RESEARCH ARTICLE

ECONOMIC ANALYSIS OF POST HARVEST LOSSES AND THE DETERMINANTS OF POST HARVEST LOSSES OF RICE AND WHEAT AT FARM LEVEL

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Abstract: The present Study was an effort to portray the extent of post harvest losses in rice and wheat in physical as well as in monetary terms and to examine the determinants of these losses so that possible measures could be taken to check these losses. Multi-stage sampling design was adopted for the study. Chhattisgarh state consists of three zones i.e. Northern hills, Chhattisgarh Plain and Bastar Plateau. As Chhattisgarh plain zone has about 73.45% of total area of Wheat and 69.92% area of paddy in Chhattisgarh, thus, Chhattisgarh plain zone has been selected purposely for the present study. The study was carried out in Rajnandgaon district. Pre tested schedule was used to collect data from 100 paddy growing farmers and 100 wheat growing farmers from 10 villages of Rajnandgaon and Dongargarh block (5 blocks each). Post harvest losses in paddy were estimated to be 4.63 kg/q and 180.48 kg/ ha whereas losses in wheat was found 3.12 kg/q and 50.73 kg/ha at farm level. Value to total post harvest losses in paddy and wheat was found 2454.59 and 735.60 Rs per hectare respectively. Losses in rupees per quintal were also worked out which was found 62.97 rupees per quintal in paddy and 45.24 rupees per quintal in wheat. Area, education, age, storage facilities and timely labour availability were the determinants of post harvest losses in paddy found negatively significant. In case of determinants of post harvest losses of wheat, crop yield was found positively significant while timely labour availability was found negatively significant.

Keywords: Post harvest losses, Paddy, Wheat, Determinants of post harvest losses

INTRODUCTION

Cereals such as rice are wheat are members of the grass family and they are particularly important to humans because of their role as staple food crops in many areas of the world. Their importance is related to a number of features. They are relatively easy to grow, store and transport and they have a high nutritive value. Paddy and Wheat are the major cereal crops which contribute highest in total cereal production in India. India has the largest area under paddy in the world and ranks second in the production after China. Country has also emerged as a major rice consumer. Wheat is the first important and strategic cereal crop for the majority of world's populations. It is the most important staple food of about two billion people (36% of the world population). Approximately one-sixth of the total arable land in the world is cultivated with wheat. Whereas paddy is mainly cultivated in Asia, wheat is grown in all the continents of the world. . India is the second largest producer of wheat after China.

Agricultural commodities produced on the farmers' field have to undergo a series of operations such as harvesting, threshing, winnowing, bagging, transportation, storage, processing and exchange before they reach the consumer and there are appreciable losses in crop output at all these stages. Post harvest losses in cereals may arise due to poor handling, over production then storage capacity, or poor management against stored grain pests. Most of the agricultural produce is wasted due to poor handling and management of cereals. Losses are not only the clear waste of food, but they also represent a similar waste of human effort, farm inputs, livelihoods, investments and scarce resources such as water. Looking at the food requirement of the population and economical condition of Indian farmers; it is important to reduce such losses. And, mere attaining the level of food requirement of population is not sufficient because India is already importing pulses and oilseeds from other countries, so it is desirable to produce that much quantity of cereals which can be exported after meeting the requirement of the domestic population. Reduction in post harvest losses of cereals is necessary to increase farmers income as the considerable amount of output is wasted in the form of these losses. This will compensate with the import of other crops and provide strength to Indian economy. So the present study deals with the post harvest losses and the determinants causing these losses in the study area.

Objectives:

1. To quantify the extent of post harvest losses at different stages in rice and wheat at farm level.
2. To determine the monetary value of post harvest losses of rice and wheat at farm level.
3. To study the determinants of post harvest losses in rice and wheat at farm level.

MATERIALS AND METHODS

Multi-stage sampling design was adopted for the present study. Chhattisgarh state consists of three zones i.e. Northern hills, Chhattisgarh Plain and Bastar Plateau. As Chhattisgarh plain zone has about 73.45% of total area of Wheat and 69.92% area of paddy in Chhattisgarh, thus, Chhattisgarh plain zone

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has been selected purposely for the present study. The study was carried out in Rajnandgaon district. Pre tested schedule was used to collect data from 100 paddy growing farmers and 100 wheat growing farmers from 10 villages of Rajnandgaon and Dongargarh block. Five villages from each of the 2 blocks have been selected randomly for the study. Bharregaon, Khuteri, Dumardeeh kala, Khaitjhiti and Dumardeeh khurd were the villages selected from Rajnandgaon block and Kusmi, Manitarai, Kasari, Ruatala and Siltikri were the villages selected from Dongargarh block. In all, 10 numbers of villages from these 2 blocks were selected for present study.

Monetary value of post harvest losses:

Monetary value of post harvest losses has been calculated based on the minimum support price of 2014-15.

Analytical tools:

Determinants of post harvest losses at farm level:

Functional analysis was used to examine the determinants of post-harvest losses at farm level. The following multiple linear regression model was specified in the present study:

$$Y = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + \ldots\ldots\ldots\ldots\ldots\ldots + a_{10}X_{10} + e$$

Were,

Y = Post-harvest losses of rice/wheat at farm level in quintals per ha.

X_1 = Area under paddy/wheat (ha)

X_2 = Area under irrigation (ha)

X_3 = Total production of paddy/wheat in quintals per ha.

X_4 = Education of the respondents in years.

X_5 = Age of the respondent.

X_6 = Transportation facility dummy which takes the value '1' if transport facility was adequate and value '0' otherwise.

X_7 = Storage facility dummy which takes the value '1' if the storage facility was adequate and value '0' otherwise.

X_8 = Threshing machine availability dummy which takes the value '1' if availability of threshing machine during harvesting was adequate, '0', otherwise.

X_9= Weather dummy which takes the value '1' if the weather during harvesting was favorable and value '0', otherwise.

X_{10} = Timely labor availability dummy which takes value '1' if labour was available timely and value '0', otherwise.

e = Random-error

RESULTS AND DISCUSSION

Post harvest losses in paddy:

The estimated post-harvest losses per quintal of food paddy produced or handled at different stages are presented in Table 1. These were estimated to be 4.63 kg/q in paddy at the farm level. Losses in kg/hectare were also work out which was found to be 180.48 kg per hectare. Losses were found maximum in drying of grains (24.19 percent) followed by storage being 21.38 percent to the total losses in paddy. Weight loss of grains in the process of drying due to reduction in the moisture content was the main reason behind the maximum share of losses in drying however it does not deteriorate the quality of grains and promote storability for a long period of time. Total post harvest losses at farms level was found maximum in large farms being 5.30 kg/quintal and shows an increasing trend from marginal to large farms.

Table 1. Estimated post harvest losses at different stages in paddy crop

S.NO.	STAGE	MARGINAL		SMALL		MEDIUM		LARGE		OVERALL	
		Losses (Kg. per hectare)	Losses (kg per quintal)	Losses (Kg. per hectare)	Losses (kg per quintal)	Losses (Kg. per hectare)	Losses (kg per quintal)	Losses (Kg. per hectare)	Losses (kg per quintal)	Losses (Kg. per hectare)	Losses (kg per quintal)
1	**Harvesting**	30.80 (19.23)	0.85 (19.23)	35.06 (19.26)	0.89 (19.26)	39.87 (19.63)	0.95 (19.63)	48.84 (20.30)	1.08 (20.30)	35.08 (19.44)	0.9 (19.44)
2	**Transportation**	10.51 (6.56)	0.29 (6.56)	12.21 (6.71)	0.31 (6.71)	15.11 (7.44)	0.36 (7.44)	13.63 (5.67)	0.3 (5.67)	12.08 (6.70)	0.31 (6.70)
3	**Threshing**	34.06 (21.27)	0.94 (21.27)	37.81 (20.78)	0.96 (20.78)	41.13 (20.25)	0.98 (20.25)	53.61 (22.29)	1.18 (22.29)	37.81 (20.95)	0.97 (20.95)
4	**winnowing**	10.87 (6.79)	0.3 (6.79)	13.00 (7.14)	0.33 (7.14)	17.63 (8.64)	0.42 (8.64)	22.26 (9.25)	0.49 (9.25)	13.25 (7.34)	0.34 (7.34)
5	**Drying**	39.13 (24.43)	1.08 (24.43)	45.30 (24.89)	1.15 (24.89)	46.59 (22.93)	1.11 (22.93)	52.70 (21.91)	1.16 (21.91)	43.66 (24.19)	1.12 (24.19)

6	**Storage**	34.78 (21.72)	0.96 (21.72)	38.60 (21.21)	0.98 (21.21)	42.81 (21.07)	1.02 (21.07)	49.52 (20.59)	1.09 (20.59)	38.59 (21.38)	0.99 (21.38)
	Total	160.14 (100)	4.42 (100)	181.98 (100)	4.62 (100)	203.13 (100)	4.84 (100)	240.55 (100)	5.30 (100)	180.48 (100)	4.63 (100)

Note: Figures in the parenthesis indicate percentage to the total post harvest losses in their respective category.

Post harvest losses in wheat

The estimated post-harvest losses per quintal of wheat produced or handled at different stages are presented in Table 2. These were estimated to be 3.12 kg/q in wheat at the farm level. Losses in kg/hectare were also work out which was found to be 50.73 kg per hectare. Losses were found maximum in drying of grains (25.64 percent) followed by storage being 22.12 percent to the total losses in wheat. Total post harvest losses at farms level was found maximum in large farms being 3.39 kg/quintal and shows an increasing trend from marginal to large farms. Reduction in the moisture content in the process of drying increases the total losses during drying. Drying, Storage and threshing of grains together contribute more than 65 percent of post harvest losses in wheat which could be minimized by the efficient use of technology and by construction of scientific storage structures.

Table 2. Estimated post harvest losses at different stages in wheat.

S.NO.	STAGE	MARGINAL		SMALL		MEDIUM		LARGE		OVERALL	
		Losses (Kg. per hectare)	Losses (Kg. per quintal)	Losses (Kg. per hectare)	Losses (Kg. per quintal)	Losses (Kg. per hectare)	Losses (Kg. per quintal)	Losses (Kg. per hectare)	Losses (Kg. per quintal)	Losses (Kg. per hectare)	Losses (Kg. per quintal)
1	**Harvesting**	6.09 (15.69)	0.43 (15.69)	7.63 (15.91)	0.49 (15.91)	9.06 (17.03)	0.54 (17.03)	11.30 (18.58)	0.63 (18.58)	8.62 (16.99)	0.53 (16.99)
2	**Transportation**	3.68 (9.49)	0.26 (9.49)	4.20 (8.77)	0.27 (8.77)	3.86 (7.26)	0.23 (7.26)	4.48 (7.37)	0.25 (7.37)	4.07 (8.01)	0.25 (8.01)
3	**Threshing**	7.75 (19.71)	0.54 (19.71)	10.12 (21.10)	0.65 (21.10)	11.24 (21.14)	0.67 (21.14)	13.63 (22.42)	0.76 (22.42)	10.73 (21.15)	0.66 (21.15)
4	**winnowing**	2.41 (6.20)	0.17 (6.20)	3.27 (6.82)	0.21 (6.82)	3.19 (5.99)	0.19 (5.99)	3.41 (5.60)	0.19 (5.60)	3.09 (6.09)	0.19 (6.09)
5	**Drying**	11.05 (28.47)	0.78 (28.47)	11.99 (25.00)	0.77 (25.00)	13.59 (25.55)	0.81 (25.55)	15.24 (25.07)	0.85 (25.07)	13.01 (25.64)	0.8 (25.64)
6	**Storage**	7.94 (20.44)	0.56 (20.44)	10.74 (22.40)	0.69 (22.40)	12.25 (23.03)	0.73 (23.03)	12.73 (20.94)	0.71 (20.94)	11.22 (22.12)	0.69 (22.12)
	Total	38.83 (100)	2.74 (100)	47.96 (100)	3.08 (100)	53.19 (100)	3.17 (100)	60.78 (100)	3.39 (100)	50.73 (100)	3.12 (100)

Note: Figures in the parenthesis indicate percentage to the total post harvest losses in their respective category.

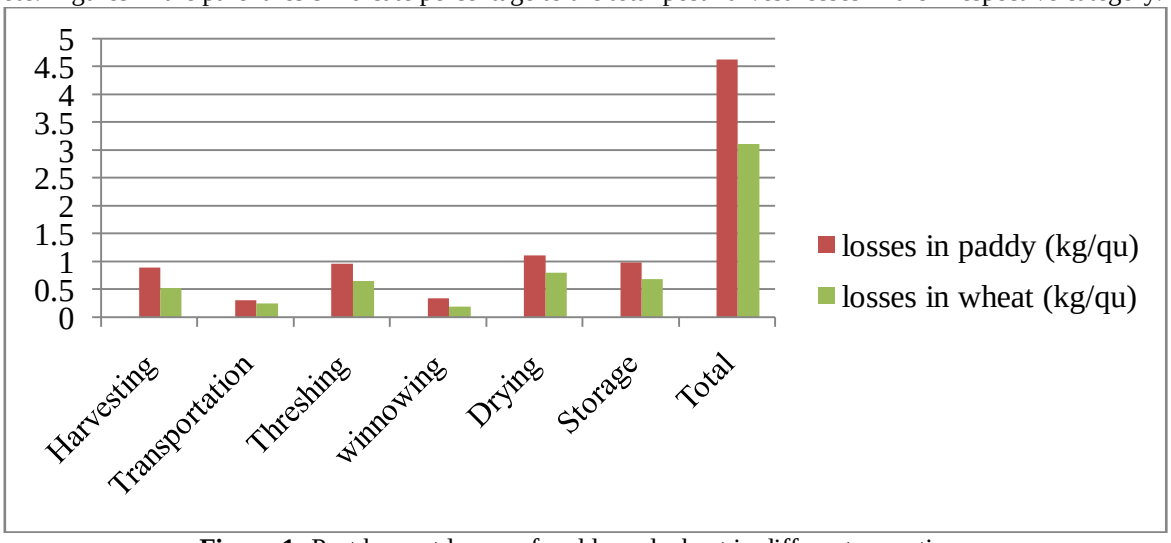

Figure 1: Post harvest losses of paddy and wheat in different operations

Monetary value of total post harvest losses of paddy and wheat at farm level:

Value to total post harvest losses in paddy and wheat was found 2454.59 and 735.60 Rs per hectare respectively (Table no. 3). Losses in rupees per quintal were also worked out which was found 62.97 rupees per quintal in paddy and 45.24 rupees per quintal in wheat. Total value of losses (rupees per hectare) in paddy was found more than thrice then that of wheat. It is due to the fact that paddy is the main crop of Chhattisgarh as well as the study area and its productivity is very high as compared to wheat. Hence the differences in magnitude of value of total losses in paddy and wheat was found more in case of rupees per hectare then that of rupees per quintal.

Table 3. Value of post harvest losses in paddy and wheat at farm level

Operations	Post harvest losses in Paddy		Post harvest losses in wheat	
	losses(Rs/q)	Losses (Rs/ha)	losses(Rs/q)	Losses (Rs/ha)
Harvesting	12.24	477.12	7.69	124.96
Transportation	4.22	164.34	3.63	58.94
Threshing	13.19	514.22	9.57	155.61
winnowing	4.62	180.24	2.76	44.80
Drying	15.23	593.74	11.60	188.62
Storage	13.46	524.83	10.01	162.68
Total	62.97	2454.49	45.24	735.60

Determinants of post harvest losses of paddy and wheat at farms level

Determinants of post harvest losses in paddy and wheat at farms level has been presented in table 4. It indicates that area, education, age, storage facilities and timely labour availability was found negatively significant and all other variables were found non-significant among the determinants of post harvest losses of paddy. So it can be suggested that by improvement in Storage facilities and by making labour available on required time; these losses can be minimized to a large extent in paddy. In case of determinants of post harvest losses of wheat, crop yield was found positively significant while timely labour availability was found negatively significant and all the other variables were found non-significant. So it can be suggested that if labour will be made available on the required time, then it may reduce post harvest losses in wheat.

Table 4. Determinants of post-harvest losses in paddy and wheat at farm level

S. No.	Explanatory variables	Coefficients/Values of paddy	Coefficients/Values of wheat
1	Intercept	6.1789	1.4337**
2	Area (X_1)	-0.2116**	0.1294
3	Irrigated area (X_2)	0.0484	-0.0242
4	Yield (X_3)	0.0024	0.1411**
5	Education (X_4)	-0.1401*	-0.0458

6	Age (X_5)	-0.0130**	-0.0063
7	Transportation facility dummy (X_6)	-0.0660	-0.0239
8	Storage facility dummy (X_7)	-0.4015*	-0.0764
9	Threshing machine availability dummy (X_8)	-0.1190	-0.0808
10	Weather dummy (X_9)	-0.1240	-0.0573
11	Timely labor availability dummy (X_{10})	-0.5948**	-0.2330*
12	R^2	0.61	0.70
13	F - Value	14.15	5.04
14	$\bar{R}^2$	0.57	0.56

* Level of significance p<0.05
** Level of significance p<0.01

CONCLUSION

Paddy and Wheat are the major cereal crops which contribute highest in total cereal production in India. Minimization of post harvest losses can be a significant factor towards the achievement of the goals of government of India for doubling farmer's income. As the study portrays, the values of losses of paddy and wheat is 2454.49 and 735.60 rupees per hectare respectively. Magnitude of loss will be very high as the cultivation area for these crops is very large in India. These losses not only reduce the farmer's income but also affect the food safety and value of foreign reserves which could be gained through the export of these cereals. Storage facility and timely labour availability are the main determinants which are found significant in post harvest losses of paddy and wheat. If the policies to overcome storage and labour problems will be made then losses of the farmers can be saved with the achievement of food safety of the nation.

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