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Economic Analysis of Chilli Cold Storage Units in Khammam District, Telangana

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Abstract

The present study looks into the economics of chilli cold storage units in Khammam district of Telengana. For the purpose of study, 39 cold storages were chosen in which 13 were large sized, 17 were medium sized and nine were small sized units. Analysis of costs and return, net present value, benefit cost ratio and internal rate of return were used for economic investigation. The total investment incurred in setting up of large, medium and small size cold storage units were Rs.8 crore, 5.5 crore and 4.5 crore, respectively. The total cost incurred was estimated as Rs.120.2/bag in large cold storage units, Rs.117.64/bag in medium sized cold storage units and Rs.128/bag in small sized cold storage units. The study emphasized on the need for initial capital support in order to ensure establishment of more number of cold storage units in various locations across the country.

Keywords: Cold storage, Net present value, Internal rate of return, Benefit cost ratio

JEL Code: Q02, Q10, Q13

Introduction

The present study showed that one third of all food produced in emerging markets is lost or wasted between the farm and the table. If we look at the case of India India alone the total value of lost food is estimated to be around $4.5bn/ annum. One major reason for this loss is the lack of 'cold chains' in rural areas- where production happen. Cold chains help to avoid losses by spoilage in between the journey from point of harvest to the ultimate consumer. They provide refrigerated storage and distribution activities (https://shellfoundation.org/).

Though there are lot of potential benefits to the farmers as well as cold chain entrepreneurs, there is a noticeable lack of investment in the cold storage infrastructure development in the country. The total capacity of refrigerated storage around the world was 719 million cubic meters in 2020, which is 16.7% more than capacity detailed in 2018(Global cold storage capacity report) North America and China accounted for most of the increment in detailed capacity since 2018. The USA was the single biggest nation having a capacity of 156 million cubic meters, followed by India at 150 million cubic meters and China at 131 million cubic meters. Canada, Brazil and, Netherlands together had normal cold storage capacity estimates of more than 100,000 cubic meters (Global Cold Chain Alliance, 2020)

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According to the data from Indiastats, the number of cold storages is highest in Uttar Pradesh with a capacity of 14545618 MT followed by Gujarat with 3790311 MT and Punjab with a capacity of 2282626 MT. The lowest number of cold storages is in Lakshadweep with a capacity of 15 MT followed by Sikkim with capacity of 2100 MT and Arunachal Pradesh with 6000 MT

Chilli is an important commercial crop in Telangana, and availability of cold chains can ensure better returns to chilli farmers. In 2019-20, Telangana ranked second in chilli area, production and productivity with area of 0.85 lakh hectares (2.10 lakh acres), production 3.28 lakh tonnes and productivity 3859 Kg/ha (1561 Kg per acre) respectively. Chilli area and production in Telangana accounts for 11.59 percent and 17 percent of all India area and production respectively. The major chilli growing districts are Khammam, Mahabubabad, Gadwal, Suryapet and Warangal (Rural). There is good demand for chilli hybrid varieties like 334 and Teja in international market. Presently, in Andhra Pradesh and Telangana, around 5.40 lakh tonnes chilli was in cold storages. There is a good demand for cold storages in Khammam as it has highest area and production of chilli in Telangana state. The study was conducted in the Khammam district of Telangana state. The study mainly concentrated on economic analysis, investment pattern, costs and returns, business analysis of different cold storages which were divided into three groups based on the capacity of the cold

storage i.e., small medium and large. (PJTSAU,2021)

Data Sources and Methodology

The current study is based on primary data collected from cold storage entrepreneurs in Khammam district of Telangana. The Khammam area lies between 16°45" and 18°35" north scope and 79°47" and 80°47" east longitude. Khammam area in Telangana state is purposively chosen for the study as it is popular for red chillies and has the greatest number of cold storage units, particularly for red chilli. The Khammam district has 39 cold storages which is the highest in number in Telangana. There were distinctive sizes of cold storage units like large, medium and small cold storage capacity units in Khammam district based on the capacity. Among the selected 39 cold storages, 13 were large units, 17 medium units and 9 small units. The following classification is followed as used in Tarun (2019)

1. Small scale cold storage unit: Cold storage units with a capacity of less than 80000 bags.
2. Medium-scale cold storage unit: Cold storage units with a capacity of 80001- 100000 bags.
3. Large scale cold storage unit: Cold storage units with a capacity of more than 100000 bags.

The information collected were displayed in tabular form to encourage easy comparison. Simple tabular analysis was employed for analysis of the capital investment, cost and return structure, commodities stored in the cold storage units and constraints in cold storage operation. For the project feasibility analysis, the discounted cash flow technique which has the advantage of reducing cash flow to a single point of time was used to facilitate the test of feasibility. The discounting procedure helps to estimate the present value of an amount either received or paid out in the future. The discounting factor permits the determination of the present value and has found application in the evaluation of the project. Three financial feasibility techniques were used in the study to evaluate the feasibility of investment in cold storage units viz; Net Present Value (NPV), Internal Rate of Return (IRR) and Benefit Cost Ratio (BCR). In cold storage operations, one bag equals 50 kg. The depreciation was calculated by the straight-line method with the expected useful life for machinery is ten years and for building the useful life is twenty years. Interest on fixed capital is measured at a rate of 10% per year. The study was based on the primary data collected from the respondents during January and February of 2021 from Khammam district of Telangana state.

Results and Discussion

Investment Details of the Selected Cold Storage Units

The average investment encountered for setting up a large size cold storage unit was Rs. eight crores. Out of the total initial investment, investment on land was Rs.2.7crores (33.75%), the investment in building, machinery and equipment was Rs.4.5 crores (56.25%) and Rs.70 lakhs (8.75%) respectively. The investment in other fixtures like packing tools, loaders, weighing machine, etc. amounts Rs. 10 lakhs (1.25% of the total cost).

The average investment costs of a medium sized cold storage unit were Rs 5.5 crores. Out of total investment, the investment on land accounted for Rs. 1.7 crore (30.9 %). The investment in the building was Rs. 3.2 crores (58.2%) whereas the investment on machinery and equipment was Rs. 50lakhs (9.09%) and investment on other fixtures like packing tools, loaders, weighing machine, etc. amounted to Rs.10lakhs (6.40%) of the total cost respectively.

The average investment incurred for setting a small size cold storage unit was Rs. 4.5 crores. The total investment cost incurred on land, building, machinery and equipment was Rs.1.1crore (24.6%), Rs.2.9 crores (65.4%) and Rs. 3950000 (8.7%) respectively. It was seen that the expenditure on other fixtures was Rs. 500000 (1.1%of the total cost of investment).

Storage Cost Details of the Selected Cold Storage Units

The fixed and variable costs were listed out according to Kart (2014). The fixed and variable cost incurred was estimated as Rs.50.8/bag (42.23%) and Rs.69.4/bag (57.4%) in large cold storage units. The main components of the fixed cost of large cold storage units were depreciation on the building which was about Rs.15.5/bag (12.89%) of

Table 1. Investment details of the selected cold storage units **(amount in Rs.)**

Particulars	Large	Medium	Small
Land	270(33.75)	170(30.9)	111.05(24.6)
Building	450(56.25)	320(58.2)	294.45(65.4)
Machinery and equipment	70(8.75)	50(9.09)	39.5(8.7)
Other fixtures	10(1.25)	10(1.81)	5(1.11)
Total Fixed Capital	800(100.00)	550(100.00)	450(100.00)

Note: Figures in parenthesis indicate per cent to total

total cost and salary to permanent employees contributed Rs.13.2/bag (10.98%). The insurance premium was Rs.8/ bag (6.65%). Depreciation on machinery and equipment was Rs. 4.8 (3.99%). The interest on fixed capital was evaluated at the rate of 10 percent which was Rs.4.6/bag (3.82%) of total storage cost. The license fee was Rs.1.5/bag (1.24%) and other costs worked out to Rs.3.2/bag (2.66%). Out of the total variable cost, the labour charges were the major cost component, which was Rs.35/bag (29.11 percent of the total storage cost). The electricity charges were Rs.29.5/bag (24.54%) of the total storage cost. The spoilage cost of the stored product was Rs.0.5 which was 0.41 percent. Water and fuel charge Rs. 2.80/bag (2.32%). Repairs, maintenance and the stationary cost amounted to Rs.1.5/bag (1.24%) and Rs.0.10/bag (0.08 %).

The fixed and variable cost incurred were worked out to Rs. 45.9/bag (39.1%) and Rs. 71.74/bag (60.9%) in medium cold storage units. The main component of the fixed cost of the medium scale cold storage unit was depreciation on the building which was about Rs.14.4/bag (12.24%) of total cost and salary to permanent employees contributed Rs.11.52/bag constituting 9.79 percent. The interest on fixed capital was Rs.4.1/bag accounting for 3.48 percent. The depreciation on machinery and equipment was Rs.4.5/bag (3.825%) for medium scale cold storage units. The insurance premium was Rs.8/bag that is about 6.8 percent of the total storage cost. License fee Rs.1.2/bag (1.02%) and other costs which was worked out to Rs.2.2/bag (1.87%). Of the total variable cost, the labour charges amounted to Rs.35/bag which was the major cost component that constituted about 29.75 percent of the total storage cost. The next important variable cost incurred was the electricity charge which was Rs.31.2/bag and which formed about 26.52 percent of the total storage cost. In cold storage, damage and compensation costs add to the variable cost as frequent power failure leads to the spoilage of the stored product and this cost amount to Rs.0.5/ bag which was 0.425 percent of the total storage cost. Water and fuel charges incurred a cost of Rs.3.1/bag which was 2.635 percent of the total storage cost. The cost of repairs and maintenance of the cold storage plant and equipment was Rs.1.7/bag which formed 1.445 percent of the total cost. Stationery cost was Rs. 0.17/ bag (0.144 percent of the total cost).

The fixed and variable cost incurred in small scale cold storage units were Rs. 53.9/bag (42.01%) and Rs. 74/bag (57.9%) respectively in small cold storage units. The main

Table 2. Details of the storage cost of the sampled cold storage units per annum per bag (Rs./bag)

Particulars	Large	Medium	Small
Fixed cost			
Depreciation on building	15.5(12.89)	14.4(12.24)	16.5(12.89)
Depreciation on machinery	4.8(3.99)	4.5(3.825)	4.43(3.4)
Payment to permanent employees	13.2(10.98)	11.52(9.79)	16.2(12.65)
License fees	1.5(1.24)	1.2(1.02)	1.25(0.97)
Insurance premium	8(6.65)	8(6.8)	8(6.25)
Others	3.2(2.63)	2.2(1.87)	2.6(2.03)
Interest on fixed capital@10 %	4.6(3.82)	4.1(3.48)	4.9(3.82)
Total fixed cost	50.8(42.2)	45.9(39.1)	53.9(42.01)
Variable cost			
Electricity charges	29.5(24.54)	31.2(26.52)	33(25.78)
Water and fuel charges	2.8(2.32)	3.1(2.635)	3.25(2.53)
Wages for labour	35(29.15)	35(29.75)	35(27.34)
Repairs and maintenance	1.5(1.24)	1.7(1.445)	1.8(1.47)
Fumigation charges	0.076(0.063)	0.076(0.0646)	0.076(0.06)
Damage and compensation	0.5(0.41)	0.5(0.425)	0.625(0.488)
Stationary	0.1(0.083)	0.17(0.144)	0.18(0.144)
Total variable cost	69.47(57.8)	71.74(60.9)	74(57.9)
Total storage cost	120.2(100.00)	117.64(100.00)	128(100.00)

Note: Figures in parenthesis indicate per cent to total

component of the fixed cost of a small cold storage unit was depreciation on building which was Rs. 16.5/bag with 12.89 percent of total cost and salary to permanent employees was Rs.16.2/bag (12.65%). The Insurance premium worked out to Rs. 8/bag which accounted for 6.25 percent. The depreciation on machinery and equipment was Rs. 4.43 (3.4%). The interest on fixed capital was evaluated at the rate of 10 percent which worked out to Rs.4.9/bag about 3.82 percent of total storage cost. The other components of fixed cost were license fee Rs.1.25/bag (0.97%) and other costs, which worked out to Rs.2.6/bag (2.03%). When it comes to variable costs, the labour charge was Rs.35/bag which was the major cost component (27.34%) of the total storage cost. The next was electricity which was Rs.33/bag with 25.78 percent of the total storage cost. The fumigation charges were 0.076 (0.06%). Damage and compensation cost was Rs.0.625/bag (0.4888%). Water and fuel charges add to the storage cost in the absence of power leading to a cost of Rs.3.25/bag (2.53%). The cost of repairs and maintenance of the cold storage plant and equipment was Rs.1.8/bag (1.4%). Stationery of about Rs. 0.18/ bag was consumed which formed 0.144 percent of the total cost.

Returns from Sampled Cold Storage Units

The maximum number of bags stored in a large cold storage unit in a year were 130000. The total cost of storage was Rs.15708300 lakhs, the cost per bag worked out to be Rs.120.2. The gross return generated by the cold storage unit was Rs. 24960000 per year and the total returns per bag being Rs.192 per bag. The net return was Rs. 9251700 per year. The BC ratio was 1.58. The maximum number of bags stored in a medium cold storage unit in a year was Rs.100000. The total cost of storage was Rs.11777200 lakhs per year, the cost per bag worked out to Rs.117.64. The gross return generated by the storage was Rs.19200000 per year and the total returns per bag being Rs.192 per bag. The net return was Rs. 7422800 per year. The BC ratio was 1.63. The maximum number of bags stocked in a small cold storage unit in a year was 80,000. The total cost of storage was Rs.10243600 per year and the cost per bag was worked out to Rs.128. The gross returns generated by the storage was Rs. 15360000 per year and the returns per bag worked out to Rs.192 per bag. The net return was Rs. 5120000 per year. The BC ratio was 1.4.

Business Analysis of Cold Storage Units

Cold storage units once after establishment, continues to generate income for about 30 years. To establish a cold storage unit, the initial investment depends on the capacity of the plant. The techniques used in the present study for analysis were Net Present Value, Benefit-Cost Ratio and Internal Rate of Return to assess the financial feasibility of cold storage units.

Small, medium and large cold storage units with an average storage capacity of 80000 bags, 100000 bags and 130000 bags of chilli respectively were taken for the study to assess the financial feasibility. The flow of cost and returns were used for analysis.

The Net Present Value (NPV) is a tool that helps to evaluate the benefits and costs incurred during the project

Table 3. Cost and returns structure of large cold storage unit

S.No.	Particulars/ Unit	Large	Medium	Small
1	Quantity stored (Bags)	130000	100000	80000
2	Total cost (Rs/yr)	15708300	11777200	10243600
3	Cost/bag (Rs/bag)	120.2	117.64	128
4	Gross return (Rs/yr)	24960000	19200000	15360000
5	Total return (Rs/bag)	192	192	192
6	Net return (Rs/yr)	9251700	7422800	5120000
7	Net return (Rs/bag)	71.8	74.36	64
	Benefit-cost ratio	1.58	1.63	1.4

Table 4. NPV, BCR, IRR of different cold storage units

S.No.	Particulars	Units	Large	Medium	Small
1	Net Present Value (NPV)	Rupees	73,308,512	62929625	49,343,700
2	Benefit Cost Ratio (BCR)	-	1.58	1.63	1.4
3	Internal Rate of Return (IRR)	Percent	30.63	34	34

Table 5. Capacity utilization by cold storage units

Type of cold storage unit	Storage potential (No. of bags)	Capacity utilization over years (percent)					Average
		2019-20 (%)	2018-19 (%)	2017-18 (%)	2016-17 (%)	2015-16 (%)	
Large	130000	88.16	86.5	84.2	90.02	91.12	88.0
Medium	100000	90.31	89.0	91.5	90.27	91.79	90.57
Small	80000	96.9	95.66	97.25	94.08	96.12	96.0

life. In this study, NPV was calculated to show the money that would be generated by a project at a given discount rate. The NPV was calculated at 14 percent discount rate as done by Ashwini (2005). The NPV of a large-scale cold storage unit was Rs. 73,308,512 and for medium scale it was Rs. 62929625 whereas for a small-scale unit NPV worked out to Rs. 49,343,700. The Net present value of cold storage units implies the financial feasibility of the cold storage units and if it is positive the project is accepted.

Benefit-Cost (BC) Ratio is another tool used in cost-benefit analysis to summarize the overall relationship between the relative costs and benefits of a proposed project. If a project has a BC ratio greater than 1.0, the project is expected to deliver a positive net present value to a firm. The BC ratio of the large, medium and small-scale cold storage unit were 1.58, 1.63 and 1.4 respectively at a 14 percent discount rate, which was more than one indicating the worthiness of the investment.

Internal Rate of Return (IRR) is a tool used in capital budgeting to estimate the profitability of potential investments. It's the discount rate that makes the net present value (NPV) of all cash flows from a particular project equal to zero. The internal rate of return was worked out to 30.63 percent for large scale and 34 percent for medium scale and 34 percent for small scale storage units. The results were in line with that of Tarun (2019). The high values of IRR clearly show potential to have better returns.

Capacity Utilization by Cold Storage Units

Capacity utilization details of cold storage units in the study area are given in table 5. The maximum storage capacity of large cold storage units in the area was 130000 bags of chilly (50 kg each). For medium and small cold storage units it was 100000 bags and 80000 bags respectively. While looking into the capacity utilization by the cold storage units for the past five years, small cold storage units was found to have an average capacity utilization of 96%, followed by medium cold storage units (90.57%) and large cold storage units (88.0%). Same trend was seen for the most recent (2019-20) year data also.

Conclusion and Policy Implications

Cold storage units are a win-win situation for both farmers and cold storage entrepreneurs. Safe storage is assured for farmers in order to help them to fetch better price by timing the sale. At the same time, it provides good income generating opportunity for cold storage entrepreneurs. The study results showed that the total investment encountered for setting of a large size cold storage unit in the study area was Rs.8 crores. The fixed and variable cost incurred was estimated as Rs. 50.8/bag (42.23%) and Rs. 69.47/ bag (57.766%) in large cold storage units. The total returns generated by the storage was Rs 24960000 per year and the returns per bag being Rs.192 per bag.For a medium sized cold storage unit the total investment cost was Rs 5.5 crores. The fixed and variable cost incurred was estimated as Rs. 45.9/ bag (39.1%) and Rs. 71.74/bag (60.9%) respectively. The total return generated by the storage was Rs. 19200000 per year.The total investment incurred for setting the small size cold storage unit was Rs. four crores. The fixed and variable cost incurred was estimated as Rs.53.9 /bag (42.01%) and Rs 74/bag (57.9%) in small cold storage units respectively. The total returns generated by the storage were Rs.15360000 per year. The Net Present Value (NPV), Benefit Cost Ratio (BCR), Internal Rate of Return (IRR) of a large cold storage unit worked out to Rs 73308512.91, 1.58 and 30.63 percent respectively. For medium cold storage unit it was Rs 62929625.32, 1.63 and 34 percent and for small cold storage units the same was Rs 49343700.25, 1.4 and 34% percent respectively. Better capacity utilization (even upto 96%) was seen for cold storage units in the study area. This shows its acceptability among the farmers. By giving support for initial capital to the entrepreneurs, more cold storage units can be made in various locations across the country. Also, more awareness creation among the farmers need to be done in order to ensure better usage of these facilities.

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