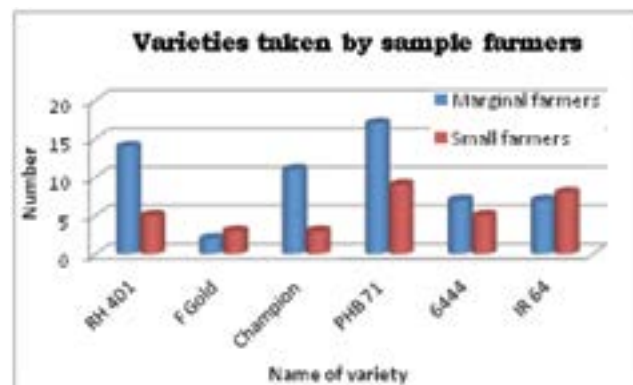


Fig. 3: Varieties grown by the sample farmers

- 1. Diversification of rice variety:** Number of rice variety adopted by the sample farmers on their farms are exhibited in the Table 5, revealed that out of total marginal farmers, twenty two (67%) were included two rice varieties in their cropping pattern and nine (27%) farmers were given choice for one variety. Similarly on the small farmers about ten (59 per cent) farmers were included two rice varieties in their cropping pattern and five (29 per cent) farmers were adopted three rice varieties on the farms. The overall figures shows that 64 per cent farmers were selected two rice varieties for their farms, 20 per cent farmers preferred only one rice variety and sixteen percent selected more than two rice varieties for production.

Table 5: Number of varieties of paddy adopted by sample farms

Variety	Marginal farmers	Small farmers	Total
One	8 (24)	1 (6)	9 (18)
Two	23 (70)	10 (59)	33 (66)
Three	1 (3)	5 (29)	6 (12)
Four	1 (3)	1 (6)	2 (4)
	33 (100)	17 (100)	50 (100)

Note: Figure in parenthesis show percentage

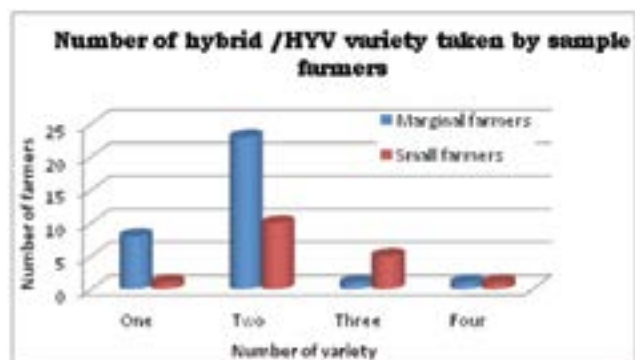


Fig. 4: Hybrid/ HYV varieties grown by the respondents

Source of agency of HYV/ hybrid rice

The source of agency for high yielding variety and hybrid rice variety to sample farmers was collected and is presented in Table 6. It is very clear that seed dealers were the main source of information regarding seed for both categories of farmers. All farmers got the information about new varieties of

rice suitable for the area. Although some farmers from both groups expressed that they were also consulted to Department of Agriculture, Jharkhand government for potential varieties of rice.

Table 6: Source of information for improved seed (No.)

Source of information	Marginal farmers	Small farmers	Total
Department of Agriculture, Jharkhand	6	8	14
Dealer of seeds	33	17	50

The overall it indicates that there exists a large gap between private and government agencies for dissemination of information regarding seed technology for the farmers in the state.

Area under hybrid rice

The area under hybrid rice, improved rice variety and other local variety on marginal and small farmers is presented in Table 7, revealed that 85-90 per cent rice area under hybrid rice varieties on these farms. Among these different hybrid rice varieties, RH -401 and P.H.B. -71 were the most popular varieties contributing about 52% to cultivated rice area. The next important variety of hybrid rice was 6444 shared nearly 16 per cent in rice area. The improved rice varieties (IR -64) covered about 16 per cent area on these farms. The analysis further revealed that PHB 71 was first choice of marginal farmers followed by RH 401 and 6444 rice varieties. Similarly for small farmers RH-401 was first choice followed by PHB -71 and RH -64 varieties of rice. The local variety covered nearly about two per cent rice area.

Table 7: Area under different varieties of paddy (No.)

Name of variety	Marginal farmers	Small farmers	Total
RH -401	4.40(23.53)	6.70(30.20)	11.10(27.15)
F Gold	1.24(6.60)	2.23(10.05)	3.47(8.50)
Champion	2.18(11.67)	1.90(8.56)	4.08(10.00)
P.H.B.- 71	5.64(30.16)	4.42(19.93)	10.02(25.50)
6444	3.48(18.62)	2.90(13.10)	6.38(15.60)
IR -64	1.24(6.60)	3.80(17.13)	5.04(12.33)
Others	0.52(2.78)	0.23(1.03)	0.75(1.83)
	18.70(100)	22.18(100)	40.88(100)

Note: Figure in parenthesis show percentage

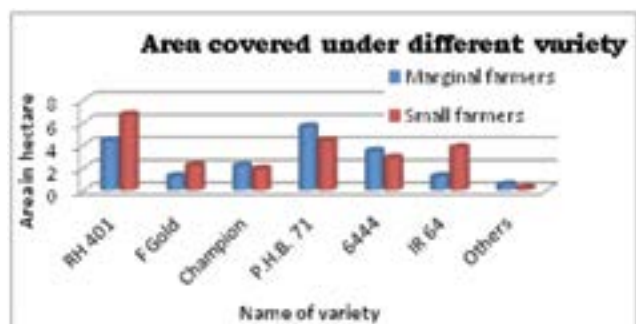


Fig. 5: Area covered under different varieties

Factors affecting the adoption of HYV / Hybrid variety of paddy

To study the relative influence of each of the four explanatory variables which are likely to have affected the level of adoption of high yielding variety (HYV) / Hybrid variety of paddy by the farmers, non linear regression (Cobb- Douglas Model) was carried out. The adoption variable (Y) was calculated by dividing area under HYV and Hybrid paddy with total paddy area on the farms multiple by 100.

Four variables namely operational land holding, education level, age of the farmers and fund available with farmers as explanatory variables determined the level of adoption of HYV and Hybrid rice on the farm. The results of the estimates of the regression coefficient of these variables along with other statistics for the non-linear regression model are presented in Table 8.

Table 8: Adoption of HYV/ Hybrid rice by sample farmers

Variables		Coefficients	Standard error
Operational area	(X ₁)	0.546***	0.189
Education	(X ₂)	0.171	0.325
Age of farmer	(X ₃)	0.036	0.325
Fund amount	(X ₄)	1.040***	0.238
Coefficient of multiple determination (R ²)			0.75

***Significant at 1 per cent level

In Table 8, the size of the coefficient of multiple determination (R²) shows that the degree of success in estimating the adoption relationship and selection of the explanatory variables. It shows the percentage of variation in adoption, which were explained by the included variables. It can be seen from the Table

8 that R² was estimated as 75 per cent, indicating that seventy five per cent variation in adoption of HYV and Hybrid rice varieties on the sample farmers were mainly due to selected explanatory variables (operational holding, education, age and fund) in the estimated equation.

The coefficient of land holding and fund available with farmers for investment on paddy cultivation were found significantly different from zero at one per cent level. These coefficients also bear positive sign. The positive sign of these coefficients explains that any increase in area under cultivation and fund available with farmers would result into an increased allocation of land to the HYV/ Hybrid rice varieties. The high level of significance of these coefficients indicates the sole determinant of adoption of HYV/ hybrid rice varieties are the operational size of farm holding and fund available with farmers for investment on paddy cultivation on the sample farmers.

CONCLUSION

It is concluded that majority of the farmers were under age group of 21-50 (66 %) and only 22 per cent were more than 50 years. The percentages of literate farmers were considerably high in both groups. The diversification on the selection of hybrid rice varieties was also significantly high in the study area. Nearly five different hybrid rice varieties were selected by the farmers for their cropping pattern. It was further observed that private seed agency is the main source of information of hybrid rice variety. The level of adoption was nearly 86 per cent in hybrid rice and twelve per cent in improved rice variety in the sample farms. The most important factors for adoption of hybrid / HYV rice variety were found on the farm i.e. size of farm holding and fund available with the farmers for meeting expenditure of hybrid rice cultivation.

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