*Journal of Agricultural Development and Policy, 2020*
*Volume 31, No. 1, 26-32*

# A Study on Problems Encountered in Procurement, Storage and Handling of Cereals by Procurement Agencies in India

**Jeevitha G N and J M Singh**

Department of Economics and Sociology, Punjab Agricultural University, Ludhiana, Punjab, India

**Abstract**

*Cereals are the staple food for the vast majority of the people in India and across the world. Along with the efficient production of cereal grains, storage of the produced grains needs to be equally emphasized in the present scenario of growing population. The problems encountered during the procurement, storage and handling of cereals by the agencies have been investigated in the present study. Information was gathered through an e-survey of officials from agencies involved in the procurement and/or storage of food grains in India. The results of the survey revealed that the main problems faced during the process of procurement and storage were; low quality of the grains brought to the procurement centers by the farmers, risk of damage due to biotic factors like insects, pests, rodents and birds. Requirement of large capital to run the Food Corporation of India (FCI), labour scarcity, especially in peak periods of procurement, lack of advanced storage structures were the main concerns required to be addressed from the institutional point of view. The study identified some policy measures such as; enhancing the storage capacity of the FCI by building advanced storage structures at key locations and developing improved scientific methods to ensure the safe storage of grains and improve food security in the country.*

**Keywords**: Storage, Cereals, Handling

**JEL classification:** C82, H57, H50

## Introduction

India is the 3rd largest economy by purchasing power parity and sixth largest economy by nominal GDP in the world. In 2018-19, the agriculture sector accounted for 18.4 per cent of the country's GVA which needs to be increased in coming years. (Agricultural Statistics at a Glance, 2020). India ranks first in the production of total pulses, millets and jute, second in production of wheat, rice, groundnut, sugarcane, cotton, tea, and third in production of total cereals. The total production of food grains in the year 2018-19 was 285.28 million tonnes while the total production of rice, wheat, coarse grains and pulses stood at 116.48, 103.60, 43.06, and 22.08 million tonnes respectively (Agricultural Statistics at a Glance, 2020). India being an agrarian country, two-third of its population, directly or indirectly, dependent on agriculture. Food grains are the predominant crops, grown all over the country, occupying a major portion of the cropped area. Cereals are the staple food for the vast majority of the people. The per capita net availability of cereals in the year 2019-2020 stood at 464.6gm per day (Agricultural Statistics at a Glance, 2020).

Food grains undergo a chain of operations such as harvesting, threshing, winnowing, bagging, transportation, storage, and processing before they reach the consumer, and there are considerable losses in crop output at all these phases. The post-harvest losses of food grains in India amount to 12 to 16 million metric tonnes each year, an amount that could feed one-third of India's poor as stipulated by the World Bank (Singh, 2010)

The post-harvest losses at the farm level have been estimated to be 3.82 kg/ q for rice and 3.28 kg/q for wheat in 2003-2004.The losses have been highest during storage in both the crops (Basavaraja *et al,* 2007). Thus,

Corresponding author email: jeevithasrushti@gmail.com

the reduction of post-harvest losses of food is a crucial component of ensuring future global food security. Storage facilities in India need to be strengthened by supplying them with the much needed scientific storage and drying equipment. More research is required to develop management protocols on grain storage, drying, and quality management in silos for Indian climatic conditions, which will be useful to store grains for Food Corporation of India, Central Warehouse Corporation, and State Warehouse Corporation in their storage facilities. The selection of good storage site, storage structure, implementation of Integrated Pest Management (IPM), ensuring proper aeration of grains needs to be emphasized followed by regular inspection of grain stocks (Sharon *et al,* 2014)

## Data Sources and Methodology

The research methodology started with an e-survey in which the e-questionnaire has been delivered to the officials from agencies/institutions involved in the procurement and/or storage of food grains across India through electronic mail applications.

In order to attain the objectives of the study relevant primary data were obtained. Using a loosely structured e-questionnaire consisting of both open-end and closed-end questions along with some Likert scale questions, the relevant information on problems faced during the procurement, storage and handling of cereals was gathered. The agencies/institutes engaged in the procurement and/or storage of food grains from which the information was collected were the Food Corporation of India (FCI), Central Warehousing Corporation (CWC), and State Warehousing Corporations (SWCs), based nationwide.

The total number of respondents was 35 that was considered to be 100 per cent. The number and percentage were used to express the responses received through e-survey.

$$\text{Per cent share} = \frac{A}{B} \times 100$$

For the analysis of five-point Likert scale questions related to problems encountered in procurement, storage and handling of food grains, the Relative Importance Index was calculated as:

$$RII = \frac{(W_1 n_1 + W_2 n_2)}{A \times N} \quad (0 < RII < 1)$$

Where W is weight given to each type of response as per the judgment of the user. In the present study, 1= Strongly Disagree, 2= Disagree, 3= Neutral, 4=Agree and 5= Strongly Agree and "n" represent the number of responses under each option, "A" represent highest weight given, and "N" represent the total number of respondents.

## Results and Discussion

A brief description of the survey respondents consisting of gender, agency/institution, years of experience, respondent's designation was outlined in the Table 1. The number and percentage were used to express the responses received. Among the respondents, 74 per cent were male and 26 per cent were female. Responses were obtained through convenience sampling technique. About 77 per cent of the respondents happened to be employees of Food Corporation of India, chief agency involved in procurement and storage operations in the country. Around 17 per cent were employees of Central Ware House Corporation and 6 per cent were employees of State Warehouse Corporation. Around 80 per cent of workers had job experience of 1 to 5 years, having relatively better experience in the procurement, storage and handling of food grain than those falling into category of less than 1 year work experience. Respondents with less than one year of work experience were 11 per cent, while 9 per cent of respondents had more than five years of work experience. Around 57 per cent of the respondents were quality control managers, operating primarily in the field of procurement and storage operations. Technical assistants constituted for about 29 per cent and 14 per cents were managers operating in other areas like accounts, finance, IT etc., who were subordinately involved in storage and procurement of food grains.

The views of the respondents on the issues that came upon during the process of procurement, storage and handling of grains in agencies with which they were working on regular basis were presented in the Table 2.

Among other issues, the low quality of grains brought by the farmers to the procurement centers was found to be the major problem during the grain procurement process. Many a times the grains brought by the farmers fail to satisfy the quality standards/ uniform specifications provided by the Government of India. The grains brought to the centers often

contained higher moisture than specified level, or the grains were broken/damaged, or unclean containing admixtures of deleterious materials like small stones and granules etc., which can lead to the deterioration of the grain quality. About 45.71 per cent of respondents agreed with the low quality of grains being the main problem while 42.86 per cent opinioned that the major problems in procurement were operational issues. Procuring large volumes of grains in short period, quality analysis of large number of arrivals in short span of time and handling the untimely arrival of the farmers were the operations issues often faced during procurement. Lack of transport vehicles and labour scarcity in the peak times of procurement, lack of well-structured procurement centers were the other problems faced during procurement apart from the quality and operational issues specified by the respondents. Wastage of grains during procurement was found to be less than 0.5 per cent which was low or negligible as stated by 88.6 per cent of respondents

The procured food grains were stored for some period to maintain the required operational and buffer stocks for the central pool. Scientific storage methods were used for the safe storage of the grains. The quality and quantity deterioration of food grains caused by the biotic factors like insects, pests, rodents and birds was the major problem in storage and handling of food grains as stated by a majority of 65.7 per cent of the respondents. Abiotic factors like moisture and temperature also pose some problems in maintaining the quality of stored grains. Around 17 per cent of the respondents have detailed about some issues, other than biotic and abiotic factors, which posed difficulties in safe storage of grains. While storing, the grain bags were stacked in about 20 to 24 layers in general. The bags were hooked to lifters while stacking which often resulted in loosening of threads of bag leading to spillage of grains around the stacks.

This in turn create imbalance in the stacks kept leading to the fall of stacks. The fallen stakes need to be restacked every time which accounts for extra handling costs. Often during high procurement seasons, when the grains procured are in excess to the available storage capacity, the bags were stacked in the space between two stacks (Alley way) which otherwise left empty for the required aeration. This problem of occupancy has often posed much trouble in maintaining the quality of grains when stored for long. Encrustation of the grains was another problem, prevalently seen in rice, when stacks were kept for relatively longer time and in

**Table 1. Demographic profile of the respondents**

| Category | Profile | Number (n) | Percentage (per cent) |
|---|---|---|---|
| Gender | Male | 26 | 74 |
| | Female | 9 | 26 |
| | Total | 35 | 100 |
| Agency/Institution | FCI | 27 | 77 |
| | CWC | 6 | 17 |
| | SWC | 2 | 6 |
| | Total | 35 | 100 |
| Years of experience | <1 Years | 4 | 11 |
| | 1 - 5 years | 28 | 80 |
| | >5 years | 3 | 9 |
| | Total | 35 | 100 |
| Designation | Manager(Quality Control) | 20 | 57 |
| | Manager(other)* | 5 | 14 |
| | Technical Assistant | 10 | 29 |
| | Total | 35 | 100 |

**Note:** *FCI: Food Corporation of India, CWC: Central Warehousing Corporation, SWC: State Warehousing Corporation, * IT, Accounts, Finance etc.*

more layers. The grains in the bottom layer get pressed when more number of layers were kept. This reduces the quality of grains in bottom layer making it appear choky (damaged and powdery). These problems were found to be relatively manageable when compared to problems caused by biotic and abiotic factors.

Majorly, covered go-downs were used to store the grains followed by CAP (covered and plinth). About 86 per cent of respondents agreed upon the fact. Around 69 per cent of respondents were satisfied with the available storage capacity while the remaining 31 per cent were not. Respondents, when asked to suggest measures to improve the existing storage capacity, about 63 per cent of them suggested for the establishment of new structures by government while only 28 per cent of respondents suggested going for privatizing/ out-sourcing of go-downs.

Among other measures suggested, a public- private partnership measure, Private Entrepreneurs Guarantee scheme (PEG, 2008) was the more pronounced one, where in the storage capacity was constructed through private entrepreneurs at the locations identified by FCI to meet the required storage capacities.

In storage, among the different methods adopted to control the possible damage due to biotic and abiotic factors, chemical-control measures were mainly used. About 69 per cent of the respondents are satisfied with chemical measures being used while 31 per cent were not satisfied.

Among alternatives and/or supplementary measures used, the UV-light trap, a mechanical control measure, was the more pronounced which was effective in controlling insects and moths. The lights used in the trap, can last for about 6 to 8 hours once charged. Traps were usually kept in 3 to 4 numbers per compartment of the godown to trap the insect files. These were already being used in southern states of India and they were suggested as an alternative measure to be adapted everywhere.

When the grains were stored for a long time in covered go-downs, between rice and wheat, rice was more likely to get damaged as the moisture loss was comparatively faster in rice. Around 54 per cent of the respondents agreed up on it. But, when kept in open storage, wheat can be more prone to damage as it can get infested with weevils easily. The proportion of grains wasted during the storage was found to be less than 0.5 per cent as 66 per cent of respondents stated the same.

The Table 3 presented the problems encountered by the agencies/institutes in procurement, storage and handling of grains from institutional point of view. Respondents were asked about various constraints that the organization, as an institute, faced in order to obtain a perspective on the current status.

The problems were classified mainly into the four categories; financial, technical, infrastructural and general problems. .Under each category, three important constrains were identified and listed. The respondents were asked to rate each constraint according to their perception on a 5 point continuum scale where a weight of 1 was assigned to strongly disagree and 5 was assigned to strongly agree. Relative importance index was calculated for each constraint and they were ranked accordingly. The following responses were received from the survey.

**Financial problems:** Among the financial constraints listed, large capital requirement was ranked first with the highest RII of 0.663. This suggested that the requirement of large capital to run the system of food security was the most important financial problem required to be addressed. High maintenance cost with the RII of 0.600 was ranked second which required to be given next priority while addressing the financial problems. Costly protective materials-materials used to protect the grains like tonnage materials, Glass-Fiber-Reinforced (GRF) rods, Bamboo mats, wooden planks, Cross Laminated Thermoplastic Fumigation(CLTF) Covers etc., - was ranked third, which had the RII of 0.594.

**Technical problems:** Among the technical constraints, inadequate manpower/labor was ranked first, with the highest RII of 0.663. This indicated that there was a shortage in labor availability, especially in peak seasons, which needed to be addressed first. The labour scarcity was relatively high in southern states. Inadequate technical supervision/staff was ranked second, with the RII of 0.594. Lack of skill among storage operators was the constraint that ranked third among technical issues needed to be addressed.

**Infrastructural problems:** Lack of advanced storage structure stood first among the infrastructural constraints required to be solved with a RII of 0.760. The pressing need to establish more number of advanced storage structure like silos was felt. Lack of adequate quality

**Table 2. Problems in procurement and storage of food grains from individual point of view**

| Particulars | Number (n) | Percentage(%) |
|---|---|---|
| Major problems in procurement of food grains | | |
| Quality of grains | 16 | 45.71 |
| Operational issues | 15 | 42.86 |
| Other | 04 | 11.43 |
| Total | 35 | 100.00 |
| Per cent grain wastage during procurement | | |
| <0.5% | 31 | 88.57 |
| 0.5-1% | 02 | 5.71 |
| >1% | 02 | 5.71 |
| Total | 35 | 100.00 |
| Major problems in storage of food grains | | |
| Biotic factors | 23 | 65.71 |
| Abiotic factors | 06 | 17.14 |
| Other | 06 | 17.14 |
| Total | 35 | 100.00 |
| Type of storage structure used | | |
| Godown | 30 | 85.71 |
| Cover and Plinth(CAP) | 05 | 14.29 |
| Plinth | 00 | 0.00 |
| Total | 35 | 100.00 |
| Available storage capacity | | |
| Satisfactory | 24 | 68.57 |
| Not-satisfactory | 11 | 31.43 |
| Total | 35 | 100.00 |
| Better measure to improve storage capacity | | |
| Establish new structure | 22 | 62.86 |
| Out-sourcing/ privatizing | 10 | 28.57 |
| Other | 03 | 8.57 |
| Total | 35 | 100.00 |
| Chemical-control measures used | | |
| Yes | 34 | 97.14 |
| No | 01 | 2.86 |
| Total | 35 | 100.00 |
| Efficiency of control measures being used | | |
| Satisfactory | 24 | 68.57 |
| Not-satisfactory | 11 | 31.43 |
| Total | 35 | 100.00 |
| Per cent grain wasted during storage | | |
| <0.5% | 23 | 65.7 |
| 0.5-1% | 11 | 31.4 |
| >1% | 1 | 2.9 |
| Total | 35 | 100.0 |
| Relative damage proportion of rice and wheat stored | | |
| Wheat | 16 | 45.7 |
| Rice | 19 | 54.3 |
| Total | 35 | 100.0 |

**Table 3. Problems in procurement and storage of food grains from institutional point of view**

| Particulars | RII* | Rank |
|---|---|---|
| **Financial Problems** | | |
| Costly protective materials | 0.594 | 3 |
| Large capital requirement | **0.663** | **1** |
| High maintenance cost | 0.600 | 2 |
| **Technical Problems** | | |
| Inadequate technical supervision (Staff) | 0.594 | 2 |
| Inadequate manpower (labour) | **0.663** | **1** |
| Lack of skill among storage operators | 0.543 | 3 |
| **Infrastructure Problems** | | |
| Lack of adequate quality control laboratory | 0.617 | 2 |
| Lack of covered storage structures | 0.543 | 3 |
| Lack of advanced storage structures | **0.760** | **1** |
| **General Problems** | | |
| Risk of damage due to abiotic factors | 0.674 | 2 |
| Risk of damage due to biotic factors | **0.691** | **1** |
| Quality deterioration due to prolonged storage | 0.566 | 3 |

**Note:** **Relative Importance Index*
*Protective materials: GRF rods, CLTF covers, storage chemicals etc.*

control laboratory, with RII of 0.617, and lack of covered storage structures, with RII of 0.543 were ranked second and third respectively among the infrastructural problems.

**General problems:** Risk of damage due to biotic factors was the constraint with the highest RII of 0.691. This indicated that the problem of wastage of grains due to biotic factors was more prevalent than other two constraints. Risk of damage due to abiotic factors was ranked second by the respondents, which had the RII of 0.674, followed by the quality deterioration due to prolonged storage. This indicated that the problem of damage due to prolonged storage was less prevalent as the grains were not kept for too long periods.

The inadequacy of manpower was much pronounced by the respondents as procurement and storage operations were strenuous and sufficient manpower/ labor was required to carry out the operations with full efficiency. Many of the respondents when asked for suggestions, proposed to carry out more research on scientific storing methods to avoid quality issues which was the major hurdle in ensuring food security of the nation.

Among the respondents, 47 per cent agreed that the bureaucracy and red tape in workplace has been affecting the process of procurement, storage and handling of food grains. By this, it can be conclude that, though 52 per cent have not agreed upon the fact, to some extent, bureaucracy was prevalent in work place which hindered the quality control and other operations.

## Conclusion and Policy Implications

The grains brought to the centers often contained high moisture than specified level, or broken/damaged, or unclean containing admixtures of deleterious materials like small stones and granules etc., which would lead to the deterioration of the quality of the grains if stored. This was found to be of major concern in the process of procurement. Meanwhile, in the process of storage, effect of biotic factors like insects, pests, rodents and birds was much pronounced which calls for further research in developing improved methods of scientific storage to make the storage more efficient.

The wastage of grains during procurement and storage was found to be less than 0.5 per cent which can be considered as low or negligible. The covered

godowns were largely used to store the grains and the available storage capacity was found to be satisfactory. The chemical control measures were mainly used to protect the stored grains and were found to be satisfactory. Between rice and wheat, when stored, the rice was relatively more prone to damages.

The requirement of large capital to operate the agencies was the major financial concern. The labour scarcity, particularly in peak periods of procurement, was the main technical issue faced by the agencies while the lack of advanced storage structures like silos was the key infrastructural issue faced by the agencies that required to be addressed.

The study identified some policy measures such as; enhancing the storage capacity of FCI by building advanced storage structures at key locations, developing improved scientific methods to ensure the safe storage of grains and creating awareness among the farmers regarding the importance of maintaining grain quality standards as prescribed by GOI, which would help in procurement and safe storage of grains and improve nutritional security in the country.

## References

Anonymous 2020.Agricultural Statistics at a Glance. Directorate of Economics and Statistics, Department of Agriculture Cooperation and Farmers welfare, Ministry of Agriculture and Farmers Welfare, GOI. https://foodprocessingindia.gov.in/uploads/publication/Agricultural-statistics-at-a-Glance-2020.pdf

Basavaraja H, Mahajanashetti S B and Udagatti N C 2007. Economic analysis of post-harvest losses in food grains in India*:* A case studyof Karnataka. *Agricultural Economics Research Review* **20*:***117-26. https://ageconsearch.umn.edu/record/47429/

Sharon M, Abirami C V and Alagusundaram K 2014. Grain storage management in India. *Journal of Postharvest Technology* **2*:***12-24. https://www.researchgate.net/profile/Arvind-Singh-21/post/what_are_ITKs_for_the_management_of_stored_grain_pests/attachment/59d648c979197b80779a372c/AS%3A468543910223877%401488720981390/download/17550-49240-1-PB.pdf

Singh P K 2010. A decentralized and holistic approach for grain management in India. Opinion paper. *Current Science* **99**: 1179-80. http://admin.indiaenvironmentportal.org.in/files/grain%20management%20in%20India.pdf

Received: January 25, 2021 Accepted: March 15, 2021