

PROJECT PROPOSAL FOR
PUSA ZERO ENERGY COOL CHAMBERS

DIRECTOR OF HORTICULTURE,ORISSA

INTRODUCTION:

Most of the horticultural crops including fruits and vegetables begin to deteriorate shortly after harvest. Refrigerated cool storage is considered to be the best method of storing fruits and vegetables. However, this method is not only highly energy intensive but also involves huge capital investment. The present trend world over is to develop a simple low cost cooling system for storage of fruits and vegetables. In order to overcome the problem of on farm storage, low cost environment friendly Pusa Zero energy cool chambers have been developed. The greatest importance of this low cost cooling technology lies in the fact that it does not require any electricity or power to operate and all the materials required to make the cool chamber are available locally, easily and cheaply. Even an unskilled person can install it at any site, as it does not require any specialized skill. Most of the raw materials used in cool chamber is also re-usable. The cool chamber can reduce the temperature by 10 – 15⁰ C of ambient temperature and maintain high relative humidity of above 90% throughout the year that can increase the shelf life and retain the quality of fresh horticultural produce.

Pusa Zero energy cool chamber can retain the freshness of the fruits and vegetables for a short period. Small farmers can easily construct these chambers near their houses or fields to store their harvest for a few days before despatching them to the wholesale market. In this way, the farmers can avoid the clutches of the middlemen and will not be forced to make any distress sale. In India 90% of horticultural produce is sold in fresh form. Due to the presence of middle men, the price of horticultural raw material is 60-100% higher in mandis than in growing areas. By avoiding middle men the poor farmers can be able to get remunerative price of their produce.

Objective

- To retain the freshness of the fruit & Vegetable for the short period of time.
- To get remunerative price for Horticultural product .
- To avoid the entry of the middle man into the transaction business.

Executive Summary

Name of the Organization	Directorate of Horticulture, Orissa, Bhubaneswa
Status	Department of Agriculture, Govt. of Orissa
Address for Correspondence	Directorate of Horticulture, IRC, Village, Bhubaneswar-15
Project Type	Farmers Awareness Programme on Fruits & Vegetable Preservation.
Location	Covers 24 Districts.
Cost of the Project	20,20,000 (1000 nos. during 2011-12 @ 50% subsidy i.e. Rs.2000/- of total project cost Rs.4000/- per unit and 1% adm. cost)
Implementation	The Project will be implemented by Horticulturist & A.H.Os.
Means of Finance	100% grant to be released by Govt. of India, Deptt. of Agriculture under RKVY (NADP).

Cost Structure:

Sl. No.	Item	Amount
1.	Bricks (400 nos.)	Rs.1,000.00
2.	Sand	Rs.100.00
3.	Bamboo, Khaskhas, etc. for top cover	Rs.300.00
4.	Thatched shed	Rs.500.00
5.	Water tank, pipes, tubes poly sheet etc.	Rs.600.00
6.	Plastic crates (6 nos.)	Rs.1200.00
7.	Labour	Rs.300.00
	Total :	Rs.4,000.00

(Rupees Four thousand) only.

Total Budget Outlay :

Total 1020 Nos. of Structure @ Rs.4,000/- comes to Rs.40,80,000/- which will be given in 50% subsidy to farmers it comes to 20,40,000/- /-.

CONSTRUCTION:

1. Select an upland having a nearby source of water supply.
2. Make floor with brick 165 cm x 115 cm.
3. Erect the double wall to a height of 67.5 cm leaving a cavity of 7.5 cm.
4. Drench the chamber with water.
5. Soak the fine river bed sand with water.
6. Fill the 7.5 cm cavity between the double walls with this wet sand.

7. Make a frame of top cover with bamboo (165 cm x 115 cm) fixed with khas khas/straw/dry grass
 8. Make thatch/shed over the chamber in order to protect it from direct sun or rain.
- (b) Operational Method:
1. Make the sand, bricks and top cover of the chamber wet with water.
 2. Water twice daily (morning and evening) in order to achieve desired temperature and relative humidity (or) Fix a drip system with plastic pipes and Micro tubes connected to an overhead water source.
 3. Store the fruits and vegetables in this chamber by keeping in perforated plastic crates.
 4. Cover these crates with a thin polythene sheet (100 or 200 gauge).
 5. The cool chamber should be reinstalled once in 3 years with new bricks utilizing the old bricks for other purpose.

Advantages:

1. This is an on-farm storage chamber working in the principle of evaporating cooling.
2. Cool chambers can be constructed easily any where with locally available materials like bricks, sand, bamboo, khaskhas/straw, gunny bags with a source of water.
3. The chamber can keep the temp. 10-15⁰ C cooler than the outside temp and maintain about 90% RH.
4. Multilocation studies at different agro climatic zones have been found to be very useful.
5. It is most effective during drying season.
6. Zero energy cool chambers can retain the freshness of the fruits and vegetables for a short period.
7. Small farmers can easily construct these chambers nearer to their houses or storage passage to store a few days after harvest before sending to the market.

Essential Precautions:

1. Select a site having natural air flow.
2. Construct the chamber in an elevated place to avoid water logging.
3. Use clean, unbroken bricks with good porosity.
4. Use clean sand free from organic matters, clay etc.
5. Always keep the bricks and sand saturated wet with water.
6. Construct under a thatch to avoid direct exposure to sun light.
7. Use plastic crates for storage, avoid bamboo baskets, wooden fibre board/boxes, gunny bags etc.
8. Prevent water drops coming in contact with stored materials.
9. Keep the chamber clean and disinfect the chamber periodically with permitted insecticides/fungicides/chemicals to protect from fungus insects/pests, reptiles etc.

Storage life of fruits and vegetables:

Crop	Month	Cool Chamber		Room Temperature	
		Days	Weight loss %	Days	Weight loss %
Mango	June-July	9	5.04	6	14.90
Banana	Oct-Nov	20	2.50	14	4.80
Sapota	Nov-Dec	14	9.46	10	20.87
Lime	Jan-Feb	25	6.00	11	25.00
Kinow	Dec-Feb	60	15.30	14	16.10
Potato	Mar-May	90	7.67	46	19.08
Tomato	April-May	15	4.42	7	18.62
Amaranth	May-June	3	10.98	1	49.80
Methi	Feb-March	10	10.80	3	18.00
Parwal	May-June	5	3.89	2	32.36
Okra	May-July	6	5.00	1	14.00
Carrot	Feb-March	12	9.00	5	29.00

ECONOMICS FOR PUSA ENERGY COOL CHAMBER

- 1) Capacity of storage 100 kg.
- 2) Cost of structure Rs.4,000/-
- 3) Depreciation cost per annum Rs. 400/-
- 4) Subsequent maintenance from 2nd year – Rs.80/- + Rs.80/-
- 5) Life span of the structure - 3 years

A) Depreciation :

- i) a) Total cost of structure Rs.4000/-
- b) Life span of the structure - 3 years
- c) Scrap value @ 10% - Rs. 400/-

$$\text{Depreciation} = 4000 - 400 = 3600/3 = 1200/-$$

- ii) Annual maintenance @ 2% of the project cost – Rs.80/-
- iii) Interest on investment considering the repayment to be made in 3 years @ 10% per annum.

$$\text{Total fixed cost} = \frac{4000 \times 10}{100} = \text{Rs.400/-}$$

$$\text{Total fixed cost} = (i) + (ii) + (iii) = 1200 + 80 + 400 = \text{Rs.1680/-}$$

(B) Operating cost

i)	Transportation of commodity	..	Rs.25/-	}	Rs.100/-
ii)	Unloading, bagging	..	Rs.25/-		
iii)	Watch & Ward	..	Rs.50/-		
Total operating cost			..A + B = 1680	+100 = Rs.1780.00	

(C) Benefits

Sl. No.	Sale of commodity	Brinjal (July-Sept.)	No.of Storage (N)	Tomato (Oct-Dec)	No. of Storage (N)	Bhendi (Jan-Mar)	No. of storage (N)	Parwal (Apr – June)	No. of storage (N)
1	2	3	4	5	6	7	8	9	10
i)	Pre-Project value (The sale price at the time of harvest)	@ Rs.800/- per Qtl. = Rs.800/-	7	@ Rs.400/- per Qtl. = Rs.400/-	7	@ Rs.800/- per Qtl.	7	@ Rs.1000/- per Qtl	7
ii)	Anticipated return after project sale price (10% loss) on an average of 4-6 days	@ Rs.1000/- per Qtl. = 0.9x1000 = Rs.900/-	7	@ Rs.600/- per Qtl. = 0.9 x 600 = 540	7	@ 1000/- per Qtl. = 0.9x1000 = Rs.900/-	7	@ Rs.1250/- per Qtl. = 0.9 x 1250 = 1125	7

Benefit = (ii – i) x N = Rs.700/- Rs.980/- Rs.700/- Rs.875/-

Total benefit per year = Rs.700/- + Rs.980/- + Rs.700/- + Rs.875/- = Rs.3255/-

Cost: benefit = Rs.1780/- : Rs.3255/- = 1:1.83

District wise projection Physical Target of (Pusa) Zero Energy Cool Chamber under RKVY for the year 2011-12

Horticulturist wise break up of pusa Zero Energy Cool Chamber 2011-12

Sl. No.	Name of the District	Name of the Hort./AHO	Target(2011-12)
	Balasore	Hort.Balasore	20
	Bhadrak	Bhadrak	35
	Keonjhar	Keonjhar	15
		Anandapur	10
		Champua	10
		AHO Kuanr farm	5
	Kalahandi	Bhwanipatna	12
		Dharamgarh	11
	Nuapada	Khariar	12
	Koraput	Koraput	10
		Jeypur	-

	Malkanagiri	Malkanagiri	10
		Chitrakonda	5
	Nowrangpur	Nawarangpur	20
	Rayagada	Rayagada	10
		Gunpur	10
	Phulbani	Phulbani	25
		Baliguda	45
		G.Udayagiri	40
		Kotagarh	15
	Boudh	Boudh	50
	Mayurbhanj	Baripada	140
		Karanjia	15
		Udala	40
		Rairangpur	20
		kalikaprasad	5
	Puri	Puri	5
		Nimapara	20
		Sakhigopal	20
		Konark	20
		Brahmagiri	10
	Khurda	Khurda	-
		Bhubaneswar	5
		Banapur	5
	Nayagarh	Nayagarh	-
		Khandapara	5
	Sambalpur	Sambalpur	20
		Kuchinda	10
		Rairakhol	10
	Deogarh	Deogarh	50
	Baragarh	Bargarh	50
		padampur	20
	Jharsulguda	Jharsuguda	20
	Sundargarh	Sudargarh	30
		Panposh	20
		Lahunipara	10
	Jagasinghpur	Jagatsinghpur	10
		Tirtol	10
	Kendrapada	Kendrapara	10
	Jajpur	Jajpur	50
	Total		1000

Horticulturist wise break up of pusa Zero Energy Cool Chamber under RKVY 2011-12 & 2012-13

Sl. No.	Name of the District	Name of the Hort./AHO	Target (2011-12)	Target (2012-13)	Total
	Balasore	Hort.Balasore	10	10	20
	Bhadrak	Bhadrak	17	18	35
	Keonjhar	Keonjhar	8	7	15
		Anandapur	5	5	10
		Champua	5	5	10
		AHO K/F	2	3	5
	Kalahandi	Bhwanipatna	6	6	12
		Dharamgarh	6	5	11
	Nuapada	Khariar	6	6	12
	Koraput	Koraput	5	5	10
	Malkanagiri	Malkanagiri	5	5	10
		Chitrakonda	3	2	5
	Nowrangpur	Nawarangpur	10	10	20
	Rayagada	Rayagada	5	5	10
		Gunpur	5	5	10
	Phulbani	Phulbani	13	12	25
		Baliguda	22	23	45
		G.Udayagiri	20	20	40
		Kotagarh	8	7	15
	Boudh	Boudh	25	25	50
	Mayurbhanj	Baripada	70	70	140
		Karanjia	7	8	15
		Udala	20	20	40
		Rairangpur	10	10	20
		kalikaprasad	3	2	5
	Puri	Puri	2	3	5
		Nimapara	10	10	20
		Sakhigopal	10	10	20
		Konark	10	10	20
		Brahmagiri	5	5	10
	Khurda	Bhubaneswar	3	2	5
		Banapur	2	3	5
	Nayagarh	Khandapara	3	2	5
	Sambalpur	Sambalpur	10	10	20
		Kuchinda	5	5	10
		Rairakhol	5	5	10
	Deogarh	Deogarh	25	25	50
	Baragarh	Bargarh	24	26	50
		padampur	10	10	20
	Jharsulguda	Jharsuguda	10	10	20
	Sundargarh	Sudargarh	15	15	30
		Panposh	10	10	20
		Lahunipara	5	5	10
	Jagasinghpur	Jagatsinghpur	5	5	10
		Tirtol	5	5	10

	Kendrapada	Kendrapara	5	5	10
	Jajpur	Jajpur	25	25	50
	Total		500	500	1000