Summary of
Base Paper at
Cold Chain Summit 2007

Cold Chain Infrastructure for Value Creation & Rural Entrepreneurship in Horticulture

INTRODUCTION

Exciting **socio-economic changes** in India, needing sensitive management to allow:
- Well being to filter down to all strata.
- Harnessing of National natural strengths into viable business.

India's **Compelling Strengths**:
- Horticultural biodiversity.
- India is one of the largest producers of Fruits and Vegetables.
- Large Agrarian work force.

Realities, **Weaknesses**:
- Inefficient management of F&V sector.
- Cultivation of F&V regional, transportation inevitable.
- F&V is inherently fragile, prone to damage easily.
- Low level awareness of best practices in post harvest technology.
- Low awareness of best practices in cold chain management.

Paradigm Shift Essential:
- Promote awareness of best practices & global benchmarks in Post Harvest care.
- Improve F&V handling practices- post harvest & in transportation.
- Develop a strong efficient cold chain supply system.
- Speed up adoption of cold chain system.

EXECUTIVE SUMMARY

Lost Opportunity – strong horticulture production base yet miniscule global share in exports or processing.

Drivers for **demand** for Cold Chain infrastructure:
- To Fully leverage strengths.
- Rapid growth of modern format organized retailing.
- Obsolete or defunct existing installations.

Bottlenecks Existing:
- High capital costs
- Limited Power supply.
- High Power costs – energy intensive industry.
- Capex Subsidy support from Government Outdated.
- High excise/customs duty on cold chain materials.
- Poor awareness of benefits of pre-cooling amongst farmers.
- Prohibitive lead time from adoption to benefits.

Limited **Knowledge Base** (India-centric):
- Lack of Domain Skills – limited knowledge resources.
- No access to trained knowledge base – specific to F&V care.
- No access to trained technical skills – sustaining specific cold chain links.
- No specialized institutes for cold chain technicians – on the job training.
- No central body of knowledge on good cold chain practices.

Two Pronged **Strategy** to **Mitigate**:

1. **Reduce Cost** burdens, Advance Viability -
    - Fiscal measures - lower customs/excise duty.
    - Revise subsidy norms to market reality.
    - Cover utilization gaps in startups; 'top-up' grants.
    - Streamline funding through PPP implementation.

2. Enhance Support Structure:
    a. Creation of **Knowledge** Cadre
        - Modernise Post Harvest curriculum in Agri universities.
        - Align with & emulate advanced foreign institutions.
        - Use the ITI's as the nodal agency.
        - Industry intervention to improve content and best practices at ITIs.
    b. Innovative Power Solutions
        - **Alternative Fuels -** Drive towards commercialisation.

Setup a nodal agency to coordinate various efforts above...

HORTICULTURE IN INDIA

FACTS:

- India produces 47 million tons of Fruit – largest producer in the world.
- India produces 96 million tons of Vegetables – 2nd in the world.
- Horticulture contributes for over 30% of agri-GDP.
- Accounts for 41 million hectares of cultivated land
- Employs close to 150 million people.
- Traditionally horticulture was grown as filler crop between grains.

SHIFT TOWARDS HORTICULTURAL CROPS:

- Due to increasing risks & investments in grain crops.
- Average Indian household diet shifting towards a larger share of fresh produce.
- Growing disposable income and increased awareness is also aiding this.

FUTURE & GROWTH:

- Booming retail sector - trade in 2006 estimated at US$320 Billion
- Growth expected to US$ 421 Billion in 2010.
- Organised sector growth at 40-45% annually.
- Penetration of organised retailing up at 6% in 2006 from 3% in 2003.
- Capacity to increase penetration in exports and food processing.

It is inferred that demand for an efficient & modern supply chains for handling of fresh produce will grow significantly.

EXISTING STATUS OF COLD CHAINS IN INDIA:

- Lack of integrated Cold Chain exists.
- Fragmented cold chain integrity with negligible pre-cooler availability.
- Pre-coolers and refrigerated transport still in an experimental stage.
- Process inefficiencies abound – lack of knowledge.
- Cold storage capacity (20 mn tons) largely caters to storage of potatoes and apples of which potato dominates.
- Capacities are clustered in 4 states – 70% in UP, Uttranchal, W.Bengal & Punjab.

- No significant capacity addition in cold storage to keep up with the explosive growth in economy.
- Horticultural business model tutors evacuating produce daily to closest mandi.
- Financial viability impacted by lack of sustained revenue due to high levels of seasonality of produce.
- Grid Power failures effect fresh produce shelf life.

Yet countries in a similar state of development & facing similar issues have overcome and transformed themselves into strong horticulture trading economies – Thailand, Peru, Chile, etc.

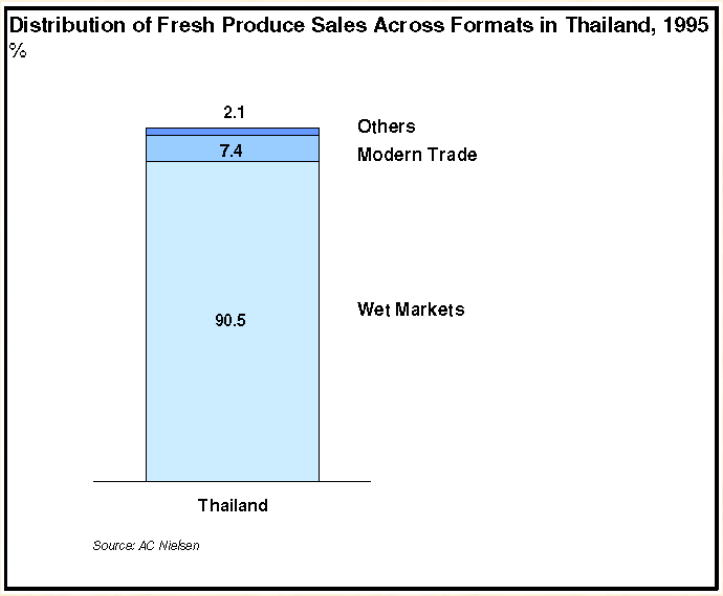
CASE STUDY OF THAILAND

Thailand's exports about 30 fruit types and in 2004 horticulture exports totalled about US$ 1.5 Billion.

Similarities with India:

- Unorganised traditional (wet) markets continue to dominate.
- Strong dichotomy between rural and urban populace.
- Similarity of tropical climate and geographical topology.
- Similarities in eating and culinary habits.
- Rich biodiversity, wide variety of produce.

HORTICULTURE TRADE IN THAILAND - RECENT HISTORY:



Till mid 1990's-

- Horticulture selling was fragmented and unorganized with over 90% flowing through wet markets (mandis).
- Only 11% of shoppers used modern retail formats for F&V shopping.
- Modern formats accounted for only 7% of total fresh produce trading.

In 1996-

- Royal Ahold started a JV with The Central Retail Corp. and setup the TOPS chain.
- World Fresh Distribution Centre established.
- Flow of fresh produce from this centre to retail outlets streamlined.

In 1999-

- Thai Fresh project initiated by a consortium of Golden Exotics, Holland and KLM Cargo.
- This established first integrated cold supply chain & modern farm practises.
- Triggered distinct escalation in exports.

The result of these initiatives was the exports of fresh produce increased from approx 1.3 mkg in 1998 to 4.6mkg in 2004.exports in 2006 stood at 11mn tons.

Initial teething problems:

- Minimal use of humidity control devices and ethylene oxidizers.
- Gaps in cold chain caused losses.
- Manual handling undid good work of cold chain.
- Cold storage facilities were typically used for produce for exports & food processing. Produce for domestic consumption never saw the cold chain.

Initiatives taken in Thailand:
A 3 pronged process adopted-

- The Foreign Agriculture Service of the USDA and logistics company EMO Trans were brought in to help develop best practices for cold supply chain and to train professionals at various levels of cold supply chain.
- Fiscal benefits - Agro industries were included within the gambit of sectors for special tax incentives, channelled through a board of investment.
- Proper guidelines for temperature and humidity controls were developed in collaboration with the USDA.

This process hinged on the PPP model with certain investments by the private sector while government provided methods to ease the viability gap.

A Board of Investment was setup by the government to encourage investments in various areas of agriculture. The BOI focussed on agriculture as a national strategic sector and offered tax and non-tax incentives.

Tax incentives offered included tax holidays, import duty exemptions on machinery, double deduction from taxable income of utility costs, etc.

Amongst the activities promoted by BOI was Food preservation, packing, Research and development, Cold storage and transportation, etc.

BOTTLENECKS & MITIGATION IN COLD CHAIN ADOPTION IN INDIA

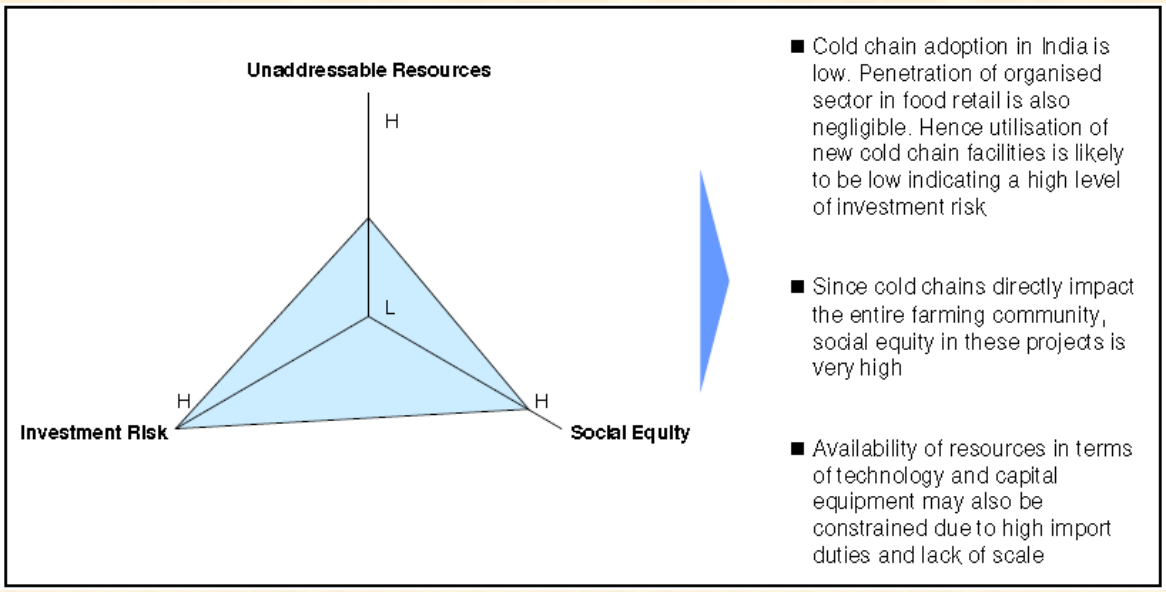
Bottlenecks	Action to Mitigate
1. Economic infeasibility in setup and operations of cold chain	Improve economic feasibility through: a. **PPP Model** to provide viability gap funding. b. Harness the power of **existing subsidies**. c. Develop **innovative rural financing models**.
2. Lack of experienced Human Capital.	Promote **Academia-industry interaction.**
3. Lack of Quality Protocols.	Develop India-centric **food & quality standards**.
4. Lack of Power Resources.	Use **alternative energy** to resolve power requirements.

Key Criteria for PPP application:

1. When **Investment risk is too large** to be borne singly or privately; because utilisation is extremely low in initial phase. Requires **viability gap funding** to sustain initial period.
2. When **Resources required in the setup are beyond the normal reach of the private sector** – land is a key bottleneck and cannot be surmounted without the intervention of the government. This issue is also being faced in the Terminal Market Complex projects at various places.
3. When **Project involves issues of social equity** – some projects like rural electrification and village roads are inherently unviable but need to be executed since it forms a part of the basic framework of good governance. Hence it is **imperative that the government participate** in its ownership

Cold Chain and PPP?

On evaluating Cold Chains along key criteria for PPP, 2 of the 3 criteria are fulfilled.



A CLEAR CASE FOR PPP IN COLD CHAINS

1. Cold chains will directly impact farmer community so there is a strong social equity.
   - Cold chains begin at farm gate so a large amount of rural development activity is triggered.
   - It creates multiple opportunities for entrepreneurs and will create unprecedented direct & indirect employment.
2. Clear lack of early viability.
   - Low awareness leading to low utilisation levels.

To test the efficacy of PPP in fostering growth, a **case study of roads** is shows:

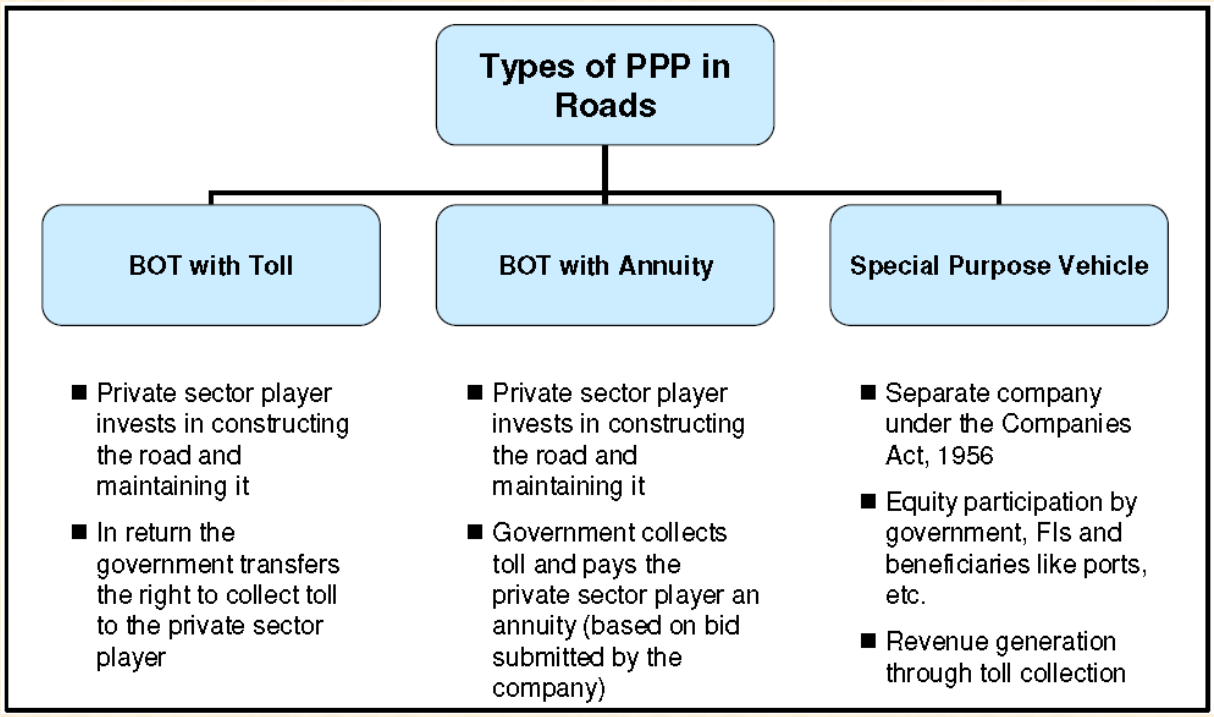
Similarities between roads and cold chain-

- Key ingredient to making either one viable is traffic estimation depending on availability of past information. This was not available and similarly little information is available on cold chain usage and adoption trends.
- Like roads, cold chains are a common resource utilized by many unrelated industries.

PPP in development of national highways faced issues similar to those of the cold chain

- Economic Viability unsure – gap funding required.
- Socio-economic impact.
- Infrastructure development.

The impact of PPP development activities in road sector will be that the sector will see an investment of Rs. 1.7 trillion till 2012 through a cumulative of three PPP Models.



Valuable lessons can be learnt from the roads sector in applying PPP to foster growth in the cold chain

Area of Action	*Pvt. Sector effort*	*Govt Support*
Infrastructure development	• Bring in the best of breed technology and equipment	• Ease import duty restrictions • Create long term demand through initiatives like TMC's ,AEZ's
Human capital development	• Collaborate with academia to help create a cadre of skilled engineers and technicians.	• Invest in creating more educational institutions.
Viability		• Provide viability gap funding • Policies to improve cold chain adoption
Infrastructure Status	• Accelerate pace and scale of projects to ensure wider reach.	• Give infrastructure status to cold chains. • Benefits-Tax holiday ,preferential land allotment, accelerated depreciation etc.
Create social equity	• Create jobs in rural and semi-urban areas.	• Educate the farmer community about long term benefits of using cold chain
Options for business models	• Financial innovation to ensure multiple business models.	• Be amenable to experiment with various options.

TRADITIONAL VIEW OF PPP IN COLD CHAINS:

Traditional evaluation of various elements of the existing horticultural value chain; and identifying areas where PPP can be applied gainfully.

Pre-cooling:

- Limited to certain produce only.
- Done entirely in rural areas close to farms.
- Heavy fragmentation of farm ownership and small size of land holdings.

- Hence the ownership will have to rest with the farmer cooperatives, rural entrepreneurs.

It may not be viable for corporates to setup pre-cooling facilities. While NABARD or RRBs may consider innovative financing models to foster entrepreneurs, PPP model is effectively ruled out at pre-cooling leg.

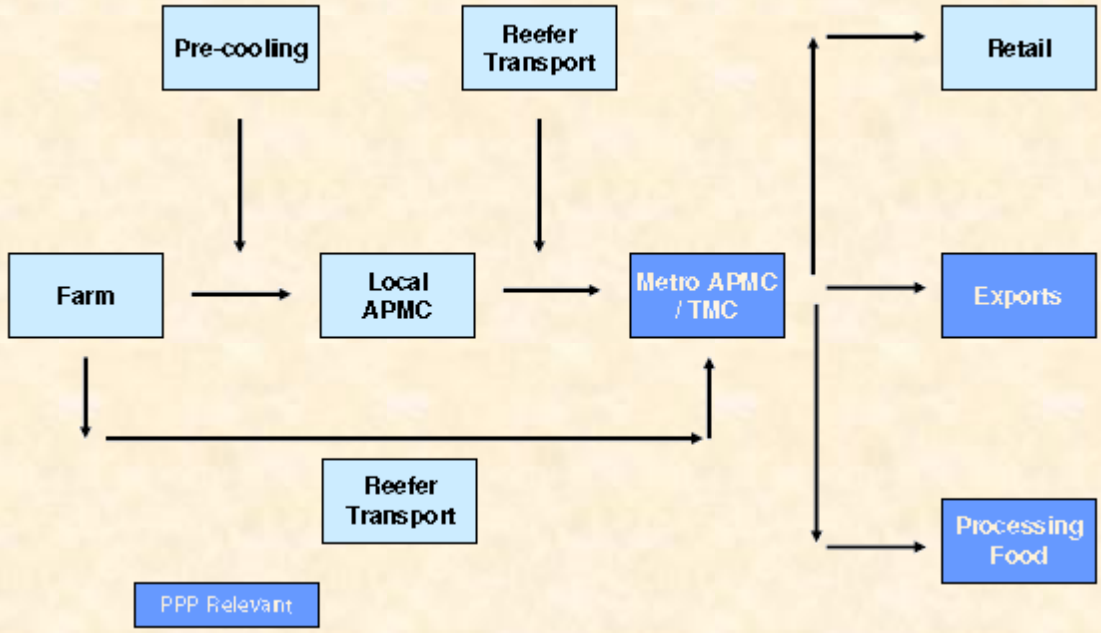
Local APMC Mandi / Marketplace: Since the significant consumption happens in larger cities, the practice of evacuating the produce at the earliest to the metro mandis is logical. A cold storage in local mandi is not envisaged as there is no prospect for long term storage.

Reefer transport: does not warrant a PPP intervention as only 20-25% of total production will require this transportation mode since most produce can be moved ambient or will move shorter distances. Only produce that require secondary movement will require reefer transportation.

Metro APMC/Terminal market complex: Due to complexity of operation and high initial capital costs, this is already coming up under the PPP model, though the model is restricted to providing subsidies under existing schemes which are inadequate.

Retail Merchandising: no lack of viability on account of utilization, PPP not envisaged here'

Food processing and exports: Likely to see significant PPP. Cold storages in air and sea ports and in food and agri parks is essential. As these are part of basic infrastructure their development falls within the ambit of the government machinery. The model for PPP in food parks is being set up by the MoFPI.



It is obvious that the traditional view is that though the **cold chain requires PPP**, it will be individually **applied to selected elements only**.

A nodal agency is required:

1. Take a holistic view of entire supply chain and assess merit of PPP in each.
2. Identify areas for PPP and support creation of various engagement models.
3. Where PPP may not be relevant, create mechanisms to support growth and development through fiscal benefits, financial models.

A CONTRARIAN VIEW

The traditional view of PPP above envisages viability gap funding and fiscal benefits. This approach can turn out to be time consuming. In cold chain there are multiple stake holders and bringing them together is a daunting task.

In a contrarian approach, if we start by estimating the scale of investments required in cold chains to create a critical mass of adoption. This will ensure a significant portion of the annual production flows through the cold chain.

Assuming, that only produce that logically needs to travel through a cold chain does so in the final analysis, the magnitude of investment is in the range of Rs.17000cr-18000cr.

Pre-coolers 6MT each – 81,250 MT capacity – Rs 3,385 cr
Reefer Transport 14/10 MT each – 14,636/6,403 trucks – Rs 2,836 cr
Cold Storage capacity – 9.2 Mn Tons – at Rs 12000/ton – Rs 11,057 cr

The govt may take the view to accelerate the process of cold chain setup, it would undertake the entire investment by itself. Models of operation may then be evolved based on a cost benefit analysis.

Allied benefits that may accrue to the govt will be-

1. Reduction of fragmented sub-optimal cold chain. One shot govt investment will enable a smooth and seamless setup of an integrated cold chain.
2. Hasten and Enhance value creation for farmers through high quality cold chain. Possibly leading to a situation where farmers' dependence on subsidies pre/post harvest is reduced. These savings in the subsidy spend will offset the initial investment

Harness the Power of Existing Subsidies

- APEDA and NHB Administered.
- The objective is to provide capex relief.
- Adoption of subsidies for cold storages is highest.
- It is low in the case of C.A storages and Pre-coolers.
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Nature and extent of subsidy is indicated below:

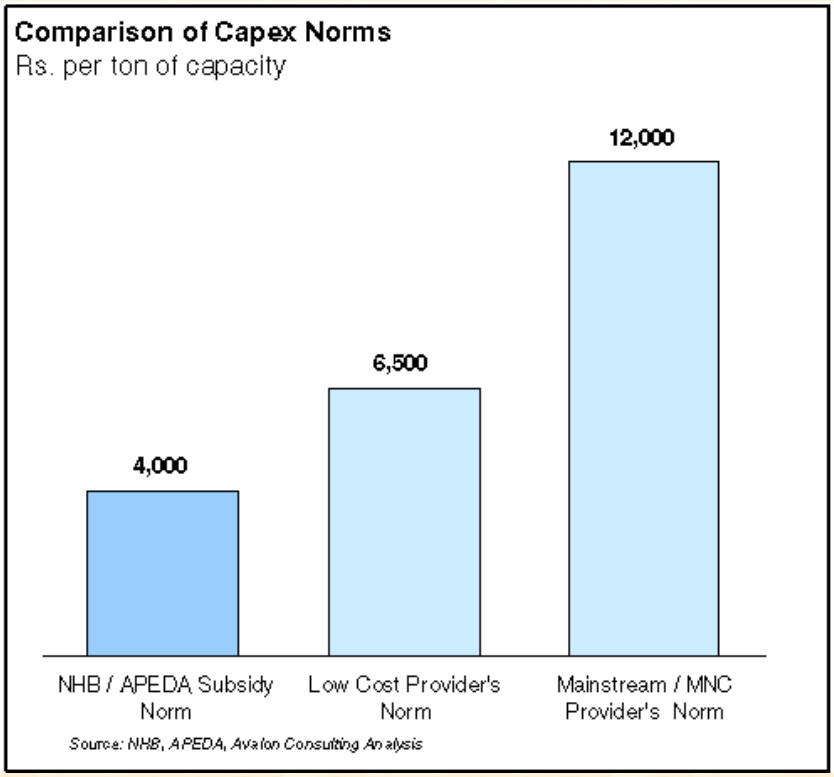
	Scheme component	Scheme scale
Pre coolers	Setting up of facility with proper air handling system	50% of cost equipment subject to a ceiling of Rs. 10 lacs per beneficiary.
Cold storages with processing facilities	Setting up of integrated post harvest handling system(pack houses with any two or more of the above facilities	25% of the cost subject to a ceiling of Rs. 25 lacs per beneficiary.
C.A storages	Setting up of specialized storage facilities such as high humidity cold storage deep freezers, C.A or M.A Storage	50% of the cost subject to a ceiling of Rs. 50 lacs per beneficiary.

However several questions crop up when evaluating the subsidy mechanism.

- Subsidy amounts may not be adequate.
- The process of obtaining may not be streamlined.
- It only subsidises the capital cost and not the operating costs.
- Power is a significant component of the cold chain. Real cost of power is high in India and this is not considered.

The fact that the level of subsidy is inadequate is evidenced by the disparity in the norms used for calculating project cost and the actual project cost for setting up facilities.

	Rs.per ton of capacity
NHB/APEDA NORM	4000
LOW COST PROVIDERS NORM	6500
MAINSTREAM/MNC PROVIDERS NORMS	12000



The inadequate capex support force the cold chain operators to compromise on quality of equipment and facility leading to creation of substandard infrastructure, poor operating performance and hence inefficient output.

The subsidy does not support integrated cold chain facilities like reefer transport and mobile cooling vans and hence needs improvements in coverage.

The subsidy structure is one dimensional and attempts to create several single cold storages rather than a modern facility providing a range of services.

INNOVATIVE RURAL FINANCING MODELS

Why are financial models required-

- Setup Requires heavy capital investments.
- Low traffic in initial phase until awareness and proof of concept increases traffic
- Initial phase may last for uncertain/undetermined time period.
- Fixed costs – salaries, power, AMC fees –to be incurred continuously.

To enable the entrepreneur to setup & to insulate from the initial losses inherent, it is essential to provide some extent of viability gap funding. Since subsidies and funding is being channelled through NABARD, RRBs etc, viability funding can also be extended through the same. Financing agencies must do following-

1. Create an objective, effective mechanism for merit assessment. Project evaluation.
2. Provide Capital & Viability gap funding – 50% of capital cost and accumulated losses for first 5 years.

LACK OF HUMAN CAPITAL

A **Key Gap** in cold chain space is lack of adequate & relevant **human capital**.

- Cold chain involves a complex chain of activities.
- Multiple complexities in human capital development. Cold chain expertise & Skilled manpower -
    - Operators.
    - Technicians.
    - Maintenance engineers.
    - Agri-experts.
    - HACCP compliance.
    - Logisitcs & Transport

Two issues need to be addressed-

- A lack of a steady stream of skilled people who manage various aspects of cold chain.
- A disconnect between desired skill-sets and academic curriculum.

Ensuring a steady stream of skilled manpower:

1. **Technical Cadre** – Engineers and technicians, who can install, commission and maintain the various equipment required in the cold chain.
2. **Knowledge Cadre** – a cadre who will take decisions on appropriate climate control and handling for various fruits & vegetables; to enable the farmer to extract maximum realisation from any unit of produce.

ECONOMICAL POWER SOURCE

- Power costs accounts for 25-40% of total operating expenditure in the cold chain.
- Current Options for accessing power are typically-grid and DG power.
- Grid power is inexpensive but unreliable.
- Apart from this in rural areas availability is also a concern.
- DG power is expensive but available on call.
- In rural areas cost of transport of diesel for DG sets is added.

Mitigators

Need to look for **alternate sources of energy** locally available. Today several options exist including bio-diesel and bio-mass. However, these are in an experimental stage and will need a few years to commercialize.

Pre-cooling is the most critical element in maintaining the integrity of cold chain. This is also the most energy consuming stage. Systematic investments in R&D and pilots by various stakeholders is required.

In the short term conventional fuels (diesel) are the only option – higher cost of fuel needs to be factored into business model. Cost of Power remains the main issue.

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