

## MANAGEMENT PRACTICES IN SOME SELECTED COLD STORAGE IN BANGLADESH

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Accepted for publication: October 12, 2008

### ABSTRACT

**Islam M.M., Kabir H. M., Sattar M.A. and Kabir M.S. 2008.** *Management Practices in Some Selected Cold Storage in Bangladesh.* *j. innov.dev.strategy 2(3): 48-54*

An attempt was made to study the management practice of some selected cold storage in Rangpur district where the main objective was to assess the management practices, to identify the major problems encountered during operations, to compare the economic assessment of private cold storage and BADC cold storage. Data were collected through interview schedule from four private cold storages and one BADC cold storages of Rangpur districts. It was found that the visited five cold storages were found to be operated within the temperature range of 1.67 to 2.8°C and relative humidity was maintained within the range of 80 to 95 percent. Operating hours of the cold storage unit range from 10 to 18 hrs. The control system was either manual or automatic. Average capacity utilization ranged from 74.42 to 100 percent. The weight losses due to evaporation of moisture from potatoes in different cold storages range from 1.2 to 2.38 percent. The storage was period in between 8.5 to 9.5 month. The cold storage facilities and their management were conforming to the requirements laid down by national codes of practices, insurance companies, banks, international and national standard or recommendations. It is also found that none of the cold storage suffered losses, but the profit (Tk/ton) is comparatively less in BADC cold storage than the privately owned cold storages. The present study indicates that there are no special problems on the technological side regarding the cold storage in Bangladesh. Therefore, cold storage facilities can be effectively used for storage of potato in Bangladesh.

**Keywords:** Economic assessment, management practice, cold storage

### INTRODUCTION

In Bangladesh, potato is one of the major food items which are preserved in cold stores for commercial storage purpose. Among the major staple foods of the world the status of potato is third. It is rich in calories, carbohydrates and proteins as well as substantial amount of vitamins. Potato is a cold climate vegetable crop which is grown in the winter season. The cultivation of potato increased considerably over the past years because of its various uses as food. The area under potato cultivation constitutes 30% of total area for vegetable crop and 1.11% of the gross cropped area. In 1996-97 about 1,34,000 ha(0.87% of total cultivated land) was under potato cultivation in Bangladesh (Razzaque, 2000). In 2003-04 potato production was about 3907 thousand metric tons (BBS, 2004). Potato is a very important item of food for human consumption. It is used in culinary preparation in a variety of products made from its fresh and processed forms. Potato tuber contains about 75 to 80 percent water, 16 to 20 percent carbohydrates, 2.5 to 3.2 percent crude protein, 1.2 to 2.2 percent true protein, 0.8 to 1.2 percent mineral matter, 0.1 to 0.2 percent crude fat, 0.6 percent crude fibre and some vitamins (Schoenemann, 1977). The common potato (*Solanum tuberosum*) is one of around 150 tuber-bearing species of the genus *solanum* (Family: Solanaceae).

Freshly harvested potatoes like other tuber crops contain more than 70 percent moisture and are perishable in nature. These crops can not be saved from spoilage unless properly preserved. Farmers usually keep their potato spread on the elevated platforms created in their dwelling houses. Some other crude methods are also used. But these methods are only partially effective for storing potatoes for one or two months depending on the varieties. Due to improper handling and storage a huge amount of potato perishes every year due to spoilage and sprouting.

For large scale commercial preservation of potatoes cold storages are used in Bangladesh. But the total number of cold storages in the country is much lower than that actually needed. There are altogether 283 cold storages of which some are out of operation due to various reasons. Average capacities of these cold storages are 2500 metric tons. (Directorate of Agricultural Marketing, 1998). To preserve the produced potatoes in Bangladesh, the number of cold storages should be increased by about 5 times the present number. Potatoes have to be stored after harvest for a shorter or longer period in order to maintain even supply to the market throughout the year for direct human consumption as well as for the processing industry. Seed potatoes have to be stored after harvest till the next planting time.

There is a popular slogan “take more potato and save rice” in our country. So, it is important to preserve the potatoes, to maintain the potato supply throughout the year. As the country is situated in the tropical zone and is hot and humid during summer, so, it is necessary to preserve the potatoes by maintaining controlled storage environment. To evaluate the process of cold storage management practices in Bangladesh a project was undertaken

in 2003. The project was aimed at achieving the following objectives: (i) to assess the management practices in the studied cold storages. (ii) to identify the major problems encountered during operations of cold storages. (iii) to compare the economic assessment of private cold storage and BADC cold storage.

**METHODOLOGY**

An attempt was made to study the management practice of some selected cold storages. Since it was not possible to visit all the cold storages in the country, some selected cold storages of Rangpur districts (greater districts) were visited in March 2004 to study the practical situations existing in the selected cold storages and to collect other relevant information. The list of all the studied cold storages is shown in Table 1.

Table1. Cold storages which were studied

Name of the cold storage	Location	Ownership pattern	Year, when started functioning
BADC cold storage	Kellabond, BSCIC area Rangpur	Government	1979
Mrs. Chowdhary Ice & cold storage limited	Kellabond, BSCIC area Rangpur	Private (A group of individual)	1969
Kisan Himagar limited	R.K. Road Binodpur, Rangpur	Private (A group of individual)	1999
Northan cold storages limited	Kundol, Dinajpur Road, Saidpur	Private (Partnership)	1970
Himaddri cold storage limited	Kellabond, BSCIC area Rangpur	Private	1976

**Collection of Data**

A questionnaire was prepared for collection of information from the cold storages. Data were collected by personal contact at the relevant cold storages site through direct interview method. Manager and other operating staffs of the cold storages were interviewed for obtaining information regarding general management practices of the cold storages. The data were placed in tabular form for comparison and analysis, in order to understand the management practice of cold storages in Bangladesh.

**Methods of cost calculation**

Estimated costs are composed of expenses that occur independent of use, termed fixed costs and those that occur because use, termed variable costs.

**Fixed cost**

Fixed cost included: Depreciation (D), Interest (I), Taxes (T) and Insurance (In).

**Depreciation**

Depreciation is the reduction in value of the cold storage machinery and building with the passage of time. In calculation of fixed cost a straight line depreciation method is assumed and the following equation was used.

$$\text{Annual Depreciation } D = \frac{P - S}{L}$$

Where, P = Purchase price of the machine, Tk.  
 S = Salvage value of the machine, Tk.  
 L = Useful life of machine in years

**Interest**

The suggested interest rate considered in this study was 10 percent of purchase price

$$\text{Interest } I = 0.1 \times P$$

Where, P = purchase price in Tk.

**Taxes**

The annual cost of taxes is estimated at about 2 percent of the remaining value when spread over a 10 year life. Tax for a particular year on a cold storage can be estimated by the following way.

$$\text{Tax} = 0.02 \times P$$

### **Insurance**

Estimated insurance cost was 0.2 percent remaining cold storage value in the beginning of the particular year and can determine by the following equation.

$$\text{Insurance} = 0.002 \times P$$

$$\text{Fixed cost (FC)} = \text{Depreciation} + \text{Interest} + \text{Tax} + \text{Insurance.}$$

### **Variable cost**

Variable costs include the cost of electricity, labour, fuel energy, ammonia gas, repair and maintenance costs and lubrication

### **Repair and maintenance cost**

Repair costs are difficult to estimate because of wide variation, resulting from difference in operating conditions, management, maintenance programs etc. Repair costs include maintenance as well as the cost of all parts and the skilled labour cost to install the parts. It was considered 3.5 % of purchase price.

### **Labour cost**

The labour cost was calculated by the following equation.

$$L_c = LC \times CC$$

Where,

$L_c$  = Labour cost (Tk/yr)

$LC$  = Labour Charge (Tk./bag)

$CC$  = Capacity of cold storage (ton)

### **Energy cost**

The cost of energy was calculated as follows.

$$EC = RE \times C \times AU$$

Where,

$EC$  = Electrical cost in (Tk./yr)

$RE$  = Rate of electrical energy in Tk./kw-hr

$C$  = Capacity of motor in kw

$AU$  = Annual use in hrs.

### **Fuel and oil cost**

Yearly fuel and oil costs were collected from the record data of cold storage managers.

Variable cost. (VC) = Electricity cost (E) + Labour cost (L) + Repair and maintenance cost + Fuel & oil cost.

Total cost,

$$T_{\text{cost}} = FC + VC$$

Where,

$T_{\text{cost}}$  = Total cost in Tk./yr.

$FC$  = Fixed cost Tk./yr.

$VC$  = Variable cost Tk./yr

Gross profit = storage rent (Tk./ton) X actual amount of product stored (ton).

Net profit = (gross profit – total storing cost)

Profit (Tk./ton) = Net profit ÷ Actual amount of product stored

## **RESULTS AND DISCUSSIONS**

### **Identification of the cold storage under study**

Five cold storages were included in this study. Out of five cold storages only one belonged to government and others were private belonging to either an individual or a group of individuals.

**Installed capacity and actually stored**

Actual stored amounts were found to vary from year to year. Variations of actual stored were within the range of 74.42 to 100 percent of the installed capacities based on 5 yrs data from 1999 to 2003.

Table 2. Installed capacities and amounts actually stored in different cold storages during the operational period

Name of the cold storage	Installed capacity (ton)	Amount actually stored		Based on
		Actually stored (5 years average) (ton)	Percent of installed capacity	
BADC cold storage	500	508	101.64	5 year data from 1999 to 2003.
Mrs. Chowdhary Ice & cold storage limited	6300	4675.6	74.42	
Kisan Himagar limited	10,000	9642.4	96.42	
Northan cold storages limited	2,000	2000	100	
Himaddri cold storage limited	3000	2770	92.33	

Table 3. Operating condition of the cold storage (inside the storage during operation)

Name of the cold storage	Relative humidity %	Temperature ( $^{\circ}$ C)	Operating hrs/day	Actual use of month/year	Control system
BADC cold storage	90-95	2.2-2.8	14-16	9	Manual
Mrs. Chowdhary Ice & cold storage limited	90-92	1.67-2.2	15-18	8.5	Manual & automatic
Kisan Himagar limited	85-90	2.2-2.8	18	9.5	Manual & automatic
Northan cold storages limited	90	2.0	10-12	9	Manual
Himaddri cold storage limited	80-90	1.67-2.2	12-15	9	Manual

**Operating condition of the cold storage****Weight loss during cold storages**

Weight losses due to evaporation of moisture from potatoes in different cold storages range from 1.2 to 2.38 percent per season (8.5 to 9.5 months). These are shown in Table 4. The rates with which weight losses took place were dependent upon the following factors:

- i. Immatured potatoes stored
- ii. Variety
- iii. Injury during harvesting and storing
- iv. Storage temperature and relative humidity during a short time after harvest.
- v. Temperature, humidity and amount of ventilation during storage.
- vi. Period of storage

Table 4. Weight loss (%) due to evaporation of moisture in different cold storages

Name of the cold storage	Weight loss (%)
BADC cold storage	2.6
Mrs. Chowdhary Ice & cold storage limited	1.2-2.38
Kisan Himagar limited	1.2-1.78
Northan cold storages limited	2.35
Himaddri cold storage limited	2.38

**Pre-storage conditions**

Before filling, the storage chambers were thoroughly cleaned and disinfected with copper-sulphate. The storing process involves three stages such as:

- i. The receiving potatoes and their washing, sorting grading and packing
- ii. Pre-cooling of potatoes
- iii. Placing the potatoes under the cold storage temperature.

### **Washing, sorting, grading and packing of potatoes**

The potatoes, which are procured and brought from different places, are washed, sorted, graded and packed in bags before storage. At this stage fanning helps remove excess moisture and heat from tubers.

### **Pre-cooling of potatoes**

Potatoes should not be stored directly in the cold storage; these are to be pre-cooled at an intermediate pre-cooling temperature of about 14 to 16°C for 48 to 72 hours. Pre-cooling prepares the tubers for the cold storage temperature.

### **Cold storage conditions**

Temperature, humidity and air movements (ventilation) are the main factors which determine the storage life of potatoes in cold storage. The requirements of these parameters differ with the use of potatoes after storage. The requirements that are to be full-filled for storing table potatoes are different from those meant for seed.

### **Pre-heating of seed potatoes before taking out from storage**

At the time of taking out seed potatoes from the cold storage seed should never be exposed to high temperature that exists outside the storage. Seeds must pass through chambers where pre-heating takes place at 14 to 16°C for 48 to 72 hours.

### **Spoilage**

Spoilage does not generally occur in the cold storage if the recommended operating conditions were maintained and handled carefully. Each cold storage under study had stand by generators, so the spoilage of potatoes due to power failure and load shading was not a factor for spoilage.

Spoilage of potatoes took place due to the following reasons:

- i. If temperature is comparatively high.
- ii. Excessive pressure of bag
- iii. Diseases
- iv. Mishandling

### **Capital Investment and bank loans for the cold storage**

Amount of money invested for each of the cold storages under study area were found to vary widely depending on the individual situations- size or storage capacity, year of investment, prices of the land, building materials and machineries and also the cost of building construction.

In comparison to storage capacities of other cold storages, the capital investment for a 500 tons capacity BADC cold storage was high. This was due to additional costs for extra buildings, which were constructed for accommodation of the BADC staffs working with the cold storage. Capital investment for each cold storage was very high and it is difficult for an individual, to invest such a large amount. For this reason bank loan was essential for establishing such a big enterprise. Bank loan were given to all of the private cold storages. The banks allowed a loan of 20 to 80 percent of the total investment. Amount of money invested for different cold storage are shown in table 5.

Table 5. Total amount of investment for different cold storage in Rangpur Districts

Name of the cold storage	Amount invested (Tk. In crore)					
	Land	Building	Machineries	Total	Own investment (%)	Bank loan (%)
BADC cold storage	0.60	0.54		1.14	Government	
Mrs. Chowdhary Ice & cold storage limited	1.5	2.5	3	7	40	60
Kisan Himagar limited	1.0	2.8	2.5	6.3	40	60
Northan cold storages limited	0.02	0.05	0.03	0.1	40	60
Himaddri cold storage limited	0.40	2	0.05	2.9	31	69

### **Physical facilities and their management**

The cold storage facilities and their management were conformed to the requirements laid down by national codes of practices, insurance companies, banks, international and national standard or recommendations. There were no

reports of troubles or inconvenience due to general layout of the cold storage surveyed. Some problems relating to the equipments as reported are e.g. lack of availability of spare parts, repair and service facilities.

### **Overall problem of cold storage business**

The problem encountered by the cold storage management as understood from interviewing the manger and other staff of the five cold storage could be summarized as follows:

- i. Potato growers do not get enough bank loans specially for growing potatoes.
- ii. Procurement policies of the cold storages are not fair:
  - a) Carrying cost is not given to the grower or traders.
  - b) Fair price is not given
  - c) Payment is delayed.
- iii. There are acute power problem arising out of frequent disruption of supply, prolonged power failure, low voltage and electrical load shading.
- iv. Cost of electrical energy is being increased quite regularly.
- v. Most of the cold storages do not have adequate transport facilities of their own for carrying potatoes.
- vii. The cold storage are not uniformly distributed over the entire area where the potatoes are grown. This situation results in low utilization of installed capacities.
- Vii. Repair and service facilities for the foreign made equipments are not available

### **Cost-benefit analysis**

Total storing cost and net profit are tabulated in the Table 6 and 7

Table 6. Storing cost and net profit of different cold storages

Name of the cold storage	Storage rent (Tk/ton)	Actual amount of product stored (ton)	Gross profit (Tk.)X 1000	Fixed cost (Tk.)X 1000	Variable cost (Tk.) X 1000	Total storing cost (Tk.) X 1000	Net profit (Tk.) X 1000	Profit (Tk./ton)
Mrs. Chowdhary Ice & cold storage limited	2238.09	4675.6	10464.41	4435.4	2397.14	6832.54	3631.87	776.77
Kisan Himagar limited	2226.19	9642.4	21465.81	5248.75	3203	8451.75	13014.06	1349.67
Northan cold storages limited	2238.09	2000	4476.18	1250.35	620.04	1870.39	2605.79	1302.89
Himaddri cold storage limited	2095.24	2770	5803.82	2640.5	2126.19	4766.69	1037.13	374.42

Table 7. Storing cost & net profit for BADC cold storage

Name of Cold storages	Buying rate (Tk/ton)	Actual amount of stored (ton)	Total cost of product (Tk.)X 1000	Selling rate (Tk./ton)	Valuation of the stored product (Tk.)X 1000	Gross profit (Tk.)X 1000	Fixed cost (Tk.)X 1000	Variable cost (Tk.) X 1000	Total storing cost (Tk.) X 1000	Net profit (Tk.) X 1000	Profit (Tk./ton)
BADC cold storage	8100	508.2	4116.42	14700	7470.54	3354.12	2280	1042.76	3322.76	31.36	61.71

The cost analysis of private cold storage and BADC cold storage are presented in Table 6 and 7. It is found that none of the cold storages suffered losses, but the profit (Tk/ton) is comparatively less in Chowdhary cold storage Ltd. and Himaddri cold storage Ltd. than the Kisan Himagar Ltd. and Northan cold storage Ltd. The main reason for this situation was high over head cost and operating cost. It is also found that the profit (Tk/ton) in BADC cold storage is very less than the private cold storage. The main reason for that the storing cost of BADC cold storage is higher than the private cold storage. Many of the post harvest handling such as grading, sorting, cleaning and transporting are not done in privately owned cold storages.

### **CONCLUSION**

The present study indicates that there are no special problems on the technological side regarding the cold storage in Bangladesh. But for smooth trouble free operation they need uniform and regular supply of electricity and

transportation facilities. Comprehensive plan to mitigate these problems will not only help growth of cold storage business but will also help the growth of production of potatoes. Therefore, cold storage facilities can be effectively used for storage of potato in Bangladesh.

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