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Extent of adoption of improved storage system (Hermetic bag): A study of Bihar

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Abstract
The main food grain losses are being carried out due to inadequate storage facility and lack of knowledge related with modern/scientific storage system of food grain. Keeping this in view, the present study had been conceptualized to assess the extent of adoption behavior of farmers towards the modern and scientific method of storage practices especially in the area of location where University of Illinois Urban-Champaign (USA) is working to popularize the scientific method (Hermetic bag) of storage system. The sample of the study were 320 farmers in which (160) beneficiaries respondents and (160) non- beneficiaries respondents selected from four district, eight blocks and eight villages of Bihar state. The findings suggest that selected farmers were found to use the hermetic bag mostly for the storage of wheat grain only. The improved storage system in terms of hermetic bag was found in terms of 88.13%, 69.38%, 65.00% and 25.62% of the total selected respondents who were used to store their surplus grain of wheat, pulses, maize and rice crops respectively. The findings were further discussed in the light of maintaining the viability, stability and profitability of farmers' produce.

Keywords: Adoption, modern storage system, hermetic bag

Introduction
The grain storage is carried out basically to maintain the quality of grain after harvest for retaining the viability of the grain for planting in the following season, maintaining the supply of grain and taking advantages of higher prices by farmers, government and industry. Every year, inadequate storage conditions result in the loss of 630 million tons of grain (Sawicka, B. 2019) [4]. Humidity, heat, pests, and aeration are all elements that affect storage conditions and, as a result, decide the quality and amount of grain stored and shorten the storage time. In this context, effective grain storage procedures are one of the most critical parts in the food supply chain, and it is a major national concern. The rising demand for food has resulted in higher agricultural yields, which has resulted in the storing of food grains in warehouses. A huge range of insect pests, weeds, and illnesses thrive in field crops. If they are not effectively controlled, they can significantly reduce yield and produce while also adding to biotic component losses such as fungus, mites, bacteria, insects, and rodents. Unfavorable temperatures, inadequate storage practices, and other abiotic factors also contribute to storage losses. In the developing countries almost all pre-harvest and post-harvest operations are conducted manually, therefore post-harvest loss accounts for 15% in the field, 13–20% during processing, and 15–25% during storage [Abass *et al.*, 2014] [1].
In rural villages of our country 60 to 70% of people are using mostly traditional storage system while only 30-40% peoples are in use of modern and scientific storage system. Modern storage systems have a higher storage capacity than conventional storage systems for long-term storage of food grains. At present there is no systematic study ever been made by researchers in this area only some fragmentary information is available? Therefore, the present study has been conceptualized to assess the extent of adoption behavior of farmers towards the modern and scientific method of storage practices especially in the area of location where University of Illinois Urban-Champaign (USA) is working to popularize the scientific method of storage system in terms of hermetic bags.

Methodology
The study was conducted in the state of Bihar where the U.S. Government through University of Illinois Urban- Champaign has recently adopted four district under a project activity to popularize the hermetic bag as the modern storage system among the farmers of

Samastipur and Begusarai districts under Dr. Rajendra Prasad Central Agricultural University and Bhagalpur and Banka districts from Bihar Agricultural University. The project activity mainly focusing on wheat and maize storage. Keeping this in view these four districts *viz*., Samastipur, Begusarai, Bhagalpur and Banka were selected as the location of study. Thus, the total sample of the study were 320 in which (160) beneficiaries respondents and (160) non- beneficiaries respondents. They were taken as the sample of the study and selected from the same four district, eight blocks and eight villages of Bihar state.

Results and Discussions

It is evident that hermetic bags were given to different beneficiary farmers under the study area through the project 'The scaling up climate smart agriculture (CSA) through mainstreaming climate smart villages (CSVs) in Bihar'. Therefore, an attempt has been made to examine the extent of adoption of hermetic bag among the beneficiary farmers. The extent of adoption was operationalized during the study in terms of the percentage score already used through hermetic bag across the storage of different food grains. The details of the results are displayed here with through Table 1 and Figure 1.

Table 1: Shows the extent of adoption related with hermetic bag

Food grains	Extent of adoption %			Total %	Ranking
	Some times	Often	Most often		
Wheat	10.00	3.75	74.38	88.13	I
Rice	12.50	8.12	5.00	25.62	IV
Maize	4.37	6.88	53.75	65.00	III
Pulses	3.75	3.75	61.88	69.38	II
Others	0.00	0.00	0.00	0.00	V

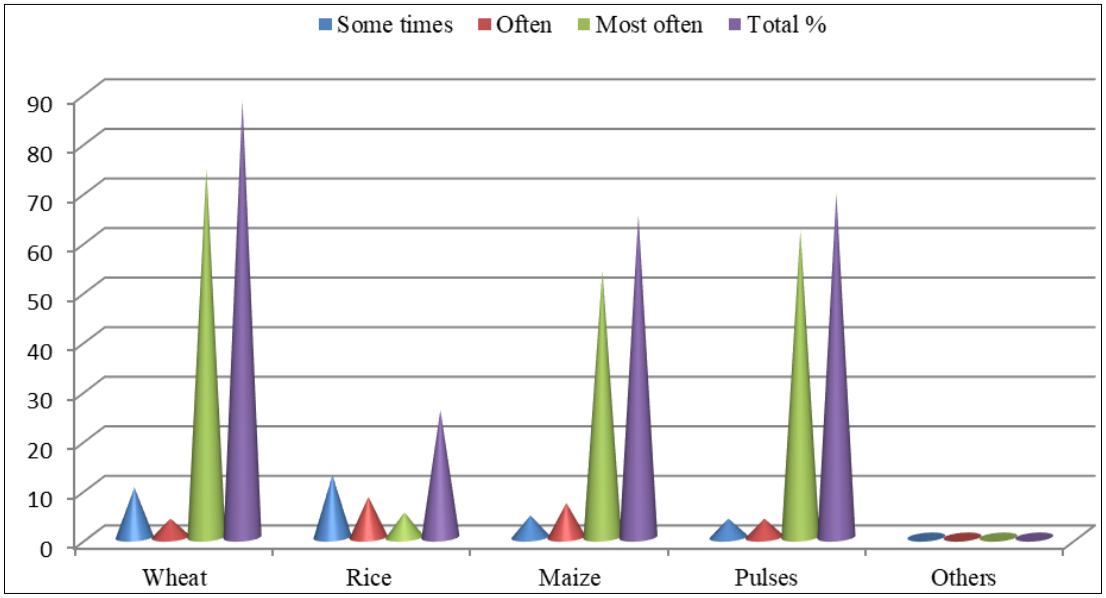

Fig 1: Shows the extent of adoption related with improved storage system (Hermetic bag)

From perusal of Table 1 followed by Figure 1 it was evident that selected farmers were found to use the hermetic bag mostly for the storage of wheat grain in the study area. The next option for use of improved storage system i.e. hermetic bag was often found to use for storage of the grain of pulses among the farmers with its percentage score of 69.38 followed by wheat grain. The improved storage system in terms of hermetic bag was also often found in terms of 65% of the total selected respondents who were used to store the grain of maize crop. During the study, it was also apparent that some farmers indicating their percentage score 25.62 were found to use the hermetic bag for storage of rice and paddy grain. The results related with the process of ranking indicated that wheat, maize and pulses were commonly found to store in hermetic bags among the farmers because beneficiary farmers were found to be convinced about the importance of this improved storage system while rice were being put in the hermetic bags only by the few beneficiary farmers.

Conclusion

Most of food grain losses are being discussed in terms of inadequate storage facility and lack of knowledge related with modern/scientific storage system. The humidity, heat, pests, and aeration all have an impact on grain quality and quantity. Improper storage conditions result in the loss of millions of tonnes of grain every year. For long-term storage of food grains, modern storage systems offer a larger storage capacity than traditional storage methods, as well as a number of additional advantages. As a result, there is need to have investments in modern/scientific grain storage systems which will be increasingly profitable in future. It is feasible to enhance grain availability for consumption by utilizing novel preservation technologies, improving our understanding of stored grain ecosystems, and creating and implementing loss detection and use of prevention approaches in order to save our national resource.

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