Mission for Integrated Development of Horticulture

Operational Guidelines Cold-chain Infrastructure

“Nodal Officers for Cold-chain”

09-May-2014
The Two Big Gambles

- Partial Monsoon proofing on account of input management.
- Agri-Sciences, Climate watch, Micro-irrigation, Weather Insurance, etc.

Weather

and the Market

- Post Harvest Supply Chain Management (cold-chain).
- Extend Reach to New Markets, opportunity of scale.
Potato

India: Per Capita Potato Production, 1961 - 2007

Major Potato Producing States in India

�آلू
What is involved?

Harvest → Farm Aggregation → Transport → Unloading → Receiving → Quality Check, weight, Pay → Selection, Sort, Trim, Dehand, etc → Wash, Treat, pre-condition → Segregate Flow by Grade, QC → Package, Brand, Marking QC

Pre-cool & condition

Cold Storage Hub → Transport → Cold-chain Distribution Centre → Ripening / Deconsolidate → Cold BULK WAREHOUSE

Cold Storage Hub

Retail to Consumer

Process → Brand → Product Cold Store

Pre-coolers and Staging Cold Rooms

आनुषंगिक कार्य
See it like a conduit

पाइप लाइन

Each Component is now supported under MIDH

Packhouses & Precoolers

Temperature controlled Distribution Hubs

Wholesalers/Retailers Consuming Markets

Cold Warehouses

Waste
Integrated

Modern Pack House
- 15 MT per day
- Supplies cold & normal chain
- 7 units at Rs. 90 lakh each = 630 lakhs

Long Haul Transport
- 10-15 MT loads
- 2-3 days TAT
- 20 units at Rs. 30 lakh each = 600 lakhs

Distribution Hub (Cold store)
- 1000 MT capacity
- 10% or 100 MT for Horti
- At Rs. 10,000 per ton = 100 lakhs

Retail distribution
- 2-4 MT loads
- Daily Delivery

Retail / Merchandising
- Temperature controlled
- Vending carts, cabinets

Component | Units | Cost | % of cost
---|---|---|---
Packhouses | 7 | 630 | 47%
Reefers units | 20 | 600 | 45%
Cold Store (MT) | 1000 | 100 | 8%
TOTAL COST | | 1330 lakhs |
| Subsidy 35% of project cost (general areas); 50% in Hilly and scheduled areas | Integrated Packhouse with mechanised facility for S&G, Washing, etc | ₹50 lakh per unit; min size of 9m x 18m |
| | Pre-cooling unit | ₹25 lakh per unit of 6 MT |
| | Cold room (Staging) | ₹15 lakh per unit of 30 MT |
| | Mobile pre-cooling unit | ₹25 lakh per unit |
### MIDH Assistance

**Credit Linked back-ended**

<table>
<thead>
<tr>
<th>Subsidy</th>
<th>Reefer Vehicles</th>
<th>Primary/Minimal Processing units</th>
<th>Ripening Chambers</th>
</tr>
</thead>
<tbody>
<tr>
<td>35% of project cost (general areas); 50% in Hilly and scheduled areas</td>
<td>₹26 lakh/ 9MT unit (NHM)</td>
<td>₹25 lakh/unit</td>
<td>₹1 lakh/MT for max capacity 300MT</td>
</tr>
</tbody>
</table>

Credit linked back-ended subsidy and and only for those units which adopt energy efficient technologies and the Technical standards, parameters and protocol issued by the Department.
MIDH Assistance

Credit Linked back-ended

Subsidy
35% of project cost (general areas); 50% in Hilly and scheduled areas

Cold Store

Type 1: Basic, large chambers (of >250 MT each) for single product storage / temperature zone.

- ₹ 8000/MT for max capacity 5000MT (NHM)
- ₹ 7600/ MT for capacity 5001 to 6500 MT (NHB)
- ₹ 7200/MT for capacity 6501 to 8000 MT (NHB)
- ₹ 6800/MT for capacity 8001 to 10000 MT (NHB)

These type of stores are usually bulk long term storage (potato, spices, pulses, etc) for loading of unpackaged produce, brick & mortar mezzanine structures. Will have handling area for seasonal loading, air monitoring mechanism for controlled replenishment/ventilation.

INTEGRATED POST HARVEST MANAGEMENT
MIDH Assistance

Credit Linked back-ended

Subsidy 35% of project cost (general areas); 50% in Hilly and scheduled areas

Cold Store

Type 2: multi-product use, >6 chambers (of <250 MT each) for various product types with basic material handling equipment

- ₹ 10000/MT for max capacity 5000MT (NHM)
- ₹ 9500/MT for capacity 5001 to 6500 MT (NHB)
- ₹ 9000/MT for capacity 6501 to 8000 MT (NHB)
- ₹ 8500/MT for capacity 8001 to 10000 MT (NHB)

These type of stores are usually distribution hubs for packaged and ready to retail produce, of PEB structure. Will additionally have pallet lifts, fork lifts, pallet racks or bins, enclosed docks/ante-room, etc.
<table>
<thead>
<tr>
<th>Subsidy 50% of capital cost</th>
<th>Functional Pack house/ on farm collection unit</th>
<th>₹ 4 lakh per unit; size of 9m x 6m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Evaporative / low energy cool chamber</td>
<td>₹ 5 lakh per unit of 8 MT</td>
</tr>
<tr>
<td></td>
<td>Low Cost Onion Storage</td>
<td>₹ 1.75 lakh per unit of 25 MT</td>
</tr>
<tr>
<td></td>
<td>Pusa Zero energy cool chamber</td>
<td>₹ 4000 per unit; size 100 kg</td>
</tr>
</tbody>
</table>
Graders, Packaging Lines
Docks & Levellers
PLC System

**Sensors**
- Temperature
- Pressure
- Humidity
- Current
- Speed

**EXTERNAL SENSE**
- Relay
- Selector
- Pushbutton
- Limit switch
- **Switches**

**Input**

**Action**

**DEVICE CONTROL**
- Motor
- Valve
- Lights
- Switches
- LAN
- SMS
Solar PV Grid interactive

Pay to Grid
- Import Meter
- Fuse switchboard

Solar PV Array
- DC-AC Invertor
- Fuse

Export Meter
- Earn from Grid

- No bank of Batteries to own.
- No need to match PV capacity.
- Minimal change to wiring.
- No more maintenance hassles.
- Lower carbon footprint.
- Offset earnings for DG Fuel.
Geothermal Cooling

- Solar Powered Circulating pumps
- Ground temperature stays nearly constant at 18°C all year around
- Earth as sump – heat transfer from coils

Low cost/renewable energy
Reduction of DTR: \((T_{\text{max}}) - (T_{\text{min}})\) by 20°C
Minimise operating costs.

<table>
<thead>
<tr>
<th>Ambient (°C)</th>
<th>Energy (kwh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>12.8</td>
</tr>
<tr>
<td>30</td>
<td>9.5</td>
</tr>
<tr>
<td>20</td>
<td>6.3</td>
</tr>
<tr>
<td>10</td>
<td>3.1</td>
</tr>
</tbody>
</table>
PCM bank serves as a thermal ‘battery’.
- Continuance in heat transfer and to drying process.
- Low cost energy source, renewable.
Capacity admeasurement:

- for Cold stores, 3.4 cum (120 cuft) chamber volume = 1MT storage capacity
- for reefer trucks, 3 cum (106 cuft) chamber volume = 1MT storage capacity

Beneficiary can apply for a Combination of scheme components under common application where the integration of activities is justified.

The subsidy need not be credit linked for Public Sector Units, Panchayats, Cooperatives, Registered Societies / Trusts and Public limited Companies, provided they meet the remaining share of project cost, out of their own resources.
Intention to promote technology induction for energy efficiency, multi-mode fast track handling and to develop market linked integration.

Assistance to commercial entities and individual entrepreneurs:

- Incentive to promote development.
- Subsidy is aimed to reduce credit burden – not to be mistaken as project financing.
- Cost norms to guide admissible project cost – actual project cost may differ.
**Yearly utilization**

<table>
<thead>
<tr>
<th>Item</th>
<th>2010-11</th>
<th>2011-12</th>
<th>2012-13</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Capacity Utilization (%)</td>
<td>75%</td>
<td>76%</td>
<td>75%</td>
<td>~</td>
</tr>
<tr>
<td>Grid Power (Hours per day)</td>
<td>16</td>
<td>16</td>
<td>17</td>
<td>6% ▲</td>
</tr>
<tr>
<td>DG Fuel Consumed (Ltrs/annum)</td>
<td>18,179</td>
<td>17,437</td>
<td>16,836</td>
<td>7.4% ▼</td>
</tr>
<tr>
<td>Electricity Bill per CS (Rs per year)</td>
<td>15,09,098</td>
<td>16,70,059</td>
<td>19,23,253</td>
<td>27.5% ▲</td>
</tr>
</tbody>
</table>

**On average most CS’s with sanctioned load of 150 – 200 kVA. national average of 167 kVA.**

**In 2012-13, the median electricity bill is INR 19.23 Lakh (per cold store per year) plus median Fuel bill of 9.5 lakhs.**

**Average age of DG sets is 9 years with average capacity of 129 kVA.**

**Adoption of Alternate sources (like wind, solar) very low <5%.**

*Total Cost estimated to be upwards of 30 lakhs per annum*
Greens Packhouse

- Minimal process requirement.
- Preliminary cold wash and packing required.

Diagram:
- Receiving Shed
- Sorting Area
- Washing, Grading Area
- Packing Area
- Precooling & Storage: 1°C / 95% RH
- Shelf Life: 1-3 weeks
Manual sorting grading on conveyor belt or static tables.

Fumigation room to have sulphur extraction; ventilation and scrubbing system.

Shelf Life
3-5 weeks

Precooling & Storage
2°C / 90% RH
Desapping racks added as part of pre-conditioning.

Mango grading washing waxing line to be installed.

For heat treatment solar thermal heaters with electric backup.

Shelf Life
2-4 weeks
External Handling yard for grading, washing, packing.

Fast packing process time critical.

Non cold chain material can bypass cold facility.

Easy to incorporate with other mild chill facility, eg mango.

Can be used to supply local markets with preliminary grading.

Receiving Sorting Shed

Washing, Grading Shed (With water tanks)

Packing Shed

Precooling & Storage
13 °C / 95% RH

Shelf Life
2-4 weeks
1. Receiving Area
2. Dehanding Tank
3. Flotation Tank
4. Air Brush, Weighing
5. Retail Packing, Stickers
6. Box inspection
7. Palletisation Area
8. Dispatch - precooler
Use both Routes to markets

Farm
Collection Sorting Packing Centre

Normal Supply Chain
HUB or Regional Mandi
Local Processing Plants

Cold Chain
Distant Process Plants
Perishable Export Centres
Distant Domestic Markets

Distant Domestic Markets

Perishable Export Centres

Distant Process Plants

Local Processing Plants

HUB or Regional Mandi

Normal Supply Chain
Think tank to Govt on the subject of cold-chain. Engage with its members to translate industry needs into policy recommendation.

Provide an enabling environment and facilitate private investment in cold-chain sector.

Address concerns on standards and protocols related to cold-chain testing, verification, certification and accreditation.

Assist in developing and promoting energy efficient technologies and adaption in India.

Capacity building and training activities to reduce the gap in skilled human resources.

Awareness programs on best practices for perishable product handling, indigenised for specific requirements and conditions.

**“Actions Taken-2013”**
Design assistance patterns, Operators Trainings, Institutional Workshops, Conclaves, MoUs, Field Studies, Appraisals, Redressals, Policy guidance.

**Stakeholder Members:**

**Groups (Self Help)**
- Farmer Groups, Consumer Groups, Cooperatives, students

**Educational (Institutes)**
- Research, Academic & Training centres

**Associates**
- Individual associate members

**Represent (Industry or Govt)**
- Industry Chambers, PSU, Apex Bodies

**Company (Commercial)**
- Food sector, equipment sector, Investors, Consultants, Logistics, etc

**Fellow**
- Senior Individuals as Fellows of NCCD
Need of Hour

- Cold-chain Initiators – modern **Pack Houses**.
- Cold-chain Transport – **Reefer transport units**.
- Distribution Hubs – Transitory **Cold stores**.
- **Ripening Facilities**.
- Farm-gate or source point **Cold storage**.
- **Merchandising** equipment.
- Energy Efficient **technology**.
- Standardised **handling – packaging**, unit loads.
- **Multi-modal**, direct access movement.
## Cold Storage Concentration

### Gap in Capacity of states with maximum requirement

<table>
<thead>
<tr>
<th>State</th>
<th>Requirement '000MT</th>
<th>Existing '000MT</th>
<th>Gap in '000MT</th>
</tr>
</thead>
<tbody>
<tr>
<td>UP &amp; Uttarakhand</td>
<td>12,228</td>
<td>10,187</td>
<td>2,041</td>
</tr>
<tr>
<td>West Bengal</td>
<td>10,566</td>
<td>5,682</td>
<td>4,884</td>
</tr>
<tr>
<td>Punjab</td>
<td>1,318</td>
<td>1,345</td>
<td>(27)</td>
</tr>
<tr>
<td>Gujarat</td>
<td>2,748</td>
<td>1,267</td>
<td>1,481</td>
</tr>
<tr>
<td>Bihar</td>
<td>4,241</td>
<td>1,147</td>
<td>3,094</td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>2,324</td>
<td>901</td>
<td>1,423</td>
</tr>
<tr>
<td>Madhya Pradesh</td>
<td>1,213</td>
<td>808</td>
<td>405</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>6,273</td>
<td>547</td>
<td>5,726</td>
</tr>
<tr>
<td>Karnataka</td>
<td>2,404</td>
<td>407</td>
<td>1,997</td>
</tr>
<tr>
<td>Haryana</td>
<td>804</td>
<td>393</td>
<td>411</td>
</tr>
<tr>
<td>Chhattisgarh</td>
<td>543</td>
<td>342</td>
<td>201</td>
</tr>
<tr>
<td>Rajasthan</td>
<td>391</td>
<td>324</td>
<td>67</td>
</tr>
<tr>
<td>Orissa</td>
<td>1,835</td>
<td>291</td>
<td>1,544</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>7,906</td>
<td>239</td>
<td>7,667</td>
</tr>
<tr>
<td>Jharkhand</td>
<td>796</td>
<td>170</td>
<td>626</td>
</tr>
<tr>
<td>Assam</td>
<td>919</td>
<td>88</td>
<td>831</td>
</tr>
<tr>
<td>Kerala</td>
<td>2,771</td>
<td>58</td>
<td>2,713</td>
</tr>
<tr>
<td>Jammu &amp; Kashmir</td>
<td>737</td>
<td>43</td>
<td>694</td>
</tr>
<tr>
<td>Tripura</td>
<td>163</td>
<td>30</td>
<td>133</td>
</tr>
<tr>
<td>Himachal Pradesh</td>
<td>487</td>
<td>20</td>
<td>467</td>
</tr>
<tr>
<td>Nagaland</td>
<td>70</td>
<td>6</td>
<td>64</td>
</tr>
<tr>
<td>Meghalaya</td>
<td>239</td>
<td>3</td>
<td>236</td>
</tr>
<tr>
<td>Manipur</td>
<td>80</td>
<td>-</td>
<td>80</td>
</tr>
<tr>
<td>Mizoram</td>
<td>74</td>
<td>-</td>
<td>74</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>61,130</strong></td>
<td><strong>24,298</strong></td>
<td><strong>36,832</strong></td>
</tr>
</tbody>
</table>

### Key Insights

- Study estimates need for 37 Million MT of capacity to be built to fill the gap. The projected gap needs to be ratified.
- This mismatch and subsequent gap that has been created has pointed towards the need for a rapid nationwide rationalization.
- This redistribution of forthcoming infrastructure development will require to also meet increased demand in connecting transport system increases.
Infrastructure Status

Recorded national level data, India created 6488 cold storage with a cumulative installed capacity of approximately 30 million Metric Tons.

- More than 25% of the cold storage units (~10 mill tons) have been built post 2005.
- Growth (CAGR 2004-12): Numbers of Cold Storage: 3.57%, Capacity: 5.19%. Growth in Transport capacity 22%
- Current short fall of reefer transportation; reports states another 30+ million tons capacity to be built.

The witnessed growth in the Cold Storage sector is accepted to only accelerate in the coming years.

Notes: 2009 and 2010 numbers only for NHB and NHM assisted cold storages. Numbers as of Dec 2012.
Source: NHB, MIDH, Directorate of Marketing and Inspection 2009.
Information for implementation design

- **Status** of cold-chain in your states.
  - How many integrated pack-houses and ageing.
  - How many reefer trucks and ageing.

- **Market** Regions where the produce is sold.
  - Market links into other states
  - Scope to develop market links

- **Power** status in your states
  - Electrical tariff

- **Policy** on Cold-chain in your State.

- **Finance** sector and **Awareness**.
धन्यवाद
Thank You

National Centre for Cold-chain Development
www.nccd.gov.in
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