PAKISTAN HORTICULTURE DEVELOPMENT & EXPORT BOARD

PRE-FEASIBILITY STUDY

ESTABLISHMENT OF COLD CHAIN SYSTEM UNDER NATIONAL TRADE CORRIDOR IMPROVEMENT PROJECT

VOLUME-IV

REFRIGERATED CONTAINERS

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PRE-FEASIBILITY REPORT

VOLUME-IV REFRIGERATED CONTAINERS

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VOLUME -1V REFRIGERATED CONTAINERS

1- CURRENT STATUS & FUTURE NEEDS

At present most of the fruits and vegetables are being carried in open trucks or shipped in ordinary containers. It is learnt that there are only about two hundred and forty refrigerated containers available in national pool, which belong to freight forwarding companies. The remaining refrigerated containers beings used for shipping perishable produces are from various shipping lines.

Meetings with logistics companies revealed that even the refrigerated containers are required in thousands it can be made available but needs 6 months prior requisition and if required in hundreds it will take one to two months.

Apart from above the discussions with various stakeholders and horticulture statistics showed that need of a national pool of containers for movement of fruits and vegetables without compromising the quality of produce is required to be established with immediate effect.

Apart from domestic transportation, some of these refrigerated containers can be provided for export purpose during peak season and emergency.

It is proposed to establish two container yards in Karachi and Lahore with a pool of 200 refrigerated containers and 50 CA refrigerated containers at each location. Karachi pool will serve the requirements of Sindh and Balochistan Provinces while Lahore pool will serve the requirement of Punjab and NWFP. Each container yard will have its own crane and five prime movers, while the growers/exporter will have to arrange the prime mover from markets as per need.

2- CREDIT POOL FOR REFRIGERATED CONTAINERS

In Pakistan refrigerated containers are being imported by shipping agents who provides export back guarantee for six month and extendable to six more months. The containers, if procured for local use only, has to pay 40% duty which is hindering the local market of utilizing refrigerated containers. Therefore, it is suggested that import of containers for horticulture products must be duty free as it is already notified under S.R.O 5.75 (1/)2006. Once this order is being implemented it will be a great encouragement for fruits and vegetable producers, wholesalers and exporters so that they can make the best use of cold chain facilities for export and local market as well.

At present most of the fruits and vegetables are being mostly transported from production to consumption centers, and to ports by open trucks. Only some exporters demanded the refrigerated marine containers to their farm/pack house sites and transported for shipping. But most of them are not willing to pay for such facility. Therefore, the exporters must be convinced to use refrigerated containers under national cold chain system, which will considerably reduce the losses sustained to perishable produce. Government can also make it mandatory for exporters to use the refrigerated containers for both inland transport and shipments for export by formulating appropriate policy.

To serve as national asset is it required to promote procurement of refrigerated containers in private sector. Normal financial charges on long term loans are 12% but according to present government policy for cold chain, 6% mark up will be paid by government. But in order to attract the investors towards this new business avenue banks should be asked to make special arrangements and establish credit pool by keeping predetermined amount of money for perspective cold chain investors at mark up lower (i.e. 3% to 4%) than prevailing market rate as it is being practiced in other parts of the world. This will ensure access to low cost capital borrowing facility and thus pave way for investment in refrigerated containers.

3- DESIGN BASIS

3.1 REFRIGERATED CONTAINER DESIGN

Generally, the refrigerated containers come in two designs;

- Sandwiched Panel construction
- Reinforced construction

IN PANEL CONSTRUCTION, A NUMBER OF PANELS ARE JOINED TOGETHER WITH THE HELP OF LOCKING MECHANISM, TO FORM THE CONTAINER. THIS TYPE OF CONSTRUCTION HAS A BASIC DRAWBACK I.E. THE PANELS TEND TO GET LOOSE OVER A PERIOD OF TIME SPECIALLY IN CASES WHERE THE ROAD CONDITIONS ARE NOT QUITE GOOD. THIS IN TURN RESULTS IN COOLING LEAKAGES, GIVING CONTINUOUS PROBLEMS. THIS TYPE OF CONTAINER CONSTRUCTION IS ALTHOUGH QUITE EASY FROM THE POINT OF VIEW OF MANUFACTURER, BUT IS ONLY SUITABLE FOR COUNTRIES WHERE THE ROAD CONDITIONS ARE QUITE GOOD.

For countries, where the road conditions are somewhat rough, reinforced types of containers are recommended. This construction is much more rigid and can sustain the jerks and jumps normally experienced by the containers. In this case, the frame of the container body is first made with the help of angle iron providing enough cross links to ensure its rigidness. The outer sheets (normally of pre-painted Galvanized Iron material) are put onto this frame with the help of rivets. Finally, Polyurethane foam is injected between these sheets so as to form a one-piece construction. Hence, the whole container becomes one piece and there are no joints involved.

Above comparison identified that the later (i.e Reinforced construction) design will be suitable for Pakistan

Photographs of refrigerated containers are illustrated in Figures IV-1 & IV-2

Figure IV-1. Refrigerated Container on Aerodynamic Prime mover

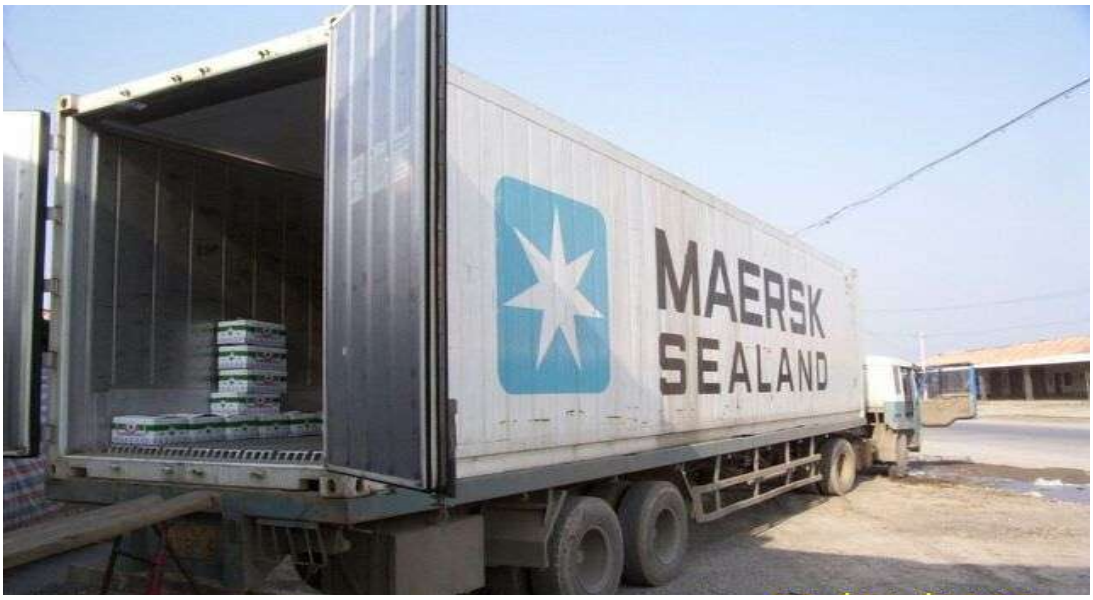

Figure IV-2. Refrigerated Marine Container

3.2 REFRIGERATION SYSTEM

Basically, there are two types of refrigeration systems currently in use apart from Nitrogen based system. These are;

- Blown system.
- Eutectic system.

❑ Blown System

This is the most widely used system in the world. Standard refrigeration units are available off the shelf in most of the countries for different container sizes and services. Some of the more established manufacturers for these types of units are:

i) Thermoking
ii) Carrier

Usually, in order to decide upon the size of unit required for a particular container size and ambient conditions, all one needs to do is to contact the respective suppliers, giving all the relevant data like, size of container, number of doors and their sizes, door opening frequency, operating temperature etc. and the supplier recommends the size of unit that would best suit to specific requirement.

❑ Eutectic System

This has also proven to be a successful method of refrigerating containers. The basic function of Eutectic solution is to store the required amount of latent heat in it so that it can be used to maintain the desired temperatures.

This system is most helpful in cases where repairing of Blown units could pose a problem during transit, since Eutectic system ensures that the required amount of cooling for the entire journey is pre-stored in the Eutectic plates before the departure of the vehicle.

This system requires manual defrosting of the Eutectic plates since they tend to build up frost, affecting the cooling of the container, specially in areas of high humidity.

The Eutectic primary vehicles have been successfully used for journeys exceeding 40 hours of traveling time with ambient temperature of 45°C.

Depending upon the specific site condition and after comparison of primary costs any one of the system can be selected.

Shippers should insist on well-maintained equipment and check for the following:

- Damage to walls, ceilings, or floors, which can let in the outside heat, cold, moisture, dirt, and insects;
- Operation and condition of doors, ventilation openings, and seals; and
- Provisions for load locking and bracing.

For refrigerated trailers and containers, the following additional checks are important:

- With the doors closed, the cargo area should be checked from inside for light--door gaskets must seal. A smoke generator also can be used to detect leaks.
- The refrigeration unit should cycle from high to low speed when the desired temperature is reached and then back to high speed.
- The location of the sensing element that controls the discharge air temperature must be located. If it measures return air temperature, the thermostat will have to be set higher to avoid a chilling injury or freezing injury to the products.
- A solid return air bulkhead should be installed at the front of the trailer.
- A heating device should be available for transportation in areas with extreme cold weather.
- Equipment with a top air delivery system must have a fabric air chute or metal ceiling plenum in good condition.

4- TRANSPORTATION

The design and condition of the transport equipment, and the loading method used, are critical to maintaining product quality. The mode of transportation and the carrier should be chosen carefully.

4.1 SELECTION FACTORS

The mode of transportation and type of equipment used should be based on:

- Destination;
- Value of the product;
- Degree of product perishability;
- Amount of product to be transported;
- Recommended storage temperature and relative humidity;
- Outside temperature conditions at origin and destination points;
- Time in transit to reach destination by air, land, or ocean transport;
- Freight rates negotiated with the carriers; and
- Quality of transportation service.

The reliability and quality of transportation services provided by different carriers must be carefully considered. Local trade publications are excellent sources of information, as many carriers and their agents advertise their schedules and destinations.

Refrigerated trailers and containers are recommended for products shipped in large volumes with transit and storage lives of one week or more. After transit, there must be enough remaining product life for marketing. Carriers using trailers and containers may offer door-to-door service, which reduces handling, exposure, damage, and theft of the products.

Similar-sized shipping containers should be loaded together in mixed loads for increased stability. Heavier shipping containers of products should be loaded first and distributed evenly across the floor of the trailer or container. Lighter shipping containers can then be placed against or on top of the heavier products.

Load lock bars, load gates, and pallets placed in a vertical position can be used to separate and secure stacks of different-sized shipping containers. To facilitate inspection of mixed loads at ports of entry, a representative sample of each commodity should be available near the door. This can minimize the unloading of cargo for examination.

The longer the transit time, the higher the risks in transporting mixed loads of agricultural products. Therefore, it is essential that guidelines be followed closely to maintain quality in distant markets.

4.2 TEMPERATURE MONITORING AND RECORDING

Shippers should follow the carrier's recommendations on loading and setting the temperature of the equipment's load compartment to avoid chilling or freezing injury to fresh products. Discharge air may be colder than the set-point temperature if the refrigeration system operates on return-air temperature sensing. The temperature should be clearly marked on the bill of lading. Drivers and shipper should check product temperatures with a pulp thermometer and record the temperatures during the loading process.

Many carriers advise setting the thermostat temperature 1^{o} C to 3^{o} C (2^{o} F to 6^{o} F) higher than the recommended temperature of 0^{o} C (32^{o} F) for chilled products. This depends on the design of the transportation equipment. Newer equipment with supply-air temperature sensing and good air circulation can be operated closer to the recommended temperature. For most tropical fruits and vegetables and plants that have recommended temperatures in the 10^{o} C to 21^{o} C (50^{o} F to 70^{o} F) range, the thermostat is set at or near the recommended temperature.

It is now possible to monitor refrigeration unit operating conditions from a central control room on a ship or by satellite transmission.

Refrigeration units for trailers and containers may have an electronic recorder which can monitor up to three different points in the load. This data can be downloaded and analyzed on a computer.

4.3 LOADING TRAILERS AND CONTAINERS

For refrigerated trailers and containers the following loading practices are recommended:

- Pre-cool the trailer or container to the recommended transport or storage temperature. Turn off the refrigeration unit during loading if the loading area is not refrigerated; otherwise, the evaporator will frost due to the warm air drawn in by the unit.
- Thoroughly pre-cool unit load as air circulation to some of the shipping containers may be limited. The containers should have openings for cooling and ventilation of product heat.
- Avoid loading tightly against flat sidewalls. Use centerline loading for unit loads.
- Secure unitized loads with dunnage between the walls and load.
- Do not block air circulation at the rear door.

5- TECHNICAL SPECIFICATIONS

Optimal & Acceptable Specifications for ATO approval of refrigerated containers are reproduced hereunder.

Optimal Specification

- Temperature control of delivery air in a band of 0.25^0C accuracy, required range of temperature settings -2^0C up to $+25^0$C.
- Continuous air circulation between 4000 and 5000 m^3/h in an empty standard 40ft container or 80-100 m^3/hm^3 internal container volume; at an additional pressure head of 150 *Pa* for cargo resistance, at 50 *Hz* electrical supply.
- Provisions for a proper air distribution e.g. 75 *mm* floor profiles
- An air ventilation rate of minimum 150 m^3/h in an empty standard 40 *ft* container or 2.6 $m^3/h.m^3$ container volume, without additional pressure difference, at 50 *Hz* electrical supply, to keep ethylene levels under control. Fresh air in- and outlet have to be located in the same plane.
- A possibility for dehumidification of the delivery air is favorable to maintain optimal relative humidity.
- At least 2 drain holes in the floor are required; in (sub) tropical areas 4 drain holes in the floor are mandatory in 20 *ft* as well as in 40 *ft* containers.

Acceptable Specifications

- Temperature control of the return air with capacity reduction in steps so that the temperature difference between in – and outlet is less then 4 to 6^0C; required range of temperature settings is -2^0C up to $+25^0$C.
- Continuous air circulation of 2000-5000 *m3/h* in a standard 40 ft container or 40-50 $m^3/h.\ m^3$ internal container volume, at an additional pressure head of 70 *Pa*, at 50 *Hz* electrical supply (minimal requirement: 40 $m^3/h.\ m^3$ internal container volume).
- Provisions for a proper air distribution, minimal 60 mm T profile in a 40 *ft* container and 30 mm in a 20 ft container
- An air ventilation rate of minimum 150 m^3/h in an empty standard 40 *ft* container or 2.6 $m^3/h.\ m^3$ internal container volume, without additional pressure difference, at 50 *Hz* electrical supply. Fresh air has to be conditioned before flowing over the products and the fresh air intake must be far enough from the exhaust.
- At least 2 drain holes in the floor are required; in (sub) tropical areas 4 drain holes in the floor are mandatory, in 20 *ft* containers as well as in 40 *ft* containers.

6- COSTING OF PROJECT

Two container yards are recommended at Karachi and Lahore and the civil part of project components include hard standing/platform to stack the containers, internal roads and boundary wall. Five prime movers for each location are provided for containers movement within the yard. In case of emergency these may be rented out for transportation to other places to facilitate the users of reefer containers. Otherwise only containers will be provided on rental bases and the arrangement of prime mover is the responsibility of user.

Apart from the cost of all above items 400 refrigerated containers and 100 controlled atmosphere refrigerated containers, two cranes, standby generators, import expenses, utilities connections, pre-operating expenses, furniture, staff vehicles, consultancy charges and contingencies are included in cost of the project (Refer Table IV-1). The cost of land has been taken on an average, which is only indicative.

Table # IV-1: PROJECT COST OF CONTAINER POOLS AT KARACHI & LAHORE

Sr. #	Description	Unit	Unit Price Pak Rs.	Amount Pak Rs.	Total Amount Pak Rs.
1	Cost of Land	2 x 5 acre	5,000,000		50,000,000
2	Infrastructure & Building				
	Hard Standing / Platform	2 x 8,923 Sq.M	2,700	48,184,200	
	Internal Road	2 x 3,570 Sq.M	2,150	15,351,000	
	Administration Block	2 x 250 Sq.M	10,800	5,400,000	
	Boundary Wall	2 x 569 rm	5,900	6,714,200	75,649,400
3	Plant & Machinery				
	Reefer Container with Gen. Set	2 x 200	2,720,000	1,088,000,000	
	Reefer Container CA with Gen. Set	2 x 50	3,220,000	322,000,000	
	Prime Mover	2 x 5	3,500,000	35,000,000	
	Crane	2 x 1	15,000,000	30,000,000	
	Standby Generator 150 KVA	2 x 1	1,500,000	3,000,000	1,478,000,000
4	Import Expenses including Clearing Charges & Duties (15%)				221,700,000
6	Utilities Connections			1,725,000	1,725,000
7	Pre-operating Expenses (5%)				91,353,720
8	Furniture Fixtures	Lumsum		1,000,000	1,000,000
9	Vehicles			2,400,000	2,400,000
10	Consulting Charges (7%)				134,289,968
11	Contingenious (5%)				102,805,904

	Total Project Cost				**2,158,923,993**

7- PROPOSED MEANS OF FINANCING

LOAN			
Long Term Loan	70%	1,511,246,795	
Total Loan			**1,511,246,795**
EQUITY			
Sponsors Equity			
Government Equity	15%	323,838,599	
Private Sponsors Equity	15%	323,838,599	
Total Sponsor Equity			**647,677,198**
Total Financing	**100%**		**2,158,923,993**

Explanatory Notes:

Debt equity ratio is taken as 70:30 and 70% of total project cost will be borrowed from bank as long term loan on 12% per annum interest rate. But as per government's policy for cold chain 6% mark up will be paid by government of Pakistan and the investor / sponsor has to pay only 6% on loan amount.

Equal public private partnership is proposed and as per this arrangement government equity will be 15% and private sponsor's equity will be 15%.

Corporate setup of project will be a Private Limited Company.

8- FINANCIAL ANALYSIS

A detailed financial analysis is carried out and discussed in this section.

Projected Income Statement has been prepared and is given Table IV-2. The key assumptions as detailed in section 8.1 are made basis for calculating total sale.

Projected Profitability Statement, inclusive of total sales, gross profit, operating expenses, operating profit and non operating profit is developed making basis of key assumptions given in Section 8.1 and enclosed in Section 8.2. The projected profitability statement clearly indicates can be successfully operated from very first year of operation.

In continuation of above Project Cash Flow Statement is prepared and enclosed in section 8.3. According to the projected cash flow Internal Rate of Return (IRR) is 32% and Net Present Value (NPV) is Rs. 3.87 billion.

Projected Balance Sheet is also prepared and enclosed in section 8.4. Return on equity is calculated and found quite reasonable increasing with the passage of time.

Break Even Analysis shows that breakeven point for first year is 77.12% but it decreases gradually (Refer Section 8.5), and from fourth year the project can be successfully operated at less than half of design capacity (i.e. 47.21%).

Benefit Cost Ratio of the project is 2.03.

In the light of above discussions it is concluded that the project is financially viable, profitable and of low risk.

8.1 KEY ASSUMPTIONS

i. Projected Income Statement

This is given in Table IV-2 and enclosed hereafter.

TABLE IV-2: PROJECTED INCOME STATEMENT

SR.	ASSUMPTION	DESIGN CAPACITY 100 %	Year 1 60%	Year 2 70%	Year 3 80%	Year 4 90%	Year 5 90%	Year 6 90%	Year 7 90%	Year 8 90%	Year 9 90%	Year 10 90%
1	Income from Reefer Containers 400 No.	480	288	336	384	432	432	432	432	432	432	432
2	Income from CA Reefer Containers 100 No.	144	86	101	115	130	130	130	130	130	130	130
	Total Income	624	374.4	436.8	499	562	562	562	562	562	562	562

Assumptions

- Monthly Average Charges of Reefer Container = Rs 100,000
- No. of Containers = 400 No.
- Income for Reefer Container per year = Rs. 480,000,000
- Monthly Average Charges of (CA) Reefer Container = Rs 120,000
- No. of Containers = 100 No.
- Income from (CA) Reefer Container per year = Rs. 144,000,000

ii. Electricity Charges

Electricity Consumption on Lump Sum Basis = Rs.200,000 / Month/Station

iii. Diesel Expenses = Rs. 150,000 / Month / Station

iv. Salaries

S. No.	Description	No. of Persons per Month	Salary Per Month	Total Salary
1	Manager	2 x 1	30,000	60,000
2	Office Staff	2 x 2	8,000	32,000
3	Drivers	2 x 5	8,000	80,000
4	Technicians	2 x 2	10,000	40,000

5	Labour	2 x 10	6,000	120,000
	Total Monthly Salaries			**332,000**
	Total Yearly Salaries			**3,984,000**

v. Amortization of Pre-operating Expenses
Recovery Period = 5 Years

vi. Promotional Expenses = 1 % of Sales

vii. Depreciation

Sr #	DESCRIPTION	Asset	Rate	Amount
1	Building	75,649,400	5%	3,782,470
2	Plant & Machinery	1,699,700,000	10%	169,970,000
3	Furniture Fixture	1,000,000	15%	150,000
4	Vehicles	3,400,000	20%	680,000
5	Utilities etc.	238,820,872	10%	23,882,087
	Total			**198,464,557**

viii. Financial Charges on Loan

- Normally 12% per annum interest is charged on loan but for cold chain project 6% markup will be paid by government of Pakistan. Therefore, 6% per annum interest on loan is considered for calculation of profitability.
- Since the repayment period of loan is 10 years 10% decrease in financial charges for coming years.

8.2 Financial Results

The projected profitability statement, projected cash flow, balance sheet and other financial indicators are given on page numbers 20-24

10- RECOMMENDATIONS

This pre-feasibility study is conducted to establish a complete cold chain system under National Trade Corridor Improvement Project and is divided into three interconnected components that include (i) export/pack houses (ii), cold storages and (iii), refrigerated containers. In this volume recommendations for refrigerated containers will mainly be discussed.

Since the horticultural crops (fruits and vegetables) are highly perishable in nature and quality of produce deteriorated in very short period. To overcome the avoidable post harvest losses and to provide the local and international consumers with quality produce it become inevitable to establish an effective nation wide cold chain system. This will not only improve the fresh produce quality and reduce post harvest losses but also enhance the international trade opportunity.

To develop a comprehensive national cold chain system, a national pool of refrigerated containers (normal 400 and CA 100) is recommended. For managing the fleet of proposed containers, two containers yards are proposed one each at Karachi and Lahore.

PROJECT COST

For calculation of project cost land value is taken on an average, which may increase or decrease depending upon the selected sites. Total project cost inclusive of infrastructure, machinery and plants and initial expenses comes to Rs.2.16 billion (Refer Table IV-1)

Public private partnership

For the success of the project the corporate setup of the project is suggested as Private Limited Company comprising of public and private sponsors sharing equal equity. The public subscription will be equal to sponsors equity and the remaining project cost will be met through long term project financing on the basis of 70%-30% debt/equity.

Viability of the project

The financial analysis clearly indicates that the project is financially viable because its Internal Rate of Return is 32% & NPV is Rs. 3.87 billion which is quite high (Refer Section 8.3) Return On Equity (ROE) is quite attractive for sponsors (Refer Section 8.4) and Benefit Cost Ratio is 2.03 (Refer Section 8.6).

Potential investors

Since the private sector sponsors' equity participation would be required to the tune of Rs.323.84 million (15%), for which financially very sound sponsors are required to be selected by providing them the feasibility of the project and marketing campaign.

The potential investors for participation in private sector equity are possible to be from exporters, big farmers, entrepreneurs, industrialist with experience in related fields' industrial projects, Pakistanis living abroad, multinationals, and logistic companies etc. It is also possible that a consortium of private investors who are willing to invest for these facilities may be formed comprising of various stakeholders as identified above.

Risk analysis

The break-even point of first year is 77.12% and it reduces with the passage of time. From fourth year the project can be successfully operated on less than half of design capacity (i.e. 47.21%).

The project is of high yield but still investor might be reluctant to invest in it. Therefore, for transition period till the exporters and wholesalers fully understood the advantage of using reefer containers, the mark-up should be further reduced (which is 6% at present) to attract more people to invest in cold chain business. To meet the objective some special funding arrangements and its disbursement through eligible members of PIFFA, logistic companies and other appropriate potential investors is strongly recommended.

Concerned Government Authority must make sure that up to mark-refrigerated containers as specified by ATO must be procured and used under this project.

Technical assistance

Training programs for sponsors and investors will have to be organized for technical and administrative staff including visit to foreign countries to study logistic, transport and operations. This will help in learning the functioning of state of the art facilities and proper implementation of the project.

Role of Stakeholders

- Potential users will be persuaded for extensive utilization of cold chain facilities for local distribution of fruits and vegetables as well as export.
- Private entrepreneurs and exporters should participate in equity.
- Government should organize initial investment in the range of Rs.323.84 million as government 15% equity in the project.
- Ministry of commerce must make mandatory to use the cold chain facilities by exporters
- Awareness campaign through workshops, banners, distribution of handouts highlighting the benefits of utilizing cold chain system shall be arranged to motivate the stakeholder.

Policy Recommendation for Sustainability of Project

For sustainability of the project policies shall be formulated in following areas.

- Employment of highly qualified managerial staff with relevant experience.
- Training of technical and administrative staff for human resource development.
- Constant Research and Development in horticulture sector.
- Future expansion and acquiring updated equipment and technologies.
- Constant follow up to explore and capture new export markets.
- Making mandatory to use cold chain facilities for export of fruits & vegetables.

- Keeping in view the future need of horticulture industry local industrialist shell be encouraged to manufacture refrigerated container within the country.
- Special funding arrangement with very competitive markup rate must be arranged initially to PIFFA members then to other stakeholders to make the use of refrigerated containers a success as a backbone of national cold chain system.

8.2 PROJECTED PROFITABILITY STATEMENT

(RS. IN MILLION)

Description	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Sales	**374.4**	**436.8**	**499**	**562**	**562**	**562**	**562**	**562**	**562**	**562**
Cost of Goods Sold										
Machine Maintenance	16.997	16.997	16.997	16.997	16.997	16.997	16.997	16.997	16.997	16.997
Direct Electircity	4.800	5.040	5.292	5.557	5.834	6.126	6.432	6.754	7.092	7.446
Diesel Expense	3.600	3.780	3.969	4.167	4.376	4.595	4.824	5.066	5.319	5.585
Total	**25.397**	**25.817**	**26.258**	**26.721**	**27.207**	**27.718**	**28.254**	**28.817**	**29.408**	**30.028**
Gross Profit	**349.003**	**410.983**	**472.742**	**535.279**	**534.793**	**534.282**	**533.746**	**533.183**	**532.592**	**531.972**
Operating Expenses										
Salaries & Remuneration	3.984	4.183	4.392	4.612	4.843	5.085	5.339	5.606	5.886	6.180
Amortization of Pre-Operating Expenses	18.271	18.271	18.271	18.271	18.271	0.000	0.000	0.000	0.000	0.000
Promotional Expenses	3.744	4.368	4.990	5.620	5.620	5.620	5.620	5.620	5.620	5.620
Depreciation	198.465	198.465	198.465	198.465	198.465	198.465	198.465	198.465	198.465	198.465
Total	**224.464**	**225.287**	**226.118**	**226.968**	**227.199**	**209.170**	**209.424**	**209.691**	**209.971**	**210.265**
Operating Profit	**124.539**	**185.696**	**246.624**	**308.311**	**307.594**	**325.113**	**324.322**	**323.492**	**322.621**	**321.706**
Non Operating Expenses										
Financial Charges on Long Term Loan	90.675	81.607	72.398	63.472	54.048	45.337	36.270	27.202	18.135	9.067
Profit Before Tax	33.864	104.089	174.226	244.839	253.546	279.776	288.052	296.290	304.486	312.639
Tax	**Exempted for 10 Years**									
Profit After Tax	**33.864**	**104.089**	**174.226**	**244.839**	**253.546**	**279.776**	**288.052**	**296.290**	**304.486**	**312.639**
Accumulated Profit	33.864	137.953	312.178	557.017	810.564	1090.339	1378.391	1674.682	1979.168	2291.807

8.3 CASH FLOW STATEMENT

(RS. IN MILLION)

Description	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Sources										
Profit After Taxation	**33.864**	**104.089**	**174.226**	**244.839**	**253.546**	**279.776**	**288.052**	**296.290**	**304.486**	**312.639**
Add Depreciation	198.465	198.465	198.465	198.465	198.465	198.465	198.465	198.465	198.465	198.465
Add Ammortization	18.271	18.271	18.271	18.271	18.271	0.000	0.000	0.000	0.000	0.000
Total Sources	**250.600**	**320.825**	**390.962**	**461.575**	**470.282**	**478.241**	**486.517**	**494.755**	**502.951**	**511.104**
Utilization										
Repayment of Loan	151.125	151.125	151.125	151.125	151.125	151.125	151.125	151.125	151.125	151.125
Total Utilization	**151.125**	**151.125**	**151.125**	**151.125**	**151.125**	**151.125**	**151.125**	**151.125**	**151.125**	**151.125**
Surplus Funds	99.475	169.700	239.837	310.450	319.157	327.116	335.392	343.630	351.826	359.979
Balance B/F	0.000	99.475	269.175	509.011	819.461	1138.619	1465.734	1801.126	2144.757	2496.583
Balance C/F	99.475	269.175	509.011	819.461	1138.619	1465.734	1801.126	2144.757	2496.583	2856.562

Net Present Value of Cahs Outflow = NPV = Rs. 3.87 billion, Assume Discount Rate = 11%

Internal Rate of Return = IRR = 32%

8.4 PROJECTED BALANCE SHEET

(RS. IN MILLION)

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Cash	**0.000**	**99.475**	**269.175**	**509.011**	**819.461**	**1138.619**	**1465.734**	**1801.126**	**2144.757**	**2496.583**	**2856.562**
Land	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000
Fixed Assets	2017.568	2017.568	2017.568	2017.568	2017.568	2017.568	2017.568	2017.568	2017.568	2017.568	2017.568
Depreciation		198.465	396.930	595.395	793.860	992.325	1190.790	1389.255	1587.720	1786.185	1984.650
Net Fixed Assets	**2067.568**	**1869.103**	**1670.638**	**1472.173**	**1273.708**	**1075.243**	**876.778**	**678.313**	**479.848**	**281.383**	**82.918**
Intangible Assets											
Preoperating Expenses	91.354	91.354	73.083	54.812	36.541	18.270	0.000	0.000	0.000	0.000	0.000
Amortization		18.271	18.271	18.271	18.271	18.271	0.000	0.000	0.000	0.000	0.000
	91.354	**73.083**	**54.812**	**36.541**	**18.270**	**-0.001**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Total Assets	**2158.922**	**2041.661**	**1994.625**	**2017.725**	**2111.439**	**2213.861**	**2342.512**	**2479.439**	**2624.605**	**2777.966**	**2939.480**
Long Term Loans	1511.247	1511.247	1360.122	1208.997	1057.872	906.747	755.622	604.497	453.372	302.247	151.122
Less: Repayment		151.125	151.125	151.125	151.125	151.125	151.125	151.125	151.125	151.125	151.125
Total Liabilities	**1511.247**	**1360.122**	**1208.997**	**1057.872**	**906.747**	**755.622**	**604.497**	**453.372**	**302.247**	**151.122**	**-0.003**
Owners Equity	647.677	647.677	647.677	647.677	647.677	647.677	647.677	647.677	647.677	647.677	647.677
Unappropriated Profit		33.864	137.953	312.178	557.017	810.564	1090.339	1378.391	1674.682	1979.168	2291.807
Total Equity	647.677	681.541	785.630	959.855	1204.694	1458.241	1738.016	2026.068	2322.359	2626.845	2939.484
Total Liabilities & Equity	**2158.924**	**2041.663**	**1994.627**	**2017.727**	**2111.441**	**2213.863**	**2342.513**	**2479.440**	**2624.606**	**2777.967**	**2939.481**
Sales		374.400	436.800	499.000	562.000	562.000	562.000	562.000	562.000	562.000	562.000
Net Income		33.864	104.089	174.226	244.839	253.546	279.776	288.052	296.290	304.486	312.639
ROE (%)		**4.969**	**13.846**	**21.198**	**27.432**	**28.134**	**30.166**	**30.784**	**31.388**	**31.978**	**32.556**

8.5 BREAK EVEN ANAYLSIS

		YEAR I			YEAR 2			YEAR 3		
	Sales	**433.800**			**506.100**			**578.400**		
Sno.	**Description**	**Total Operating Cost**	**Variable Operating Cost**	**Fixed Operating Cost**	**Total Operating Cost**	**Variable Operating Cost**	**Fixed Operating Cost**	**Total Operating Cost**	**Variable Operating Cost**	**Fixed Operating Cost**
1	Machine Maintenance	16.997	11.898	5.099	16.997	11.898	5.099	16.997	18.340	7.859
2	Direct Electricity	4.800	3.840	0.960	5.040	4.032	1.008	5.292	4.234	1.058
3	Diesel Expense	3.600	3.600	----	3.780	3.780	----	3.969	3.969	----
4	Salaries & Remuniration	3.984	3.187	0.797	4.183	3.347	0.837	4.392	3.514	0.878
5	Promotional Expenses	3.744	3.744	----	4.368	4.368	----	4.990	4.990	----
6	Financial Charges on Lor	90.675	----	90.675	81.607	----	81.607	72.398	----	72.398
7	Amortization	18.271	----	18.271	18.271	----	18.271	18.271	----	18.271
8	Depreciation	198.465	----	198.465	198.465	----	198.465	198.465	----	198.465
	Total	**340.536**	**26.269**	**314.267**	**332.711**	**27.424**	**305.287**	**324.774**	**35.046**	**298.930**
	Sales-V .cost		**407.531**			**478.676**			**543.354**	
	Breakeven - %		**77.115**			**63.777**			**55.016**	

		YEAR 4			YEAR 5		
	Sales	**650.700**			**650.700**		
Sno.	**Description**	**Total Operating Cost**	**Variable Operating Cost**	**Fixed Operating Cost**	**Total Operating Cost**	**Variable Operating Cost**	**Fixed Operating Cost**
1	Machine Maintenance	16.997	18.340	7.859	16.997	18.340	7.859
2	Direct Electricity	5.557	4.446	1.111	5.834	4.667	1.167
3	Diesel Expense	4.167	4.167	----	4.376	4.376	----
4	Salaries & Remuniration	4.612	3.690	0.922	4.843	3.874	0.969
5	Promotional Expenses	5.620	5.620	----	5.620	5.620	----
6	Financial Charges on Lor	63.472	----	63.472	54.048	----	54.048
7	Amortization	18.271	----	18.271	18.271	----	18.271
8	Depreciation	198.465	----	198.465	198.465	----	198.465
	Total	**317.161**	**36.262**	**290.101**	**308.454**	**36.877**	**280.778**
	Sales-V .cost		**614.438**			**613.823**	
	Breakeven - %		**47.214**			**45.743**	

Break Even Point (Q) = $\frac{FC}{Sale - VC}$ x 100

Break Even Point for year 1 = 77.12%
Break Even Point for year 2 = 63.78%
Break Even Point for year 3 = 55.02%
Break Even Point for year 4 = 47.21%
Break Even Point for year 5 = 45.74%

8.6 BENEFIT COST RATIO

(RS. IN MILLION)

Description	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**
Factor based on 15% discount	0.870	0.756	0.658	0.572	0.497	0.432	0.376	0.327	0.284	0.247
Sales	374.400	436.800	499.000	562.000	562.000	562.000	562.000	562.000	562.000	562.000
	325.728	330.221	328.342	321.464	279.314	242.784	211.312	183.774	159.608	138.814
	2521.361									
Cost of Goods Sold	25.397	25.817	26.258	26.721	27.207	27.718	28.254	28.817	29.408	30.028
Operating Expenses	224.464	225.287	226.118	226.968	227.199	209.170	209.424	209.691	209.971	210.265
Total Cost	249.861	251.104	252.376	253.689	254.406	236.887	237.678	238.508	239.379	240.294
	217.379	189.835	166.064	145.110	126.440	102.335	89.367	77.992	67.984	59.353
	1241.858									

Benefit Cost Ratio = 2.030

9- IMPLEMENTATION PLAN

A tentative implementation plan is prepared and given in Figure IV-3

Months

SL #	Description	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Month 13	Month 14	Month 15	Month 16
1	Pre-feasibility Report	■ ■ ■															
2	PC - 1		■ ■ ■														
3	Government Approval			■ ■ ■	■ ■ ■												
4	Public / Private J.V.				■ ■ ■	■ ■ ■											
5	Procurement of Land						■ ■ ■	■ ■ ■									
6	Civil Works								■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■		
7	Opening L.C. / Machinery Procurement									■ ■ ■	■ ■ ■						
8	Arrival of Machinery													■ ■ ■			
9	Erection and Installation														■ ■ ■	■ ■ ■	
10	Commissioning																■ ■ ■

Figure IV-3: Implementation Plan