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Norms for storage gains/losses: A case for wheat (*Triticum aestivum*) stored in FCI/ godowns in India

D K SHARMA*, V K SINGH, M K GARG, K PAWAR

AICRP on PHET, Hisar Centre, Department of Processing & Food Engineering, COAE &T, CCSHAU, Hisar, Haryana 125 004 India

ABSTRACT

Food Corporation of India (FCI) is dealing with the storage and movement of foodgrains, therefore, some amount of storage and transit loss is inevitable in heavy operations conducted by the corporation in such perishable commodities. However, since the corporation is thriving on the subsidy from government of India only, the utmost endeavor of each and every official must be to minimize the storage and transit losses in the corporation. Moreover, in India where millions face problem in getting twice meals a day, wastage of even a single grain is unaffordable. The storage gains/ losses are calculated on monthly basis, depot and commodity basis. However, for the purpose of investigation or fixation of responsibility, stack may be taken as unit. And, for the purpose of regularization, period of computation is taken on yearly basis instead of monthly basis, in respect of cases relating to the preceding years. From the state agencies procuring wheat stocks for central pool, FCI takes 1% gain while taking over the stocks from agencies. No norms for storage and transit loss have been fixed by FCI. However, as per convention, certain regions such as Punjab and Haryana are calculating justified storage losses on the basis of two parameters namely, loss in weight on reduction in moisture content (allowance of 0.7%) and period of storage (0.2% per year).

Key words: Norms for storage grains, Wheat stored

Wheat (*Triticum aestivum* L.) and rice (*Oryza sativa* L.), the two major staple food commodities, are stored and handled in jute bags. The bags containing the grains undergo at least twelve handlings from the start of procurement to reaching retail stores. Government agencies in India keep the grain-stocks in their warehouses and the surplus stocks are stored in the open in Cover and Plinth (CAP) storages. Outdoor storage involves wheat and paddy only. The bag-stack grain storage system is preferred by FCI/CWC as it facilitates ventilation throughout the storage period and aids rapid distribution as well as dissipation of fumigants but at the same time it favours cross-infection by crawling and flying insect pests. In many of the warehouses there is rapid turnover of stocks and the system of first-in first-out is not followed. The major pests encountered in grain stacks and storage premises are *Sitophilus oryzae* (L.), *Rhyzopertha*

dominica (Fabricius), *Tribolium castaneum* (Herbst), *Oryzae philus surinamensis* (Linnaeus), *Togoderma granarium* (Everts) and *Ephesti acautella*.

Food prices play an important role in the well-being of the poor and poverty reduction in developing countries. India has one of the largest food subsidy programmes in the world that has created a relatively effective social safety net but is also under increasing criticism because of its large contributions to government budget deficits, economic inefficiency and poor targeting. The Food Corporation of India (FCI) is always under attack from all quarters for perceived operational inefficiencies leading to increase in the food subsidy burden. The procurement incidentals include statutory charges such as market fee, rural development/ infrastructure development cess, VAT and non-statutory charges like dami/arhatia commission, mandilabour charges, cost of gunny bags, handling charges, internal transport and interest charges. Some of these charges are under the control

*Corresponding author e-mail: dksharma.hau@gmail.com

of FCI and in some cases FCI has no role. However, since the corporation is thriving on the subsidy from government of India only, the utmost endeavour of each and every official must be to minimize the storage and transit losses in the corporation. Moreover, in India wastage of even a single grain is unaffordable. The storage gains/ losses are calculated monthly, depot and commodity basis. However, for the purpose of investigation or fixation of responsibility, stack may be taken as unit. And, for the purpose of regularization, period of computation is taken on yearly basis instead of monthly basis, in respect of cases relating to the preceding years. From the state agencies procuring wheat stocks for central pool, FCI takes 1% gain while taking over the stocks from agencies. No norms for storage and transit loss have been fixed by FCI. However, as per convention, certain regions such as Punjab and Haryana are calculating justified storage losses on the basis of two parameters namely, loss in weight on reduction in moisture content (allowance of 0.7%) and period of storage (0.2% per year).

Practical experiences

No norms for storage and transit loss have been fixed by FCI. However, as per convention, certain regions such as Punjab and Haryana are calculating justified storage losses on the basis of two parameters namely, loss in weight on reduction in moisture content (allowance of 0.7%) and period of storage (0.2% per year). This lacks scientific justifications.

Besides routine prophylactic treatment of bag-stacks and storage premises with malathion (0.15 g/m²) and dichlorvos (0.2 g/m²), the grain stocks are fumigated with phosphine under fumigation covers or sheets. Black low-density polyethylene (LDPE) covers of 0.25 mm thickness and, in a few places, rubberized fabric with aluminium finish on one side are used for fumigation of bag-stacks. The cover is weighted down to the floor with sandbags, mud, loose sand or merely gum tape. The stacks are fumigated on more than one occasion at a dosage of three aluminium phosphide tablets per tonne with five days exposure period. The longer the stack remains in the storage depot the more it is fumigated. As many as seven fumigations with phosphine are permitted for stored grains. The exposure period is rarely extended to ten days or more, which is necessary when the temperature is 20°C or less and when *Sitophilus* spp. or phosphine-resistant strains are present. Palliative treatments with higher application rates i.e., ten tablets/t and/or inadequate exposure periods i.e., less than five days are not ruled out. Most of the warehouses with gabled asbestos roofs are not suitable for whole-godown

treatment. Nevertheless, occasionally fumigation of entire warehouse (shed-fumigation) with shell-type is carried out using aluminium phosphide tablets. Reports supported by gas concentration data on whole godown treatment are, however, lacking. Detection and gas monitoring devices for phosphine are hard to come by and hence these are rarely used to assess the safety of the working environment when fumigation operations are under way. Phosphine concentrations as high as 2 ppm are estimated in the workplace during grain fumigation. In the absence of suitable gas mask canisters, transient symptoms of occupational exposure in the workers involved in fumigation work are noticed. Also, quality checks are periodically made on aluminium phosphide tablet formulations supplied by the manufacturers as per the standards laid by the Bureau of Indian Standards (BIS, 1980). Accordingly, the tablet formulations should weigh 3 g, containing not less than 56% aluminium phosphide by mass and the tablet should not decompose in 30 min to liberate phosphine in 100% humidified chamber. The aluminium phosphide content is determined by the reaction of phosphine carried by a stream of nitrogen with potassium per-manganate. As the rate of nitrogen carrier gas flow is not specified in the method of BIS (1980), chances of variable results exist. The optimum flow rate of nitrogen to carry phosphine to potassium permanganate is 15-25 ml/min. Tablets manufactured in India were to be analysed. Aluminium phosphide content ranged from 56 to 70%. Fumigation sheets/covers should also conform to the criteria stipulated in Indian standard (BIS, 1991). There are various tests exemplified by fumigation retention test, tests for workmanship, strength of joints, tensile strength, ease of repair, blocking test, flex test, accelerated ageing test, etc. During fumigation of bag-stacks with aluminium phosphide tablets, 50% of the tablets are distributed on the top and 50% all around the stack. It is known that the decomposition of the tablet is influenced by ambient humidity and temperature. Even in the presence of favourable conditions like 25°C and 75% relative humidity, it was reported that undecomposed aluminium phosphide up to 5% persists in the spent dust. This is a source of contamination of grains.

An important component of procurement is the cost of gunny bags which account for 22-23% of total cost. Other components of procurement incidentals include internal movement, interest charges, *mandi* (market) labour charges, custody and maintenance charges, etc., and this account for about 15-20% of the cost. Almost a similar trend was observed in rice.

CONCLUSION

India's food subsidy system has been a major component of the social safety net for the poor, guaranteeing the availability of foodgrains at affordable prices, helping to reduce malnutrition and ensuring price stability in the country. The procurement price is the most important determinant of food subsidy. The distribution costs are less important compared with other factors.

The climatic conditions in India allow rapid multiplication of insects in short durations and the current grain storage system permits quick re-infestation of fumigated commodities. Hence, fumigants and insecticides are repeatedly applied.

No norms for storage and transit loss have been fixed by FCI. However, as per convention, certain regions such as Punjab and Haryana are calculating justified storage losses on the basis of two parameters namely, loss in weight due to reduction in moisture content (allowance of 0.7%) and period of storage (0.2% per year).

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