A Study on Logistics Management in Agricultural Products of Rajasthan

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Abstract

Logistics management for agriculture production priorities across the globe have evolved considerably over the last four decades, to being more precise for post-harvest losses of foodgrains in logistics. The need for precise 'Estimation of Post-Harvest Losses of Foodgrains' was being felt in the context of planning for the agricultural development, proper distribution of government programmes, pricing policies for agricultural commodities and to increase the availability of food. For accumulating the figure of foodgrains losses in different stages of logistics, for knowing the losses data a survey conducted by the researcher. This study was conducted in Rajasthan which have high yield production of some crops in India, but due to lack of proper logistics system farmers of this area suffer heavy losses and difficulty in procuring their agriculture production. Estimation of Logistics Losses' of some of the important cereals, namely, Oil Seeds, Wheat, Jowar, Bajra, Jo and Maize.

Post-harvest losses of agriculture production have been estimated at different stages from production to storage such as harvesting, threshing, winnowing, bagging, transportation, storage and processing before they reach the end consumer among major food grains produce in Rajasthan. The data from 2012-13 to 2017-18 on area, production and productivity of two major food grains have been observed under researcher analysis. The post-harvest losses have been estimated by using the stratified sampling, data collected from farmers, wholesalers, processors and retailers in each crop in Rajasthan for the year 2017-18. Tabular analysis has been used to calculate approximately the post-harvest losses at different stages, and operative analysis has been used to assess the influence of socio-economic factors on post-harvest losses. Findings of this study reflects that wheat production has been increased due to increased wheat productivity in India. The post-harvest losses at the farm level have been calculated and estimated to be 3.83 kg/ q for Oil seeds and 3.27 kg/q for wheat. The losses quantity have been highest while keeping at storage in both the crops. The factors that influence the post-harvest losses significantly at the various level have been identified and at the end some policy implications have been suggested to reduce above mentioned losses of Production.

Key Words: Agriculture, Logistics, Food grains, Post-harvest losses and Rajasthan

Introduction

Produced Food grains have to undergo a series of operations before final consumption such as harvesting, threshing, winnowing, bagging, transportation, storage and processing then they reach the end consumer, and there are appreciable losses in crop output at all the above mention stages. A recent estimate by the Ministry of Food and Civil provides, GOI, puts the whole preventable post-harvest losses of food grains at ten percent of the total production or about twenty Mt which

is equal to the total food grains produced in country like Australia annually. In a country where 20 per cent of the population is undernourished, post-harvest losses of 20 Mt annually is a substantial avoidable waste. According to a World Bank study, post-harvest losses of food grains in India are 8-10% of the total production in logistics from farm to market level and 4-5 per cent at market and distribution levels. For the system as a whole, such losses are figured out to be 11-15 Mt of food grains annually, including 3-4 Mt of wheat and 5-7 million tonnnes of oil seeds which are the major crops taken under this study. With an average quantity per capita consumption is about 15 kg of food grains per month, these losses would be sufficient to feed about 70-100 million people, i.e. about 1/3rd of India's poor or the entire population of the states of the Bihar and Haryana together for about a year. Thus, the post-harvest losses have impact at each level that are micro and macro levels of the economy.

Profile of the Study Area:

This research is conducted in the state of Rajasthan area taken under this study are ALWAR, Bharatpur and Jaipur three cities of Rajasthan, for the same a summary table presentation of Rajasthan Agri Statistics.

Table No. 1.1 Summary of state agri statistics

S.No.	Components	Growth/ratio
1	Population dependent on agriculture	Two Thirds
2	Agriculture GDP at current prices	□7.67 lakh crore (US$110 billion) (2016-17 est.)
3	Growth of Agriculture GDP	19.5%
4	Agricultural sectors contribution in GSDP	24.7%
5	Food Grain production (Thousand Tonnes)	11283.4
6	State's contribution to national food grain production	5.17%
7	State's rank in food grains production	7th
8	Yield Kg/Hectare (of total food grains)	890
9	Total agricultural area irrigated	35%
10	Area under wells and tube well irrigation	60-70%
11	Rice Production (Thousand Tonnes)	228.3
12	Wheat Production (Thousand Tonnes)	6326.5
13	Oil Seeds production (Thousand Tonnes)	4469.2
14	Sugarcane production	135.4

Source: PHD RESEARCH BUREAU, Compiled from RBI and Economic Review of Rajasthan 2016-17

The study on post-harvest losses in food grains at totally different stages of their handling would facilitate assess the extent and magnitude of losses and determine the factors liable for such losses. This successively would facilitate develop correct measures to correct measures to cut back these losses. Evolving correct policies for minimizing post-harvest losses would crucially rely upon reliable and objective estimates of such losses at various different stages. This information

is important for scientists, technologists, policymakers, administrators and industrialists.

The specific objectives of the present study are:

I. To measure the extent of post-harvest losses in food grains, and

II. To study the factors affecting post-harvest losses.

Review of Literature

Review of post-harvest loss on food grains

1. The research reported the estimates of post-harvest losses of rice and wheat in India at different stages of post-harvest operations and the post-harvest losses were estimated using the survey data collected from 100 farmers, 20 wholesalers, 20 processors and 20 retailers in each crop in Karnataka for the year 2003-04. Tabular analysis was used to estimate the post-harvest losses at different stages, and functional analysis was used to assess the influence of socio-economic factors on post-harvest losses at the farm level. The post-harvest losses at the farm level were estimated to be 3.82 kg/q for rice and 3.28 kg/q for wheat. The losses are highest during storage in both the crops. The factors that influence the post-harvest losses considerably at the farm level known and some policy implications were highlighted.

2. The research found that the post-harvest losses at national level from producer to retailer were 10.74 percent for Aman 11.71 percent for Boro, and 11.59 percent for Aus rice. The estimated total post-harvest losses of rice at farm level in Bangladesh were 9.16 percent, 10 percent and 10.17 percent for Aman, Boro and Aus respectively. Total post-harvest losses of rice at farm level are 86.28 – 87.77 percent

of the total post-harvest losses and the storage loss is 33.92 – 40.99 percent of total losses at farm level. The storage loss of rice is (3.45 – 4.14 percent) and it is followed by drying (2.19-2.37 percent), harvesting (1.60-1.91 percent), threshing (1.10-1.79 percent) and transportation (0.87-1.13 percent). The estimated total post-harvest losses of rice at processor level in Bangladesh were 1.30%, 30% and 1.13 percent for Aman, Boro and Aus respectively while the estimated total post-harvest losses of rice at wholesale level were 17 percent, 0.18 percent and 0.19 percent for Aman, Boro and Aus respectively and at retail level were 0.27 percent, 0.31 percent and 0.28 percent for Aman, Boro and Aus respectively. Therefore, reducing the post-harvest losses the maximum amount as doable could be important regarding issue in achieving food security of Country. Clearly the estimation of post-harvest grain losses and its management practices and capacities would minimize the magnitude of loss for the action of food security objective.

3. The research is about post-harvest losses in India, the issues of supply chain and challenges to improve the SCM and logistics to reduce the losses. It highlights the food grain production, post-harvest losses, warehousing role of FCI and current status of SCM, warehouse storage and need for improvement. It also suggest the areas for improvement to reduce post-harvest losses. In India, the role of warehouses within the overall logistics chain was forever underplayed. But this construct of integrated logistics chain management should target all elementsviz transportation, warehousing, inventories, information etc. so on to improve the potency of logistics chain that is significant to the economy of the country.

Sampling

A stratified sampling design was adopted for the ultimate selection of foodgrain-growing farmers. The Alwar district (Rajasthan) with an oil seeds production of 234887 per hectare in the state topped the list of oil seeds-growing districts. Hence, this district was selected for choosing oil seeds-growing cultivators in the preliminary stage of sampling. For wheat, kota district with production of 193938 per hectare the district stood first in the state. Hence, it was considered for selecting wheat-growing cultivators in the first stage of sampling. In the second stage, two talukas were chosen from each of the selected districts and then five villages predominantly growing the selected food grains were chosen from each of the selected talukas. Finally, 10 foodgrains-growing farmers in each village were randomly interviewed. In all, 50 cultivators growing oil seeds in Alwar district and 50 cultivators growing wheat in the Kota districts were selected at the rate of 25 farmers from each taluka. From each of the selected districts, 10 wholesalers, 05 processors and 10 retailers dealing in each of these crops were also interviewed for eliciting information on post-harvest losses.

Analytical Techniques

For computing the area growth, production and productivity of selected food grains, compound growth equation of the form Y= abT was estimated. Averages and percentages were accessed for the post-harvest losses. Information regarding post-harvest losses was obtained from the farmers during following operations:

I. Harvesting
II. Threshing

III. Cleaning/Winnowing, and
IV. Drying

The information on following losses was collected from the farmers as well as market intermediaries:

(i) Storage, and
(ii) Transit.

The total post-harvest losses were calculable as a total of all these losses.

Functional analysis was done to examine the factors responsible for post-harvest losses in food grains.

The following multiple linear regression function was specified in the present study:

$Y = a_0 + a_1x_1 + a_2x_2 + a_3x_3 + \ldots\ldots.. + a_6x_6 + e$

Where,

Y=post-harvest losses of oil seeds/wheat at farm level in Quintals per hectare

X_1= storage dummy which takes the value "0" if the storage facility was adequate and value"1" otherwise

X_2=weather dummy which takes the value"0" if the weather during harvesting was favourable and value "1"otherwise

X_3=Transportation dummy which takes the value"0" if transportation facility was adequate and value"1"otherwise

X_4= Threshing machine dummy Which takes the value"0" if availability of threshing machine during harvesting was adequate ,"1", otherwise

X_5= Weather dummy which takes the value "0", if the weather during harvesting was favourable and value "1", otherwise

X_6= Grading dummy which takes the value "0", if grading facility was adequate and value "1".

e= Random error

Growth in Area, Production and Productivity of Oil seeds and Wheat

To examine the temporal production pattern of oil seeds and wheat, the growth analysis was conducted with respect to their area, production and productivity in the study districts, state and country. The area under oil seeds in the Alwar district registered a positive annual growth of 1.59 per cent (Table 1.2) and the production increased at a moderate rate of 0.87 per cent annually. However, the productivity witnessed a mild declining annual growth of -0.81 per cent. Thus, in the study district, increase in oil seeds production was Estimated Post-harvest Losses in Oil seeds and Wheat.

Table 1.2 Growth in area, production and productivity of oil seeds and wheat

S. NO.	Particulars	Oil Seeds			Wheat		
		Alwar District	Rajasthan State	India	Kota District	Rajasthan State	India
1	Area	1.59	1.40	0.62	-0.40	-0.20	1.67
2	Production	0.87	2.88	1.90	0.61	0.83	3.81
3	Productivity	-0.81	1.51	1.27	2.24	2.08	2.11

The survey data revealed that average size of farm holding was 5.00 ha for oil seeds growers, and 6.24 ha for wheat growers. The sample farmers were found growing oil seeds over an area of 2.50 ha and wheat over 2.25 ha. These sample farmers obtained an average yield of 43.96 q/ha of oil seeds and 13.70 q/ ha of wheat. A majority of oil seeds-growers (44.00%) and wheat-growers (52.00%) belonged to middle age group of 35-50 years. The proportion of illiterate farmers in the sample was 19.67 per cent for oil seeds cultivators and 21.67 per cent for wheat cultivators

Estimation of Post-harvest Losses

The estimated food grains post-harvest losses per quintal bases produced or handled at different stages are presented in Table 1.3. These were estimated to be 3.82 kg/q in oil seeds and 3.28kg/q in wheat at the farm level. These losses were maximum due to faulty storage (1.20 kg/q in oil seeds and 0.95 kg/q in wheat) in both the crops. Important factors leading to storage losses were

  I.   Non-availability of separate godowns for storage,
  II.   Poor storage structures,
 III.   Presence of rodents, insects and dampness, and
 IV.   Improper drainage at storage places.

The grain losses during the threshing activity were estimated to be 0.52 kg/q in oil seeds and 0.44 kg/q in wheat. The threshing losses were mainly in the form of broken grains, which were slightly higher, when the produce was threshed by machine as compared to manual threshing. These threshing losses were still higher when power threshers were used. Still a majority of the farmers preferred power threshers due to their low cost and time advantage.

Table 1.3 Estimated post-harvest losses at different stages in oil seeds and wheat:

Stages	Oil seeds Loss (kg/q)	Loss (%)	Wheat Loss (kg/q)	Loss (%)	
I. Farm level losses					
Harvesting	0.40	7.70	0.36	8.33	
Threshing	0.52	10.02	0.44	10.19	
Cleaning/winnowing	0.20	3.85	0.14	3.24	
Drying	0.80	15.41	0.66	15.28	
Storage	1.20	23.11	1.95	21.99	
Transportation	0.50	9.63	0.51	11.81	
Packaging	0.20	3.85	0.22	5.09	
Total losses at farm level	**3.82**	**73.57**	**4.28**	**75.93**	
II. Wholesale level losses					
Storage	0.12	2.31	0.08	1.85	
Transit	0.17	3.27	0.12	2.78	
Total Losses at farm level	**0.29**	**5.58**	**0.20**	**4.63**	
III. Process level losses					
Storage	0.01	0.17	0.01	0.19	
Transit	0.01	0.15	0.01	0.14	
Grain Scattering	0.01	0.10	0.01	0.14	
Total losses at processor level	**0.03**	**0.42**	**0.03**	**0.47**	
IV. Retailer level losses					
Storage	0.53	10.21	0.41	9.49	
Transit	0.32	6.16	0.25	5.79	
Handling	0.21	4.04	0.16	3.70	
Total losses at retailer level	**1.06**	**20.42**	**0.82**	**18.98**	
Total Post-harvest losses	**5.20**	**100.00**	**4.32**	**100.00**	

The losses due to drying operation in grains were estimated to be 0.80 kg/q in oil seeds and 0.66 kg/q in wheat. They are mainly due to use of traditional methods of drying by the farmers. The grain losses as a result of faulty transportation were estimated to be 0.50kg/q in oil seeds and 0.51 kg/q in wheat. Majority of the farmers

used bullock carts and tractors to transport the produce to different market places. The losses were recorded during loading and unloading of production for transportation.

Grain losses during harvesting were estimated to be 0.40kg/q in oil seeds and 0.36 kg/q in wheat. These losses were mainly due to shedding of grains. The amount of losses varies on the crop stage and time of harvesting. The losses during cleaning/ winnowing operation were estimated to be 0.20 kg/q in oil seeds and 0.14 kg/q in wheat. The packing losses were estimated to be 0.20 kg/q in oil seeds and 0.22 kg/q in wheat.

The average post-harvest losses per farm were estimated at 4.20 quintals for oil seeds and 1.01 quintals for wheat. The average losses per ha worked out to be 1.68 quintals for oil seeds and 0.45 quintals for wheat. Nag et al. (2000) have reported that post-harvest losses in chickpea were 6.97 per cent of production.

Market Level Losses

The total post-harvest losses at wholesaler level were 0.29 kg/q in oil seeds and 0.20 kg/q in wheat. The storage losses in oil seeds and wheat at the wholesale level were 0.12 kg/q, and 0.08 kg/q, respectively. The other component of post-harvest losses at this stage was transit losses of 0.17 kg/q in oil seeds and 0.12 kg/q in wheat. The transit losses were more because of the use of unsuitable transport containers, negligent driving and rough roads. The post-harvest losses at the processor level were negligible (0.03 kg/q) at less than one per cent of the quantity handled in both the food grains. The post-harvest losses at the retail level were 1.06 kg/q in oil seeds and 0.82 kg/q in wheat. The transit loss was 0.32 kg/q in oil seeds

and 0.25 kg/q in wheat. The losses due to spoilage and multiple-handling of produce during retailing were 0.21 kg/q in oil seeds and 0.16 kg/q in wheat. The post-harvest losses at the retailer level due to storage were 0.53 kg/q in oil seeds and 0.41 kg/q in wheat.

Total Post-harvest Losses in Food Grains

The total post-harvest losses worked out to be 5.19 kg/q in oil seeds and 4.32 kg/q in wheat. The losses were maximum at the farm level (3.82 kg/q in oil seeds and 3.28 kg/q in wheat) accounting for 73.57 per cent and 75.93 per cent of the total post-harvest losses, respectively. The market level losses were 5.59 per cent in oil seeds and 4.63 per cent in wheat of total post-harvest losses. The losses at processor level were less than 0.50 per cent of the total losses. The losses at retail level were 20.42 per cent in oil seeds and 18.98 per cent in wheat. The post-harvest losses were relatively more at retail than at wholesale level. Hence, proper storage arrangements at retail level are needed.

Conclusions and Policy Implications

This study has estimated post-harvest losses in two major food grains, viz. oil seeds and wheat. It has been found that about 75 per cent of the total post-harvest losses occur at the farm level and about 25 per cent at the market level. The post-harvest losses at farm level have been observed as 1.68 q/ha in oil seeds and 0.45 q/ha wheat. On per farm basis, these have been estimated to be 4.20 quintals in oil seeds and 1.01 quintals in wheat. The storage losses at different stages have added up to about 35.80 per cent of the total post-harvest losses in oil seeds and 33.52 per cent in wheat, while harvesting

and threshing operations together have accounted for about 17 per cent of total losses in both the crops. Transportation losses at various levels have been important component of post-harvest losses, contributing to about 20 per cent of the total losses. The functional analysis has revealed that education level of farmers and bad weather conditions influence the post-harvest losses significantly at farm level in both the food grains, while inadequate availability of labour and faulty storage method influence the post-harvest losses positively and significantly in oil seeds and wheat, respectively. Educating and training the farmers on post-harvest operations would greatly help in reducing the post-harvest losses in food grains. The establishment of small-size cold storage units in the production centres would help reduce the storage losses. In this direction, the zero energy cool chambers technology developed by the Indian Council of Agricultural Research needs to be popularized.

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