Confederation of Indian Industry

Feasibility Report for

COLD CHAIN DEVELOPMENT FOR APPLES IN J&K

Published by Confederation of Indian Industry (CII)
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Contents

LIST OF TABLES

LIST OF FIGURES:

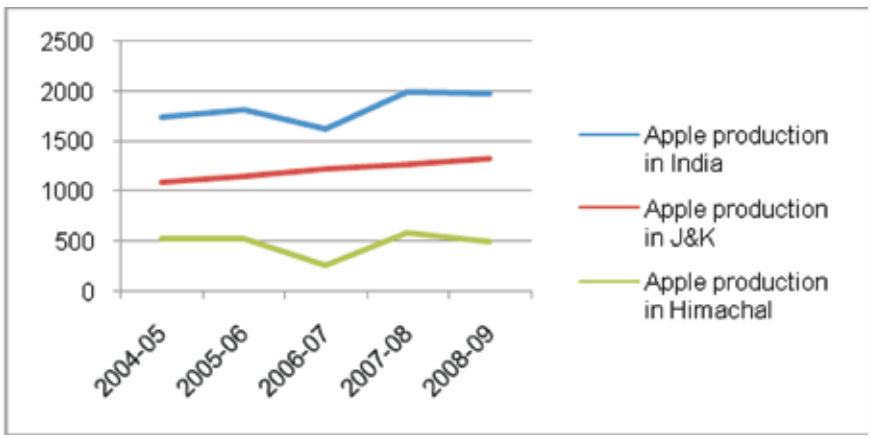
ANNEXURES

1. Introduction

1.1 Background

Jammu & Kashmir is endowed with distinctive agro climatic conditions which clearly divide the state into three zones viz. temperate, sub tropical and cold arid zone with a diverse range of crops and vegetation. Main crops include Apple, Pear (Pome Fruits), Peach, Plum, Cherry (Stone Fruits) and walnuts, almonds (Nuts). Apple tops the list as the horticultural production @ 87 % of the total fruit production in the state.

FIGURE 1: PRODUCTION OF APPLE IN LAST 5 YEARS IN INDIA

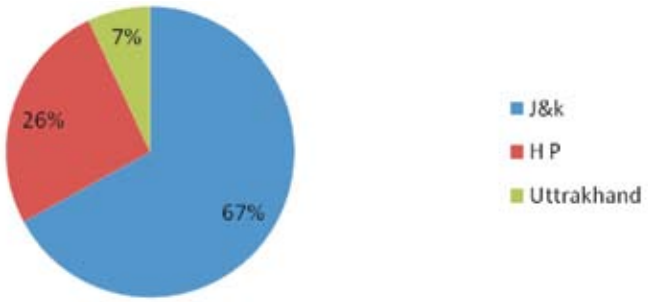


Source: NHB

J&K accounts for 67 % of the total apple production in India and is competitive. Apple production in state yields 10 MT / ha vs. national average of 7.4 MT / ha. The state produces mainly Red Delicious type of apples that counts for ¾ of crop. Some 20 cultivars are commercially grown, prominent varieties include Hazaratbali (Benoni), Maharaji (White Dotted Red), Delicious (Red Delicious), American Trel (American Apirogue), Amri (Ambri Kashmir) and Kesri (Cox's Orange Pippin).

Jammu & Kashmir, despite providing the majority of Apples supply faces a number of challenges, in market access, packhouse & cold store infrastructure and dated post harvest and packaging practices that results in lower earnings for growers and the allied trading community. The lack of infrastructure means that the farmer sells in the flush of season, thereby reducing opportunities of realizing higher price out of season.

FIGURE 2: PRODUCTION SHARE OF MAJOR APPLE PRODUCING STATES



Source: NHB

Cold store space in state is estimated @19,600 MT storage or 1.7% of marketable crop compared to 10% of total marketable Apple production of Himachal is stored in cold stores (including CA Stores - Controlled Atmospheric Stores). CA Stores preserve quality and extend store life of apples to beyond 180 days to provide premium grade fruit out of season. J&K has just 10,500 MT of CA Stores operated by private investors versus 18,000 MT in Himachal and 12,000 MT in Haryana.

TABLE 1: STORAGE CAPACITY VS MARKETABLE APPLE PRODUCTION

State	Estimated CA capacity (MT)	Estimated Cold Store (MT)	Cold store capacity for Apple	Total storage capacity	Ratio of Storage Capacity to the total marketable production in the state
J&K	10500*	45500	9100***	19600	1.7
Himachal	29700**	20000	20000	49700	9.4

*Includes Harshana Nature Pvt. Ltd. & Kohinoor Industries at Kashmir

**Includes Fresh & Healthy Enterprise (CONCOR) at Rai, Haryana

***Only 20 % of the total Cold storage capacity is used for Apple storage and Rest is used for making ice and storing Vegetables

Out of this capacity, a few cold stores are used for Apple storage in Jammu & Kashmir rest of them are used either for potatoes or for ice. Presently CA storage capacity for apple in the state is about 10,500 MT.

TABLE 2: TABLE 2CA STORE IN KASHMIR

Store	CA Capacity (MT)
Harshna Nature Private Limited,Sopian	3,500
Kohinoor Industries, Srinagar	7,000

Hence 1.7% of total marketable apple is stored in Kashmir region. The proposed project (24000 MT) will almost double the storage capacity in the state.

The Apple growers in J&K are still using wooden boxes for packaging while corrugated cardboard cartons are being used for Apple packaging in Himachal. Most of the apple from Kashmir is packed

in wooden boxes of 18 kilos. The boxes are made manually and quality fluctuates. To keep up with the market trends as well as for environment reasons, Apple growers need to shift from wooden boxes to corrugated cartons.

The projects will run on farm level sourcing (direct procurement from orchards through collection centers), educate farmers on modern post harvest practices including picking, sorting and handling, and build world class cold stores and grading systems that will preserve quality and reduce losses. At Jammu, the project includes ripening centre that can be used for fruit such as banana, papaya and mango, thus creating a hub for fruit processing in the state.

Global AgriSystem has proposed a modern system for procurement, processing and storage supported by refrigerated logistics to create a cold chain infrastructure in state. The clear objective is to develop infrastructure that will have a multiplier effect on inviting private investment in cold chain projects in the apple belts of the state. These “projects” will create capacity for storage and processing and provide domestic markets for the state’s apple growers. 3 projects are proposed, one each at Anantnag and Sopian in the heart of apple orchards and a market hub at Jammu.

CA Stores of 6,000 MT with matching packhouse will be built at Sopian and Anantnag while the Jammu Hub will include 2,000 MT of CA Stores with matching Packhouse, 10,000 MT of Cold Stores and 100 MT of Ripening Chambers. In short, 24,000 MT of cold stores including 14,000 MT of CA space and 10,000 MT of conventional cold stores will be built along with ripening chambers of 100 MT.

The estimated project cost of Jammu hub is 5,495 lakhs and for Anantnag & Sopian , it is 5935.01 lakhs State govt will create a SPV (Special Purpose Vehicle to run this project. A special fund for promoting Reefer trucks will be provided.

The projects require expertise in fruit procurement, technical skills for packhouse and cold store operations and business skills for marketing, typically available in the private sector. For this project, it is envisaged that the Govt of J&K will promote these projects by forming a SPV (Special Purpose Vehicle) that will be divested to eligible private investors through a public bidding process. The Govt through the SPV, shall acquire land, receive regulatory approvals including facilitating state and local level clearances, and receive sanctions for grant / subsidy from the Horticulture Mission for North East & Himalayan States (HMNH) so that the start up time for a private developer is minimized.

Global AgriSystem was contracted by National Task Force on Cold Chain Development at CII (Confederation of Indian Industry) to prepare a detailed business plan for setting up the cold chain infrastructure for apples in Jammu & Kashmir. Specific objectives include:

Identification of feasible projects in post harvest management, cold chain and packhouse infrastructure and logistics for Apples that would integrate the supply chain from orchards to markets

Envision PPP development of projects at each of the 3 locations including a fund for subsidizing a reefer truck base to cater to the cold store needs.

2. The Project

2.1 The Project Concept

The concept for the project is to create post harvest infrastructure linking orchards to markets through cold chain. Key motive is to develop cold stores and grading sorting facilities in state so that there is a trickledown of benefits to farmers, trading community and local employment. While J&K is the dominant provider of apples, the sale is done principally in flush season to outside markets in view of a lack of cold stores. External markets including Delhi, Mumbai and other metros control the purchase and distribution of the state crop. This project aims to develop infrastructure that will provide additional benefits to growers and traders especially out of season and also create local employment. As an added measure, with the cold stores in place, there will be an immediate market in the vicinity of orchards that will motivate farmers for improving their crop. There also emerges an opportunity for branding the state produce under an umbrella origin brand for carton labels, pack and product labels and for promotions.

The total production of apple in J & K is 1.4 MMT, of which 20 % is in the culled apple category. Marketable volumes are around 1.1 MMT. The total installed capacity of cold storage and J&K is 42869 MT including CA storage in Kashmir, however only about one third of installed capacity are used for storage purposes and rest are used for ice and other purposes. In Kashmir total CA storage capacity is about 10000 MT along 2500 MT of CS store.

Out of this storage capacity only 13000 MT of apple is stored in Kashmir from total 1.1 MMT of marketable apple. The remaining quantity is sold as fresh, or stored in heaps or stored in other markets of India. Delhi continues to be the key market handling over 50% of crop; recent trends have shown that dispatches to other major markets are taking place directly. An estimated 0.6 MMT (1/2) of Kashmir apples enter Delhi market every season and about 45000 MT is stored there only.

Delhi acts as a transit market for Kashmir apple and through Delhi market, Kashmir apple reaches across India. 1.7% of the total production of apple can be stored in Kashmir region; so apple cultivators in J&K can't fetch the true value of their produce. A strong cold chain infrastructure and integration between backward and forward linkage will ultimately make Kashmir apple available in Indian market in the lean season also and the state can directly sell apple to the major markets.

2.2 Importance

The cold chain infrastructure in J&K will change the marketing scenario of Kashmir apple as follows:

- **Value addition to product:** Currently no specific grading system is followed by the apple farmers in J&K. Improper storage, drying, sorting and grading practices and handling system, and lack of awareness about Phyto-sanitary conditions are some of the reasons for poor quality of Kashmir Apple when it reaches to the market. Grading and sorting of the apple at production centers as per market standards will add value to the produce and it will be able to compete in the market. Similarly, storage of produce and off-season sales will further fetch better price compare to sale during the peak season.
- **Reducing wastage:** Almost there is value loss of 30% of total apple produced in the state and the main reason of wastage is lack of storage and logistic facility. The proposed infrastructure in the state includes storage as well as logistic facility in an integrated manner, which will lead to saving of wastage of apple at various stages in the supply chain. This benefit of saving in wastage will be additional income for the farmers.
- **Meeting seasonal fluctuations:** The harvest season of Apple is from August to October. The apple growers in Kashmir are forced to sell their produce to trader in the peak season only because the state lacks in enough cold chain infrastructure to store the produce. The infrastructure will enable adequate quality storage within the state. The growers in J&K then can have a control over the supply and they can capitalize by selling Apple in the high demand situations in lean season even in the distant markets.

2.3 Project Structure

The facilities proposed to be set up in Jammu & Kashmir include 2 CA Stores (capacity 6000MT each) with pack house facility for apple in Kashmir Valley, serviced by three collection centers and a horticulture hub at Jammu of 12000 MT capacity with CA store (2000MT) and one large Cold store (10000 MT) is to be set up along with an Auction Centre. The Hub at Jammu also includes ripening centre for Banana, Mango and Papaya. There is also a component of Reefer transport model which can minimize the quality loss of apple during transport and Kashmir apple can directly be made available to distant markets. Therefore, the proposed cold chain infrastructure network in J&K for apples will enable adequate quality storage within the state to provide minimal weight and quality losses. Implementation of this facility will fetch a high value price to the apple growers in Kashmir.

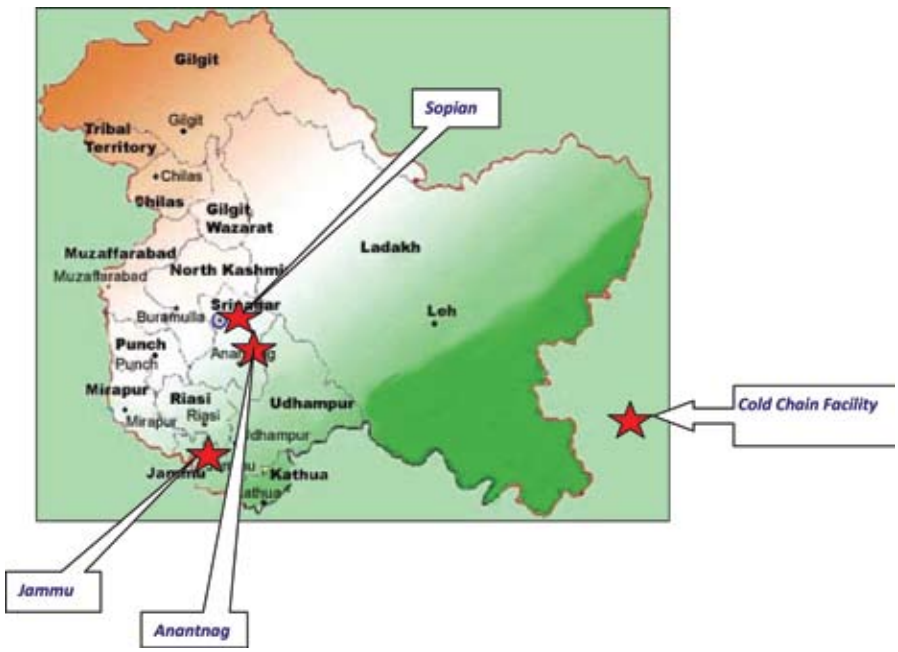
The project is the combination of long term and short term storage along with grading, sorting and processing facilities. The two CA stores are located next to the finest growing area and this is done to capitalise on the long term gains in the markets from March onwards. As Kashmir NH 1 opens in March, these cold stores will provide much needed storage in the Valley for premium quality. The hub at Jammu will act as a specialised market throughout the season and offers large scale ripening for inbound fruit such as bananas, mango and papaya.

2.4 Project Location

The locations for the cold chain infrastructure have been decided on the basis of the parameters like production clusters, access to logistics and other infrastructure. The production clusters is the main priority. The collection centres and even the three facilities are to be set up either in the production clusters or nearby production clusters.

For this project three locations have been identified and details are given below.

FIGURE 3: LOCATION OF FACILITIES IN J&K



1. Sopian			
Infrastructure	**Proposed Peak Capacity**	**Number of units**	**Collection centers**
Pack House	10TPH	1	Pulwama, Kulgam, Chari-e-sharif
CA Storage	6000 MT	1	

2. Anantnag			
Infrastructure	**Proposed Peak Capacity**	**Number of units**	**Collection centers**
Pack House	10TPH	1	Batingoo, Brakpora, Kulgam
CA Storage	6000 MT	1	

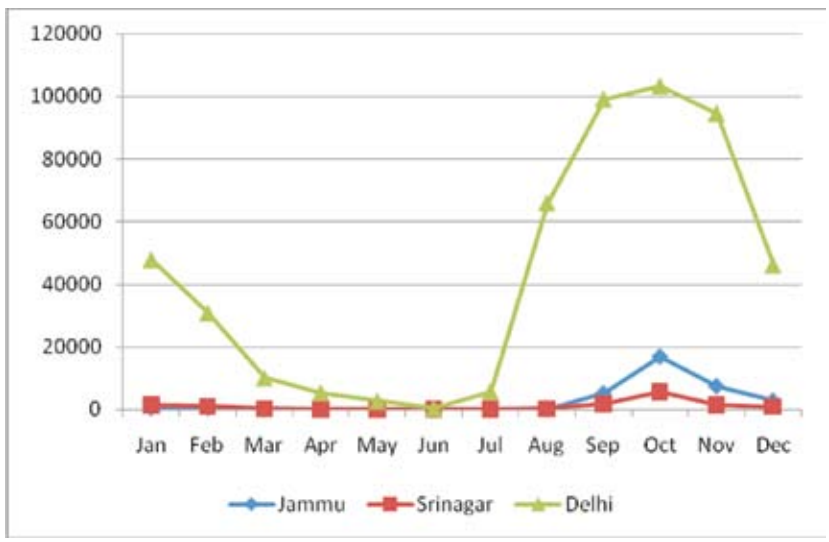
3. Jammu			
Infrastructure	**Proposed Peak Capacity**	**Number of units**	**Collection Centers**
Pack House	5TPH	1	**R.S.Pura, Batote, Udhampur**
CA Storage	2000 MT	1	
Cold Storage	10000MT	1	
Ripening Chambers	20 MT	5	

2.5 Demand Drivers for Setting up of integrated cold chain with reefer logistics

Under this project, it has been envisaged to create storage capacity 24000 MT apples in Kashmir. Out of which 14000 MT of Apple will be stored in CA and 10000 MT in cold stores. The capacity can be well justified by a detailed analysis of arrival and prices of Apple throughout the year. Arrival of apple starts in August, peaks in October due to huge arrivals from almost all the apple producing belts of Jammu & Kashmir, Himachal and Uttranchal and then gradually declines as the season draws to an end in about mid December or early January. The arrivals in the market after that are mainly from cold storage and some late arrivals. The price trend generally follows demand and supply patterns, with highest price in August at the start of the season and then going down with increase in arrivals in the following month and then going up in the late season (March onwards due to minimum supply).

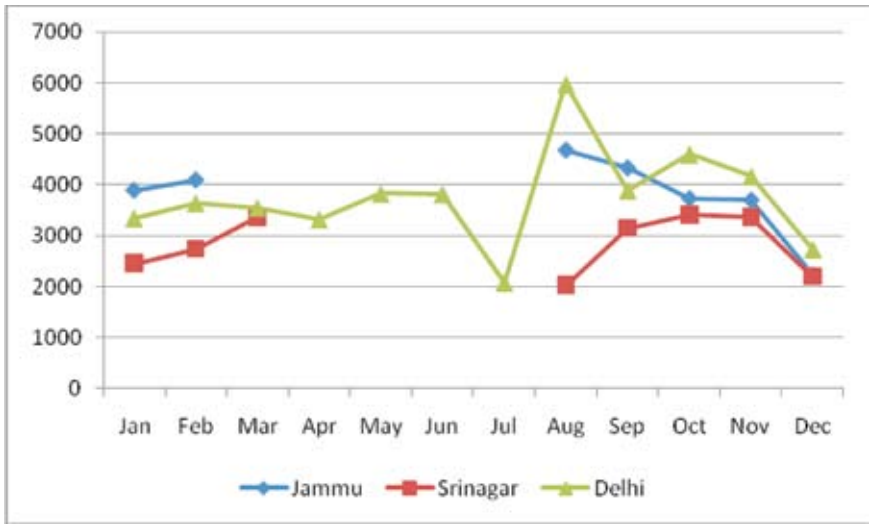
The supply of Apple in six months preceding August is almost negligible leading to large demand and supply gap. So the market treats the fresh crop with enthusiasm and also the arrival in August is dominated by a superior crop from Himachal, which fetches a good price.

FIGURE 4: MONTHLY TREND OF APPLE ARRIVAL (MT) IN THE MARKETS OF JAMMU, SRINAGAR AND DELHI (2009)



Source: NHB

FIGURE 5: MONTHLY TREND OF APPLE PRICES (RS/QUINTAL) 2009

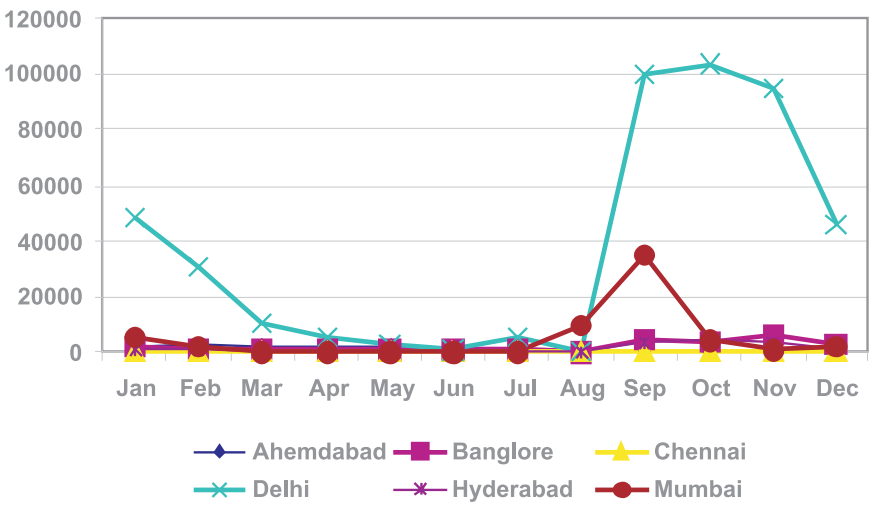


Source: NHB

Delhi is the major market of apple in the country; it is also a transit market. The maximum arrival of the produce is in Delhi market in the month of October when the produce from Jammu and Kashmir starts coming and it decreases slightly in November and then there is a steep decline in the month of December which reduces further in January and in the month of April the arrival is almost negligible.

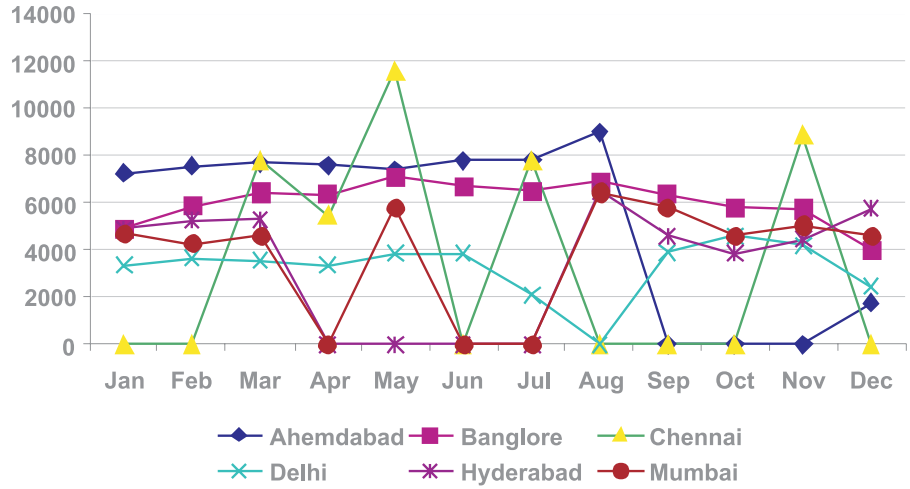
In the year 2009 the total arrival in the month of October was 1, 03,381 MT and the average price was Rs. 4,597 per quintal in Delhi market. The price of Apple was highest in the month of August i.e. Rs. 5,978 per quintal; it declined to Rs. 3,889 per quintal in September and further increased in the month of October to Rs. 4,597 per quintal.

FIGURE 6: MONTHLY TREND OF APPLE ARRIVAL (MT) IN THE SOUTHERN MARKETS AHEMDABAD, BANGALORE CHENNAI, HYDERABAD, MUMBAI AND DELHI (2009)



Source: NHB

FIGURE 7: MONTHLY TREND OF APPLE PRICES (RS/QUINTAL) IN THE SOUTHERN MARKETS AHMEDABAD, BANGALORE CHENNAI, HYDERABAD, MUMBAI AND DELHI (2009)



Source: NHB

In markets like Ahmedabad, Bangalore Chennai, Hyderabad, Mumbai (2009), the price and arrival trend of year 2009 shows a huge demand and supply gap, January onwards till July, which is evident from high prices prevailing during this time. Particularly as in Chennai market price of Apple is Rs 7800/quintal in the month of March where the arrival is almost negligible that is 40MT. same goes for Mumbai market the Apple price touches up to Rs 6000/quintal and the arrival again is negligible from March to July. The prices are higher March onwards, as fresh arrival is negligible and trade is mainly in the stored crop which demands a high price.

Analysis of weekly arrival and wholesale price data for the five major markets for 2009-2010 indicates that India's apple market is poorly integrated. There appears to be no strong relationship between price levels and fluctuations in the Delhi market—which handles about 70 percent of India's domestic apples—and prices in the other regional markets. Some market imperfections are to be expected given India's large size and stage of development, as well as the regional concentration of apple production. The degree to which the markets are not integrated is, however, somewhat surprising. In contrast to an efficient market, where spatial differences in prices primarily reflect transport and transaction costs, the spatial price variations in India are suggestive of weak market infrastructure and institutions, and a lack of competition between domestic suppliers.

Analysis of weekly wholesale price and domestic market arrival data for the major urban markets for 2009 and 2010 indicates that Delhi prices do not significantly affect prices elsewhere—that the other major markets are not well integrated with the Delhi market. And, except for Mumbai prices' affecting prices in Bangalore and Kolkata, none of the other markets are integrated. With widespread improvements in telecommunications in India, poor information flow across the markets is unlikely to be the cause of poor price linkages. More likely explanations include poor supply chain infrastructure for perishable commodities and the tendency of traders in more distant markets, such as Chennai, Bangalore, and Mumbai, to contract directly with growers and circumvent the

Delhi market. Another factor may be the cascading effect of large trading margins that obscure price differences. The lack of price integration between the Delhi market and the other major markets indicates the potential gains from investments in infrastructure and institutions that improve marketing efficiency.

In these months, the crop from the cold storage fetches good price. The proposed cold chain infrastructure in Jammu & Kashmir has the capacity of storing 24000 MT of apple. 14000 MT of which stored in CA storage which can be supplied in Reefer vans to these markets directly also bypassing Delhi market and can meet the high demand. This will fetch the true and high price of Kashmir Apple.

2.6 The Proposed cold chain infrastructure:

Proposed project will have four different levels of infrastructure / facilities to integrate the supply chain for Apple sold across the Indian market. These facilities will include:

- Collection centers at production clusters (Pulwama, Kulgam, Chari-e-sharif Batingoo, Brakpora, R.S.Pura, Batote, Udhampur)
- Reefer trucks
- Integrated pack house with controlled atmospheric conditions at Jammu, Anantnag, and Sopian
- Ripening centre for banana at Jammu

2.6.1 Collection Centers (CC) at production clusters

Proposed CCs shall have basic infrastructure for handling produce at the field level during season. Facilities at the CCs will include weighing machine (Platform) with 1000 Kgs of capacity, and manual grading / sorting. Nine CCs have been proposed under this project, three for each facility namely Pulwama, Kulgam, and Chari-e-sharif for in Sopian, Batingoo, Brakpora, and Kulgam for Anantnag and R.S.Pura, Batote, Udhampur for Jammu.

2.6.2 Reefer Trucks

Reefer trucks of varying capacity for transportation of fresh produce from facility to distant markets.

2.6.3 Integrated Pack House in Jammu & Kashmir

The proposed facilities at Jammu, Anantnag & Sopian will serve as pack house cum hub where products will be brought after harvesting, to prepare them as per the market requirements in terms of grading, packing, cold storage, CA storage and transportation. The infrastructure will be having facilities for performing various post harvest functions in

such a manner that products are prepared with utmost care to avoid injury or bruising. At this place, value addition will also be done without modifying the ultimate shape and utility of the product. Thus, not only cosmetic appearance of the produce is enhanced, but also there is considerable increase in shelf life of the product. Similarly, corrugated packaging is done rather than wooden packaging, which is safe for the produce to be transported over long distance plus it maintains the quality standards. CA storage facility is provided to store fresh produce for long duration as per requirement.

2.7 Facilities

After the primary sorting and grading, the produce is brought to the cold storage / CA storages and stored as per recommended temperature, humidity level and other criteria to extend their shelf life.

The development of cold storages including cold chain for transport has an important role to play in reducing the wastage, and thus providing remunerative prices to not only to growers but also for the developers.

2.7.1 Facility at Jammu

The Hub will have CA stores (10*200 MT), MA stores (10*1000 MT) and pack house with Apple Optical Sorting Grading line of 5 TPH. Main crops will be apples and potato followed by other produce. Ripening facility has been proposed to meet the demand of Banana in J&K as well as in nearby other smaller markets. Banana will be brought from distant production areas such as Gujarat and Maharashtra as per availability and will be ripened for distribution. Five (5) chambers, with capacity of 20 MT each will be developed to ripen 20 MT of banana every day. Other fruit like mango and papaya will be processed in season. the facility for apple destined for CA storage. The capacity of the proposed sorting grading line is 10MT per hour.

2.7.2 Facility at Anantnag & Sopian

Each facility shall include CA stores (30 * 200MT) that will serve lean season demand of Apple in distant market. Apple will be procured in the peak season from August to September and sold after March. Since there is a huge demand and supply gap from the month April to August, the apple growers can have an advantage of time and price arbitrage and can fetch the true value of their produce. The packhouse will include 10 TPH optical Sorting / Grading lines at each location.

2.7.3 Need of Cold chain Logistics

In this cold chain infrastructure project in J & K, there is a proposal of storing 14000MT of Kashmiri Apple in CA (Controlled Atmosphere) store. CA stored produce has to be

transported in temperature controlled conditions to maintain the freshness, firmness, quality, and moisture content. To make this project feasible, CA infrastructure is to be followed by the Reefer logistics to maintain the continuity in the cold chain. The project concept is to have a price and time arbitrage in southern markets. Reefer logistics is a primary requisite to fulfil this objective.

A component of subsidy will be needed to create a pool of reefer trucks, which is available from HMNH (Horticulture Mission for North East & Himalayan States) under condition that outbound reefer service would be made available to the 3 units for transport of CA Apples. Applicants would need to confirm availability of Reefer transport at all the three facilities (Jammu, Anantnag and Sopian) as per unit needs from April onwards.

3 Technology

The Indian market has grown quality conscious over the past decade due to various reasons, namely availability of high quality imported Apples and an economic upswing. The project concept has been developed with a view to improve quality of produce in the supply chain, by specific interventions starting from the field level, packhouse and cold storage technology, grading and sorting systems, reefer transport and packaging.

3.1 Grading system

J&K producers follow an outdated grading system of producing two main grades (A & B quality) and a culled grade while Himachal has adopted internationally accepted norms of grading. Therefore, there is an immediate need of upgrading the standards and educating the farmers. J&K follows three recognized grades of apple commonly known as A, B and C grades. The first two are marketable, while the C grade apples are not considered fit for table purposes and are classified as 'culled' apples for being sold for processing purposes only.

3.1.1 Internationally Accepted: Colour and Size Grading

Colour Grading

A Grade: This grade has further been subdivided into the following three categories:

AAA Grade	Fruits must have attained or developed more than 80% colour characteristics of the variety, having normal shape typical of the variety and should be clean bright and free from blemishes or defects.
AA Grade	Fruits must have attained or developed 70 - 80% colour characteristics of the variety, having normal shape typical of the variety and should be clean bright and free from blemishes or defects.
A Grade	Fruits must have attained or developed 60 -70% colour characteristics of the variety, having normal shape typical of the variety and should be clean bright and free from blemishes or defects.

B Grade: Fruits with 50% colour characteristics of the variety, with slightly abnormal shape and with two or three headed spots.

C Grade: Fruits with fresh injuries and spots, which are likely to rot immediately in transit. Shapeless and not fit for the fresh market.

Size Grading

Grading is carried out on the basis of the diameter of the fruit.

SIZE	MINIMUM DIAMETER OF FRUIT IN MM
Super Large	85 & Above
Extra large	80-85 mm
Large	75-80 mm
Medium	70-75 mm
Small	65-70 mm
Extra Small	60-65 mm
Pittoo	60 & Below

3.1.2 Mechanised sorting and Grading:

The fruit is graded on the basis of colour, weight and size.

J & K Apple needs to have a more elaborate grading system and be at par with the International norms as given above (both for colour and size grades). Under this project it has been planned to set up 8-10 lane optical camera grading system for apples. To grade the fruit on international

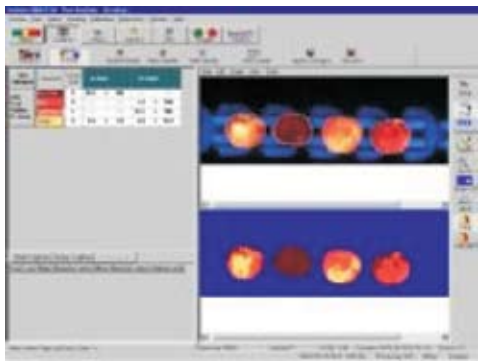
standards instead of manual grading, a mechanised grading system would be installed which not only improve the quality of the fruit Apple but speedup the grading process too.

Waxing of Apple:

The apple can be coated with wax to improve its aesthetic appeal and reducing the loss of water hence ameliorating weight loss. The waxes applied on apples can either be animal wax, vegetable wax or mineral and synthetic wax. After applying wax, the fruit assumes glossy and firm appearance which is considered as an important quality in apples. Preventing the loss of water in apples also helps to maintain firmness and juiciness. If apples lose water through respiration and transpiration they lose the desirable characteristic crispy texture, shrink and become hard. Wax coated J&K apple can be transported over long distances such as to distant markets in the South or can be exported also as the wax coated reduces the ripening process. The most common wax used on apples is a vegetable wax called carnauba wax or shellac.

3.1.3 Grading & sorting technologies to be set up at Jammu & Kashmir for Apples

Grading line for weight



Operating screen for shape & colour grading

2 lane colour grader for Apples

8-10 lanes shape & colour grader for Apple Storage

3.2 Cold Storages Vs Controlled Atmosphere:

For this particular project of cold chain in J & K, in Kashmir there is a proposal of setting up Controlled Atmosphere (CA) storages of capacity of 12000 MT. For High quality produce, harvesting of fruit just before the triggering of ripening and pre-cooling /rapid cooling are some of the prerequisites of CA storage. Pre-cooling is not needed for the CA storage in Kashmir due to the low ambient temperature. Fruit can be stored for a long period in CA storage and the quality is also maintained because of gaseous composition control. Therefore only apples of good quality and long storage potential should be stored in CA stores. Immature or over mature apples should not be held in this manner. The CA stored apple should be protected from mechanical damage and extreme temperatures during transport.

3.3 ULO (Ultra Low Oxygen)

Controlled atmosphere storage is a well-established technique used to extend the storage life of apples and maintain the quality too. Firmness, acidity, colour and other quality parameters are maintained in CA, whereas the ability of apples to produce volatile compounds is suppressed during and after CA storage. The aroma suppression depends on both the atmosphere composition and the length of storage time. Improved fruit quality and extended storage life are achieved by lowering the oxygen concentration to less than 1%, i.e. storing in ultra-low oxygen (ULO) atmosphere. The lower limit for oxygen, at which no accumulation of anaerobic respiration products (acetaldehyde, ethanol, and lactate) occurs, is connected to the cultivar, growing area conditions and climate. In countries like Italy, ULO storage is used to reduce physiological disorders in Red Delicious Apple. Therefore ULO is better technique for Apple storage.

3.4 Thermal Insulation:

It is recommended that appropriate BIS standards are adopted for selection of design parameters and method of application of thermal insulation (IS 661 & 13205). For fresh F & V are stored at 0oC, it is recommended to design thermal insulation for (-4oC to + 2oC) temperature condition to have lower heat load.

Materials of thermal insulation and its application-

Cold chambers have to be insulated on walls, ceilings / roofs & floors with proper insulating material of adequate thickness, with provision for vapour barrier on outer side & proper cladding/ cover on inner side. The commonly used insulation materials are:

a) Expanded polystyrene

b) Rigid Polyurethane foam

c) Rigid phenolic foam

d) Mineral wool in composite panel form

e) Extruded polystyrene

Among them the main insulation material for the panel is Polyurethane and expanded polystyrene. If we compare then polyurethane is better than Polystyrene because of following reasons:

- PUF has a better R-value than EPS per inch thickness of insulation. Since PUF has the highest rated insulation in this world and comparatively more rigid than EPS.
- PUF has one of the lowest moisture permeability ratings. The permeance rating on PUF is 1.2 while that of EPS is 5.0.
- PUF is resistant to most counter chemicals while EPS reacts violently to petroleum.
- Mechanical strength of PUF panel is better than EPS.
- The compression strength and bonding strength of PUF panel is better than EPS.
- The density of a product will determine the strength of it. The PUF has a density of 2.2 lb while that of EPS is 1lb.

3.5 CA Door:

The door of the CA store should possess these qualities:

- High insulation efficiency
- Effective Perimeter hermetic sealing
- Easy and fast to operate
- Gas leak proof
- Preference to sliding doors

4 Cold Chain Infrastructure

4.1 Basis for selection

All the components of the proposed project has been selected based on availability of raw material in production cluster (for collection centers) and linking this to the markets through optimizing use of infrastructure. For maintaining continuity of cold chain, refrigerated trucks have been proposed for transportation of perishable commodities.

Minimal infrastructure has been proposed at the collection centers (CCs) to take care of product handling at the field level for safe transportation of the same to the pack house. The design of various facilities such as site plan, buildings, waste disposal area, area for parking of vehicles and environmental features of the pack house facility has been undertaken as per specific technical requirements.

4.2 The Proposed Infrastructure and Processing Facilities at Jammu

The proposed distribution centre broadly consist of

- CA and Cold store
- Ripening centre
- Administration
- Utilities
- Green area
- Auction centre

4.2.1 CA and cold store

The facility will have 10 CA chambers with 200 MT capacity each with dimensions as (15*7*9) cubic metre. The total CA storage capacity of the facility is 2000MT. It also includes 10 conventional cold store chambers with 1000 MT capacity each with dimensions (28*25) sqm. The total CS capacity is 10,000MT.

4.2.2 Ripening Centre

The ripening centre includes 5 ripening chambers each with capacity of 20MT and dimensions of (10.5*5) sqm. The ripening centre will work for 12 months a year.

4.2.2.1 Rationale for installing Ripening chambers

Generally banana is sold as green. Modern banana ripening facilities are conspicuously absent in Jammu and Kashmir. Ripening of banana is done by traditional method in closed chambers or rooms by using acetylene which is hazardous to health and not considered as good practice. A very few ripening facilities are available in the existing markets. Therefore ripening facility at Jammu would help retailers / users of the facility to provide uniformly ripened banana to the target consumers. Additional fruits that can be ripened are Papaya and Mango.

4.2.3 Administration

It will consist of office block. This will be at entrance of the facility.

4.2.4 Utilities

This area around 962.5sqm will consist of change rooms, canteen etc. It will also consist of area for Genset, Electric room, and Rest room, Crate washing facility, Security post and weigh bridge, loading and unloading bays, parking area, cash & carry and green area. A guest house is also there for the vendors, traders etc.

4.2.5 Green area

Taking into consideration the environmental aspect, green area is also kept in the proposed facility. it is around 945sqm in Jammu.

4.2.6 Auction Centre

There is also a provision of auction centre for auctioning of produce. The total area given to the auction centre is 945sqm.

Apart from these facilities there is also a provision of constructing a logistics block (350sqm), packaging area 866.25 sqm, and guest house at the Jammu facility.

4.3 The Proposed Infrastructure and Processing Facilities at Anantnag and Sopian

The proposed infrastructure at Anantnag and Sopian is same. Each of the facility will broadly consist of

- CA store
- Administration
- Utilities
- Green area
- Auction centre

4.3.1 CA store

At each facility in Anantnag and Sopian there are 30 CA chambers with capacity of 200 MT each and dimensions of (15*7*9) cubic metres.

4.3.2 Administration

It will consist of office block. The total area given to the administration block is 490 sqm.

4.3.3 Utilities

This area around 525sqm will consist of sub station etc. It will also consist of area for Genset, Electric room, Canteen and Rest room, Crate washing facility, Security post and weigh bridge, loading and unloading bays, parking area, cash & carry and green area. A guest house is also there for the vendors, traders etc.

4.3.4 Green area

Taking into consideration the environmental aspect, green area of 1575sqm is also kept in the proposed facility.

4.3.5 Auction Centre

There is also a provision of auction centre for auctioning of produce. The total area given to the auction centre is 840sqm.

Apart from these facilities, Sopian and Anantnag, each of them will be having logistics block (315sqm), and a parking area of 1575sqm.

Other facilities which are common to each cold chain infrastructure at Jammu, Anantnag and Sopian are

4.4 Grading & sorting Area

This hall will consist of one line for sorting and grading line would be used for grading and sorting of Apple on the basis of size, colour and shape. During sorting and grading, undesirable produce will be separated manually while the acceptable ones will be allowed to continue and fill directly into the crates or bin. The area given to pack house in Jammu facility is 1750sqm including lab and an area of 1680sqm is given for the same at each of the facility at Anantnag & Sopian.

4.5 Holding Area with weighing scales

Holding hall will have controlled temperature range of 18 to 24 degree. In addition to temperature management, humidifier will also be installed to maintain the desired humidity level. There is also provision of weighing scale in the holding area.

4.6 Unloading Dock cum Reception area

The unloading and transfer of horticulture produce will be carried in the plastic crates from this zone. Each user will have its own unloading and loading area with sufficient parking area. For common users, sufficient space is kept for unloading and loading to feed the produce in the sorting grading line, from where users can take sorted and graded produce to the respective areas.

- Produce from trucks will be un- loaded here before feeding it into the grading line.
- The plastic crates containing produce would be received at reception area. From the reception area, crates would be moved to sorting grading lines through roller conveyers after weighing and inspection of the produce.

4.7 Other requirements

A separate area is kept for DG set location, Effluent Treatment Plant (ETP) etc. in the proposed facility. A provision of overhead water tank was also kept in the DC. There is a provision of Security post and weigh bridge at the entry of the area.

4.8 Detail of facilities

The facility details are given in Annexure II

5 Project Implementation

The project proposes a demand driven/pre-marketed model with strong backward/forward linkages and sustainable supply chain. The primary objective of the proposed project is to facilitate establishment of integrated value chain, with processing at the core and supported by requisite forward and backward linkages. The project includes centre-cum- cold chain in identified clusters, processing of intermediate products, collection centre cum cold chains, centralized infrastructure to take care of processing activities, which require cutting edge technologies and testing facilities, besides the basic infrastructure for water supply, power, environmental protection systems, communication etc. The supply chain will establish on-Farm Primary Processing Centre cum cold chain facilities for aggregation of the produce, which will be linked, to the retail outlets/processing parks through appropriate produce aggregation facility and collection centre cum cold chain and Reefer van transportation net works.

Government of J&K will create Special Purpose Vehicle/s either for individual or all 3 projects (SPV) that will be divested to private investors through a public bidding process. The SPV shall acquire land and land related permissions including CLU, apply for and receive statutory approvals and clearances and sanction of subsidy. In parallel, J&K Govt or its nodal agency for the project shall move forward the PPP process through development of project specific DPR's / Project Information Memorandum, Bidding Documents including RfQ and RfP either internally or through independent agencies.

It is proposed that private investors shall bid in a public call for tender and the highest bidder may be awarded the project subject to having the necessary technical, business knowledge and financial strengths and committing to implementation of the project in a specific period.

5.1 Setting up of a SPV:

The proposed project would be implemented on a PPP basis through project specific Special Purpose Vehicles (SPV) owned and managed by the members. The state Government is responsible for forming this SPV that will be divested to private investors. An SPV shall ordinarily be a Company registered under Companies act 1956. There shall be one nominee of the State Govt. (Department of Agriculture/Horticulture), one nominee of CII on the Board of Directors of the SPV till completion of the project.

- Acquire land for each facilities along with cleranaces and registration
- Obtain local approvals, registrations and clearances

- Apply for financial assistance and receive sanction under RKVY, the norm of assistance will match HMNH

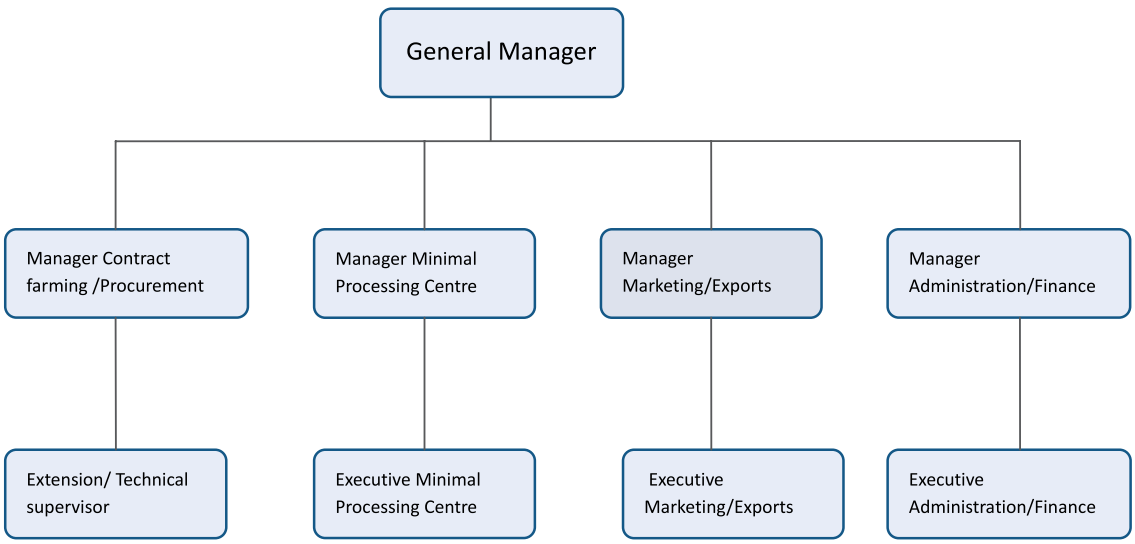
5.2 Role of State Government

The project envisages pro-active involvement of the State Government in the following areas:

- Providing project and bidding documentation for the PPP
- Providing requisite land to the project, wherever needed, in appropriate mode, to the project
- Providing necessary external infrastructure to the such as power, water supply, roads, effluent disposal etc, wherever needed
- Providing necessary project related clearances on expeditious basis

5.3 Facility Organizational Structure

FIGURE 8: ORGANIZATIONAL STRUCTURE



6 Project Financial

6.1 Cost Estimates

The project is consisting of three facilities which is primarily CA/MA storage at three different locations the state in the growing area of the apple. The proposed facilities shall be created at Jammu with 2000 MT CA, 10,000 MT CS and 100 MT Ripening Chambers. At Anantnag and Sopian, 6000 MT CA storage facilities at each centre is proposed to be created. A fleet of 150

Trucks are also proposed for ensuring Integrated Cool chain in the State. Financial model has been developed with total project cost estimates at Rs. 22,075.87 lakhs. All the components of the project, aimed at achieving the estimated operational efficiencies based on assumed various operational parameters of economies, are assessed and featured below:

TABLE 3: PROJECT COST

Total Project Cost *(Rs in Lakhs)*

	PROJECT COST				
Particulars	**Jammu**	**Anantnag**	**Shopian**	**Reefer**	**Total**
Land & Land Development	803.40	742.51	742.51	–	2,288.42
Building	1,315.80	882.55	882.55	–	3,080.91
Plant & Machinery	2,070.35	2,113.02	2,113.02	4,650.00	10,946.39
Other Machinery & Equipment	836.59	1,744.30	1,744.30	60.00	4,385.20
Total Fixed Assets	5,026.15	5,482.39	5,482.39	4,710.00	20,700.92
Pre-Operative Expenses	206.24	203.20	203.20	–	612.64
Margin Money For Working Capital	263.48	249.42	249.42	–	762.31
Total	5,495.86	5,935.01	5,935.01	4,710.00	22,075.87

6.1.1 Land & Site Development

Land measuring 7 Acres for facility at Jammu and 5.5 Acres each for facilities at Anantnag and Sopian are calculated to be adequate for the establishing the project. The cost of land is highly variable in terms of geographical preference of the storage location and hence provided indicative costs @ Rs 80 lakhs per acre for Jammu and Rs 90 lakhs each for Anantnag and Sopian has been taken into the account. Total cost on this account has been taken into consideration is Rs 2288.42lakhs, including cost of all development activities like land levelling, roads, external lighting, boundary wall, green area, parking slots, security gates etc.

TABLE 4: LAND AND SITE DEVELOPMENT COST

(Rs in Lakhs)

	LAND & SITE DEVELOPMENT COST			
Particulars	**Jammu**	**Anantnag**	**Shopian**	**Total**
Land Cost	560.00	496.80	496.80	1,553.60
Registration Fee & Transfer Expenses	44.80	39.74	39.74	124.29
Land Levelling & Greenery	2.91	2.30	2.30	7.50
Greenery & Landscape	1.41	0.79	0.79	3.05
Road & Drainage	63.22	57.24	57.24	177.70
Parking Slots, Reception Area & Corridors	100.10	116.48	116.48	333.06
Complex Lighting	17.68	15.91	15.91	49.50
BOUNDARY WALL (Running Meters)	4.60	4.26	4.26	13.11
Security Gate	1.04	1.04	1.04	3.12
Architect Fee	7.64	7.92	7.92S	23.48
TOTAL	803.40	742.51	742.51	2288.42

6.1.2 Building Construction

Construction of facilities; Cold Store Chambers, CA stores, moving corridors, Sorting, Grading & Processing Hall, Lab, Loading & Unloading ways, Stores and Utility area are proposed to be constructed as per the drawing. Administrative Office, Security Cabin, Canteen, change rooms and Toilets etc are also designed to be constructed as a supportive infrastructure.

TABLE 5: BUILDING CONSTRUCTION COST

(Rs in Lakhs)

	BUILDING CONSTRUCTION			
Particulars	**Jammu**	**Anantnag**	**Shopian**	**Total**
Pre Engineered Building	401.66	251.23	251.23	904.12
Cold Store Structure	473.20	189.28	189.28	851.76
Process Hall & Grading Area	114.27	127.92	127.92	370.11
Lab Area	1.30	1.30	1.30	3.90
Packing Material Store & Holding Area	103.74	114.66	114.66	333.06
Cash & Carry	42.59	35.49	35.49	113.57
Change Room & Labour Convenience	5.07	5.07	5.07	15.21
Administrative Building	22.65	29.74	29.74	82.13
Guest House	21.63	28.05	28.05	77.74
Security & Time Office	3.38	3.38	3.38	10.14
Canteen	6.76	5.07	5.07	16.90
Auction Centre	39.31	34.94	34.94	109.20
Logistic Park	14.56	13.10	13.10	40.77
Utilities, Sub-station & DG Room	7.80	5.20	5.20	18.20
Power House open Area	7.28	4.16	4.16	15.60
Architect Fee	50.61	33.94	33.94	118.50
TOTAL	1315.80	882.55	882.55	3080.91

Total amount including the contingency provisions @ 4% has been provided at Rs 3080.91 lakhs.

6.2 Plant & Machinery

6.2.1 Plant & Machinery

Refrigerated units, Cooling Towers, Puff Panels, Doors, CA equipment, Sorting & Grading lines are proposed to be installed for the best quality solutions.

TABLE 4: PLANT & MACHINERY COST

(Rs in Lakhs)

	PLANT & MACHINERY				
Particulars	**Jammu**	**Anantnag**	**Shopian**	**Reefer**	**Total**
Refrigeration Equipment (Blue Star Make: Flooded Screw Brine Chiller, Model No. LCWX1-180EEF, 4 W+1 S), Air Cooling Units, Air Handling Units with UVC Emitters etc.	364.00	291.20	291.20		946.40
Cooling Tower (with BacComber), Pumps, Plumbing, Ethylene Generator, Humidifier, Ventilation & Accessories etc.	291.20	187.20	187.20		665.60
PUF Panels & Doors	780.00	468.00	468.00		1,716.00
CA Equipment including doors (10 Chambers x 200 MT)	234.00	598.00	598.00		1,430.00
Grading/ Sorting Line	312.00	468.00	468.00		1,248.00
Installation Charges	89.15	100.62	100.62		290.39
Reefer Trucks				4650.00	4650.00
TOTAL	2070.35	2113.02	2113.02	4650.00	10,946.39

In case of machinery, the consultants have had discussions with leading suppliers and accordingly design and specifications are frozen. The cost estimates that include erection and commissioning costs have been taken at Rs 10,946.39lakhs.

6.2.2 Miscellaneous Fixed Assets & Equipment

DG Set for power back up. Material handling equipment, Pallet Trucks, Bins, Crates and Office Furniture are required for smooth operation and administration. A total provision for the same has been made with an outlay of Rs 4211.32 lakhs (Rs in Lakhs)

TABLE 7: MISCELLANEOUS FIXED ASSETS & EQUIPMENT

(Rs in Lakhs)

	OTHER MACHINERY & EQUIPOPMENT			
Particulars	**Jammu**	**Anantnag**	**Shopian**	**Total**
Stackers	43.68	29.12	29.12	101.92
Pallet Trucks	13.00	10.40	10.40	33.80
Underground Water Tank (50,000 Ltrs)	11.44	11.44	11.44	34.32
Electricity Equipment (KVA)	62.40	52.00	52.00	166.40
Electricity Installation	17.69	12.05	12.05	41.80
DG Back-up (KVA each)	93.60	72.80	72.80	239.20
Fire Fighting Equipments	20.80	20.80	20.80	62.40
Lab Equipment	1.04	1.04	1.04	3.12
Digital Electronic Weighing Machines 2000 Kgs Capacity	0.26	0.78	0.78	1.82
Digital Electronic Weighing Machines 20 Kg, Metal Body, Inbuilt Battery Backup	0.18	0.18	0.18	0.55
Bins	482.56	1,447.68	1,447.68	3,377.92
Crates	51.98	48.05	48.05	148.08
TOTAL	798.63	1706.34	1706.34	4211.32

6.2.3 Office Equipment

Office Furniture and other various equipments are required for smooth administration. A total provision for the same has been made with an outlay of Rs 173.88 lakhs.

TABLE 8: MISCELLANEOUS FIXED ASSETS

(Rs in Lakhs)

	MISCELLANEOUS FIXED ASSETS				
Particulars	**Jammu**	**Anantnag**	**Shopian**	**Reefer**	**Total**
Furniture & Fixtures	15.60	15.60	15.60	30.00	76.80
Car / Jeep	8.32	8.32	8.32	10.00	34.96
Computers & Communication System	2.60	2.60	2.60	6.00	13.80
Laptop	1.04	1.04	1.04	2.00	5.12
Office Equipments	10.40	10.40	10.40	12.00	43.20
TOTAL	37.96	37.96	37.96	60.00	173.88

6.2.4 Pre-Operative Expenses

The project is proposed to go commercial by the end of the year zero and thus expenses during the preoperative are provided on various accounts like Interest on Term Loan, Professional Charges and Establishment administrative expenses amounting to Rs 612.64lakhs.

TABLE 9: PRE-OPERATIVE EXPENSES

(Rs in Lakhs)

	PRE-OPERATIVE EXPENSES			
Particulars	**Jammu**	**Anantnag**	**Shopian**	**Total**
Start up & Administrative Cost	20.80	17.20	17.20	55.20
Preliminary & Start up Expenses	5.00	5.00	5.00	15.00
Salaries & Supervision Cost	22.95	22.95	22.95	68.85
Insurance	25.05	28.23	28.23	81.51
Professional Charges	10.00	10.00	10.00	30.00
Security Deposits	40.00	30.80	30.80	101.60
Interest	82.44	89.03	89.03	260.50
TOTAL	206.24	203.20	203.20	612.64

6.3 Margin For Working Capital

Margin for working capital is assessed at Rs 762.31 Lakhs at first year's operations. The balance requirement at higher capacities is proposed to be met through internal accruals. The inventories are calculated on the basis of 15 day's investment on procurements, two months inventory of packing materials and two months debtors

6.4 Contingencies

Contingency provisions @ 4% on construction and equipments are directly added to the cost of respective components.

6.5 Sources of Finanace

The means of finance for total cost amounting to Rs. 21,907.67 lakhs are proposed as indicated below:

TABLE 10: SOURCES OF FINANCE

(Rs in Lakhs)

	MEANS OF FINANCE				
Particulars	**Jammu**	**Anantnag**	**Shopian**	**Reefer**	**Total**
Promoter's Funds	1,894.93	1,217.50	1,217.50	555.00	4,884.93
Financial Assistance	853.00	1,750.00	1,750.00	1,800.00	6,153.00
Term Loan	2,747.93	2,967.50	2,967.50	2,355.00	11,037.93
Total	5,495.86	5,935.01	5,935.01	4,710.00	22,075.88

The project being an infrastructure project is to be set up as a vital link for value addition at the production zone for the large number of orchard owners in PPP mode of investment; it is proposed to create a SPV for extending the desired assistance from Government. The financial assistance calculation is done on the basis of Horticulture Mission for North East & Himalayan States (HMNH) but the state government will apply for the financial assistance from Rashtriya Krishi Vikas Yojna (RKVY), then the norm of assistance will match HMNH to make it a self sustainable venture inviting the investments from private investors with reasonable returns.

Term loan is proposed to avail as 50% of the project cost at 12% rate of interest per annum. Repayment is proposed in 10 half yearly equal instalments with moratorium of about a year.

6.5.1 Working Capital Loan

TABLE 11: WORKING CAPITAL LOAN

(Rs in Lakhs)

	WORKING CAPITAL ASSESSMENT				
Particulars	**Period Days**	**Jammu**	**Anantnag**	**Sopian**	**Total**
Procurement	15.00	168.88	180.08	180.08	529.03
Packing Material	60.00	143.50	134.40	134.40	412.30
Sundry Debtors	60.00	741.53	683.20	683.20	2,107.93
TOTAL		1,053.91	997.68	997.68	3,049.26
Margin		263.48	249.42	249.42	762.31
MPBF		790.43	748.26	748.26	2,286.94

Working capital is assessed and proposed to be financed from scheduled Bank. Proposed attaining higher capacities gradually, the requirement of working capital too shall increase simultaneously. Margin assumed at 25% for the first year is built up in the project cost

and the increased requirement during forthcoming years shall be met through internal accruals. Rate of interest is assumed at 12% per annum. Basis of computing the working capital are assumed at extreme comfort level which by way of efficient realization of debtors, could further be controlled and brought down. The margin has been built in the project to the extent of initial requirement of first year's operations and additional requirements in the subsequent years are proposed to be met from internal accruals.

6.6 Operations & Revenue

6.6.1 Assumptions for Revenue realization

The facilities are created to take the maximum benefits of mechanized controlled atmosphere for shelf life enhancement of the Product through long term storage. The capacities so introduced are proposed to be utilized by the promoters through trading operations. The capacities of normal cold storage and ripening at Jammu facility are proposed to be offered to small growers to service and promote the farming and trade as well.

The detail break up of revenue projection is given in the following two tables:

TABLE 12: BASIC PARAMETERS

	LOCATION & REVENUE PARAMETER	
Particulars	**Capacity**	**Location**
CA Storage		Trading
CA Storage	2000 MT	Jammu
	6000 MT	Anantnag
	6000 MT	Sopian
CS & Ripening		Service Income & Trading
Normal CS	10000 MT	Jammu, Service Income 50% Trading 50%
Ripening	100 MT	Jammu, 100% Service Income
Reefer Transport		Service Contract
Reefer Trucks	150 Trucks	At all three Facilities

6.7 Balance Sheet

Starting from the reserves on account of financial assistance at Rs 6153 lakhs, project shall accumulate these reserves to Rs 20,164 lakhs, translating over threefold rise.

TABLE 13: BALANCE SHEET

(Rs in Lakhs)

	BALANCE SHEET							
Particulars	**Year 0**	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	**Yr 6**	**Yr 7**
LIABILITIES								
Promoter's Funds	4,884.94	4,884.94	4,884.94	4,884.94	4,884.94	4,884.94	4,884.94	4,884.94
Reserves & Surplus	6,153.00	7,098.36	8,741.58	10,649.73	12,822.82	15,731.79	17,951.28	20,164.40
Term Loan	11,037.94	9,934.04	7,726.24	5,518.44	3,310.64	1,102.84	–	–
Bank Borrowings-W C	-	2,286.94	2,613.65	2,613.65	2,613.65	2,613.65	2,833.46	2,833.46
TOTAL	22,075.87	24,204.28	23,966.40	23,666.76	23,632.05	24,333.21	25,669.68	27,882.80
ASSETS								
Fixed Assets	20,700.92	20,700.92	19,116.87	17,532.81	15,948.75	14,364.70	12,780.64	11,196.58
Less Depreciation	-	1,584.06	1,584.06	1,584.06	1,584.06	1,584.06	1,584.06	1,584.06
Net Block	20,700.92	19,116.87	17,532.81	15,948.75	14,364.70	12,780.64	11,196.58	9,612.53
Current Assets	-	3,049.26	3,484.87	3,484.87	3,484.87	3,777.95	3,777.95	3,777.95
Preoperativ Exp.Not W/O	612.64	490.11	367.58	245.06	122.53	–	–	–
Cash & Bank Balance	762.31	1,548.04	2,581.14	3,988.08	5,659.96	7,774.62	10,695.15	14,492.32
TOTAL	22,075.87	24,204.28	23,966.40	23,666.76	23,632.05	24,333.21	25,669.68	27,882.80

6.8 Profitability

Overhead costs have been estimated by consultants based on their experience in other projects of similar nature and capacity. Profitability of the project is worked out for 7 years, till the project attain its debt free status, is given below:

TABLE 14: PROFIT & LOSS ACCOUNT

	PROFIT & LOSS ACCOUNT						
Particulars	**Year 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	**Yr 6**	**Yr 7**
NET REVENUE	11,522.35	13,168.40	13,168.40	13,168.40	14,375.26	14,375.26	14,375.26
TOTAL EXPENSES	7,271.42	8,379.11	8,379.11	8,379.11	9,088.65	9,088.65	9,088.65
GROSS PROFIT	4,250.93	4,789.29	4,789.29	4,789.29	5,286.60	5,286.60	5,286.60
DEPRECIATION	1,584.06	1,584.06	1,584.06	1,584.06	1,584.06	1,584.06	1,584.06
INTEREST	1,588.89	1,439.49	1,174.55	909.62	671.06	406.19	340.02
PREOP. EXP. W/O	122.53	122.53	122.53	122.53	122.53	–	–
PROFIT BEFORE TAX	945.36	1,643.22	1,908.15	2,173.09	2,908.96	3,296.36	3,362.53
INCOME TAX						1,076.87	1,149.42
PROFIT AFTER TAX	945.36	1,643.22	1,908.15	2,173.09	2,908.96	2,219.49	2,213.11

Tax is considered as exempted for first 5 years and 30% exempted for next 5 years. The tax is calculated @ 30 %. The change in applicable rates shall be put in effect time to time.

6.9 Cash Flow & Repayment Schedule

TABLE 15: CASH FLOW & REPAYMENT SCHEDULE

(Rs in Lakhs)

OPENING BALANCE	–	945.36	1,643.22	1,908.15	2,173.09	2,908.96	2,219.50	–
SURPLUS/(DEFICIT)	945.36	1643.22	1,908.15	2,173.09	2,908.96	2,219.50	2,213.11	945.36
Sources of Funds	**Year 0**	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	**Yr 6**	**Yr 7**
PROMOTOR'S CONTRIBUTION	4,884.94	–	–	–	–	–	–	–
RESERVE & SURPLUS	6,153.00	–	–	–	–	–	–	–
NET PROFIT		2,544.35	3,082.71	3,082.71	3,082.71	3,580.02	2,625.68	2,553.13
DEPRECIATION		1,567.04	1,567.04	1,567.04	1,567.04	1,567.04	1,567.04	1,567.04
PRELIMINARY EXP.W/O		121.80	121.80	121.80	121.80	121.80	–	–
INCREASE IN TERM LOAN	11,037.94	–	–	–	–	–	–	–
INCREASE IN BORROWINGS-WC	–	2,286.94	326.71	–	–	–	219.81	–
Deployment	22,075.88	6,540.12	5,119.89	4,793.18	4,793.18	5,290.49	4,428.86	4,137.11
INCREASE IN FIXED ASSETS	20,700.92	–	–	–	–	–	–	–
PRELIMINARY EXPENSES	612.64	–	–	–	–	–	–	–
DECREASE IN TERM LOAN	–	1,103.90	2,207.80	2,207.80	2,207.80	2,207.80	1,095.24	–
INCREASE IN CURRENT ASSETS	–	3,049.26	435.61	–	–	293.08	–	–
INTEREST PAYMENT (TL & WC))	–	1,598.99	1,439.49	1,174.55	909.62	671.06	406.19	340.02
TOTAL	21,313.56	5,752.15	4,082.90	3,382.35	3,117.42	3,171.94	1,501.43	340.02

Generating sufficient cash at its operations, the project is capable of serving it's interest and debt retiring obligation, retaining sufficient surplus to meet any unseen requirement of process updating or meeting the needs of sensible factors

6.10 Investment Analysis

TABLE 16: INVESTMENT ANALYSIS & KEY INDICATORS

INVESTMENT ANALYSIS & KEY INDICATORS								
Particulars	**Year 0**	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	**Yr 6**	**Yr 7**
Gross Sales	–	11,522.35	13,168.40	13,168.40	13,168.40	14,375.26	14,375.26	14,375.26
Profit Before Tax	–	945.36	1,643.22	1,908.15	2,173.09	2,908.96	3,296.36	3,362.53
Project Cost	22,075.87	22,075.87	22,075.87	22,075.87	22,075.87	22,075.87	22,075.87	22,075.87
Promoter's Funds	4,884.94	4,884.94	4,884.94	4,884.94	4,884.94	4,884.94	4,884.94	4,884.94
Rotation Factor	–	0.52	0.60	0.60	0.60	0.65	0.65	0.65
GP Margin	0.00%	36.89%	36.37%	36.37%	36.37%	36.78%	36.78%	36.78%
NP Margin	0.00%	8.20%	12.48%	14.49%	16.50%	20.24%	22.93%	23.39%
Return On Investment (ROI)	0.00%	4.28%	7.44%	8.64%	9.84%	13.18%	14.93%	15.23%
Return On Capital Employed	0.00%	19.35%	33.64%	39.06%	44.49%	59.55%	67.48%	68.83%

6.11 Key Performance Indicators:

TABLE 17: KEY PERFORMANCE INDICATOR

KEY PERFORMANCE INDICATORS	
Particulars	**Envisaged**
IRR (Internal Rate of Return)	23.02
Average DSCR	1.96
Break Even Point %	42.91
Pay Back Period (Yrs)	4.42

6.12 Internal Rate of Return

TABLE 18: INTERNAL RATE OF RETURN

INTERNAL RATE OF RETURN								
Particulars	**Year 0**	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	**Yr 6**	**Yr 7**
Capital Cost	15,922.87							
Gross Revenue	–	11,522.35	13,168.40	13,168.40	13,168.40	14,375.26	14,375.26	14,375.26
Prod & Other Costs		7,271.42	8,379.11	8,379.11	8,379.11	9,088.65	9,088.65	9,088.65
Salvage Value								
Gross Surplus	(15,922.87)	4250.93	4789.29	4789.29	4789.29	5286.60	5286.60	5286.60
IRR								23.02

6.13 Average Debt Service Coverage Ratio

TABLE 19: AVERAGE DEBT SERVICE COVERAGE RATIO

AVERAGE DEBT SERVICE COVERAGE RATIO							
Particulars	**Year 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	**Yr 6**	**Yr 7**
Net Profit	945.36	1,643.22	1,908.15	2,173.09	2,908.96	3,296.36	3,362.53
Depreciation	1,584.06	1,584.06	1,584.06	1,584.06	1,584.06	1,584.06	1,584.06
Preliminary Exp.W/O Added Back	122.53	122.53	122.53	122.53	122.53	122.53	122.53
Interest	1,598.99	1,439.49	1,174.55	909.62	671.06	406.19	340.02
Total	4,250.93	4,729.89	4,729.89	4,729.89	5,286.60	5,286.60	5,286.60
Term Loan Interest	1,324.55	1,125.85	860.91	595.98	331.04	66.17	–
Interest on Working Capital	274.43	313.64	313.64	313.64	340.02	340.02	340.02
Term Loan Repayment	1,103.90	2207.80	2207.80	2207.80	2207.80	1102.84	–
Total	2,702.89	3,647.29	3,382.35	3,117.42	2878.86	1,509.02	340.02
Dscr	1.57	1.31	1.42	1.54	1.84	3.50	15.55
Average Dscr	1.57	1.42	1.42	1.45	1.52	1.69	1.96

6.14 Break Even Point

TABLE 20: BREAK EVEN POINT

BREAK EVEN POINT							
Particulars	**Year 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	**Yr 6**	**Yr 7**
Gross Sales	11,522.35	13,168.40	13,168.40	13,168.40	14,375.26	14,375.26	14,375.26
Fixed Cost (Incl Dep.& Int.)	3,770.40	3749.62	3,484.69	3,219.75	2,981.19	2,593.79	2,527.62
Variable Cost	6,806.59	7,775.56	7,775.56	7,775.56	8,485.10	8,485.10	8,485.10
Contribution	4,715.76	5,392.84	5,392.84	5,392.84	5,890.15	5,890.15	5,890.15
Break Even Point (%)	79.35	69.53	64.62	59.70	50.61	44.04	42.91
Cash Bep (%)	43.76	37.88	32.97	28.06	21.64	17.14	16.02

6.15 Pay Back Period

TABLE 21: PAY BACK PERIOD

PAY BACK PERIOD								
Particulars	**Year 0**	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	**Yr 6**	**Yr 7**
Gross Sales	15,922.87							
Fixed Cost (Incl Dep.& Int.)		2,651.94	3,349.80	3,614.74	3879.67	4,615.55	3,803.55	3797.17
Variable Cost		2,651.94	6,001.75	9,616.48	13,496.16	18,111.71	21,915.26	25,712.43
Contribution								4.42

Operational strength of the project, with sensibility tested on various financial and risk parameters, is worked out to be satisfactory and safe.

7 Key Factors For The Project Success

There are several factors which determine the success of the project; however some of these are the designated as the key factors, discussed below

7.1 Supply

It is necessary to have access to abundant raw materials at a competitive price, with a time lapse between harvest and processing of not more than 8 to 12 hours. The duration and schedule of harvest determine the occupation rate of the unit and its economic return.

7.2 Technology and Equipment

The most subtle point in the process in found at the level of technology, packaging without condensation, constant level of temperature and humidity, which affects the quality of final products, if fails there would be risk of, condensation and chance of fungus growth.

7.3 Personnel

This is relatively delicate fresh fruits and vegetable industry that necessitate a training programme for team leader and maintenance personnel (Refrigeration, CA and mechanical). There are two sensitive areas: reception of raw material and packaging without condensation.

7.4 Quality Control

Raw material test: sample analysis to determine harvest date and time and act upon farming technique, maturity of the essence and yields are to be tested. Finished products tests: establish precise identity guides for each lot, which helps improve the power of negotiation and product quality stabilization.

7.5 Distribution and Commercialisation

Market for fresh fruits and vegetables is international and domestic. It is essential to have international and domestic partners who are either distributors or users. The setting up of this unit in an area is well known for the specific products with exclusive production window.

7.6 Financing

This depends on the quantity and diversity of raw material as much as the possible sale price. Nonetheless, in normal working conditions (more than 6 months out of 12 months), and with average prices, the annual turnover/investment ratio is more than double. The working capital needed on the method of paying the farmers and the user's term of payments (Payments with order, upon delivery, etc.)

7.7 Induced Activities

This activity allows for the development and stabilisation of diverse agricultural production. The industry can create a market for intermediate food products, the cardboard for boxes, service industry for supply and distribution.

ANNEXURE I

Government Assistance (State and central)

Horticulture is the one of main segments of agriculture in India, with important sub-segments being fruits, vegetables, aromatic and herbal plants, flowers, nuts, spices and plantation crops. Different parts of India are endowed with different agro-climatic conditions which facilitate growing of a wide variety of horticultural crops, including root and tuber crops, mushroom, ornamental crops, and plantation crops like coconut, areca nut, cashew and cocoa. As Jammu and Kashmir is endowed with a wide variety of temperate fruits and vegetables in which Apple tops the list.

The Government of India has been encouraging adoption of horticulture as a means of diversification from the traditional grains and cereal crops, which is not only eco-friendly but also ensures more efficient use of land and other natural resources. Several policy measures and promotional schemes have been introduced, for end to end development of the sector. Presently, India is the second largest producer of fruits and vegetables in the world, though its share in world trade is very small. India has also made noticeable advancement in the production and exports of flowers. Further, it is the largest producer, consumer and exporter of spices.

With this backdrop, government of India launched the National Horticulture Mission (NHM) in 2005-06, with the objective of facilitating holistic and integrated development in the Horticulture sector. It is based on cluster approach, focused development of selected crops, improvements in production and productivity, adoption of good agricultural practices aimed at promotion of exports and focus on Post Harvest Management. To enhance the productivity and to promote horticulture in India and particularly in difficult states like J& K, National Horticulture Mission has been providing financial assistance under many Schemes. One of the Scheme under which this particular project is being implemented is Technology Mini Mission III. The pattern of financial assistance under these schemes is as follows:

S. No	Item	Maximum Permissible Cost	Pattern of Assistance#
A.	**Mini Mission- I**		
	Seed and Planting material – Production and supply of parental lines, quality seeds, rootstocks, motherstocks (scion blocks)	Rs.15 lakh/ project	
1	Technology Standardization / refinement and dissemination	Rs.20 lakh/ project	
2	Acquisition of technologies including import of planting material from other countries	Rs.10 lakh/ project	
3	Imparting training through on farm trials / front line demonstrations	Rs.5 lakh/ project	
	Mini Mission – II		
	Production of planting material		
	Model nursery / Big Nursery (2-4 ha)	Rs.6.25 lakh/ha	100 % of the cost for Public sector and 50% for private sector having production capacity of 50,000 plants per ha per year. Assistance could be availed upto Rs. 25.00 lakh by public sector and Rs. 12.50 lakh by private sector for an area of 4 ha.
(ii)	Small nursery (1ha)	Rs.6.25 lakh	100 % of the cost for Public sector and 50% for private sector having production capacity of 50,000 plants per ha per year for 1 ha.
	Setting up of TC Units	Rs.100 lakh/unit	100 % of the to Public sector and 50% of cost to private sector units having production capacity of 15 lakh plants of mandated crops for which protocols are available for commercial use.
(iv)	Rehabilitation of existing Tissue Culture (TC) units.	Rs. 15 lakh per unit-as Project based activity	100% of the cost to public sector and in case of private sector 50% of the cost.
	True Potato Seed Center	Rs. 25 lakh per center	100% of the cost to public sector and 50% of the cost to private sector.
(vi)	Progeny and Herbal Gardens	Rs. 5 lakh/unit	100% of the cost to public sector and in case of private sector @ 50% of the cost.
	Seed production for vegetables and Rhizomatic spices		
a)	Open pollinated crops	Rs. 30,000/ha	For public sector 100% for private sector, 75% of the cost, limited to 5 ha. Output target of seed for each crop will be fixed by the individual state for each beneficiary, before releasing funds.

S. No	Item	Maximum Permissible Cost	Pattern of Assistance#
	Hybrid seeds	Rs. 1,33,000/ha	For public sector, 100% and for private sector, 75% of the cost limited to 2 ha. Output targets of seed for each crop will be fixed by the individual State for each beneficiary, before releasing funds.
	Import of planting material for trial and demonstration purpose (By State Government, Growers' Associations recognized by NHB/MOA, PSU)	Rs. 10 lakh	100% of the cost for state Govt./ PSUs and 75% of the cost to Recognized Growers' Association.
(ix)	Seed infrastructure for handling, processing, packing, storage etc. of seeds of horticulture crops.	Rs. 200 lakh	100% of the cost to public sector and 75% of cost to private sector.
	Area expansion under Hort. Crops		
I.	Fruits (for a maximum area of 4 ha per beneficiary)		
	Cost Intensive Crops		
a)	Fruit crops like Grapes, Strawberry, Kiwi, Passion fruit, etc.		
	Fruit crops like TC Banana & Pineapple		
c)	Fruit crops like Banana sucker & Papaya		
(ii)	High density planting (apple, pear, peach, mango, guava, litchi, ber, etc.)		
	Fruit crops other than cost intensive crops using normal spacing		
II.	Vegetable (for maximum area of 2 ha per beneficiary)		
	Open pollinated	Rs. 30,000/ha	75% of the cost i.e. Rs. 32500/ha.
(ii)	Hybrid	Rs. 45,000/ha	75% of the cost i.e. Rs. 33750/ha.
III	**Mushroom**		
	Integrated mushroom unit consisting of composting, spawn production unit and training	Rs.50 lakh/unit	100% of the project cost for public sector 50% for Private sector.
(ii)	Spawn making unit	Rs. 15 lakh/unit	100% of the cost to public sector and 50% of the cost to private sector.
	Compost making unit	Rs.20 lakh/unit.	100% of the cost to public sector 50% of the cost to private sector.
IV.	Flowers (for a maximum area of 2 ha per beneficiary)		
	Cut flowers	Rs. 70,000/ha	75% of the cost i.e. Rs. 52500/ha. Provision of protected cultivation can also be availed in addition to the above.
(ii)	Bulbous flowers	Rs. 90,000/ha	75% of the cost i.e. Rs. 67500/ha. Provision of protected cultivation can also be availed in addition to the above.
(iii)	Loose Flowers	Rs. 24,000/ha	75% of the cost i.e. Rs. 18000/ha.
	Model Floriculture Centre	Rs. 100 lakh per centre	100% of the cost to public sector.

S. No	Item	Maximum Permissible Cost	Pattern of Assistance#
V.	Spices (for a maximum area of 4 ha per beneficiary)		
	Seed spices and Rhizomatic spices	Rs. 25,000/ha	75% of the cost i.e. Rs. 18750/ha.
(ii)	Perennial spices (black pepper, cinnamon, clove and nutmeg)	Rs. 40,000/ha	75% of the cost i.e. Rs. 30000/ha.
	Cost intensive spices viz. Saffron	Rs. 80,000/ha	75% of the cost i.e. Rs. 60000/ha.
VI.	**Aromatic Plants** (for a maximum area of 4 ha per beneficiary)		
	Cost intensive aromatic plants (patchouli, geranium rosemary, etc.)	Rs. 75,000/ha	75% of the cost i.e. Rs.56250/ha.
(ii)	Other Aromatic Plants	Rs. 25,000/ha	75% of the cost i.e. Rs. 18750/ha.
	Rejuvenation/Replacement of senile plantations	Rs. 30000/ha	50% of the cost subject to a maximum of Rs. 15000/ha limited to 2 ha per beneficiary.
4	**Creation of water sources**		
	Community tank/on farm pond / on farm water reservoirs with use of plastic / RCC lining	Rs. 17.25 lakh/ unit	100% of the cost for 10 ha of command area, with size of 100m x 100m x 3m or any other size depending upon pro rata basis, owned & managed by a community/ farmer group. Cost for non-lined ponds/ tanks only in black cotton soils will be 33% less. Assistance under the mission will be restricted to the cost of plastic/ RCC lining. However, for non NREGA beneficiaries, assistance on entire cost including construction of pond as well as lining can be availed
(ii)	Water harvesting system for individuals- for storage of water in 20mx20mx3m pond / tube wells / dug wells	Rs. 1.38 lakh / unit	75% of the cost i.e. Rs.1.03 lakh per beneficiary
	Protected Cultivation		
I	**Green House Structure**		
	Fan and pad system	Rs. 1465/Sq.m	50% of the cost limited to 1000 Sq.m per beneficiary
b)	Naturally ventilated system		
	Tubular Structure	Rs. 935/ Sq.m	50% of the cost limited to 1000 Sq.m per beneficiary
	Wooden Structure	Rs. 515/ Sq.m	50% of the cost limited to 1000 Sq.m per beneficiary
(iii)	Bamboo Structure	Rs. 375/ Sq.m	50% of the cost limited to 1000 Sq.m per beneficiary
	Plastic Mulching	Rs. 20,000 / ha	50% of the cost limited to 2 ha per beneficiary
III	**Shade Net House**		
	Tubular Structure	Rs. 600/sq.m	50% of the cost limited to 1000 Sq.m per beneficiary

S. No	Item	Maximum Permissible Cost	Pattern of Assistance#
(ii)	Wooden Structure	Rs. 410/sq.m	50% of the cost limited to 1000 Sq.m per beneficiary
	Bamboo Structure	Rs. 300/Sq.m	50% of the cost limited to 1000 Sq.m per beneficiary
IV	**Plastic Tunnels**	Rs. 30/sq.m	50% of the cost limited to 5000 sq.m per beneficiary
	Anti Bird / Anti Hail Nets	Rs. 20/Sq.m	50% of the cost limited to 5000 sq.m per beneficiary
VI	Cost of planting material of high value vegetables grown in poly house	Rs. 105/ sq.m	50% of the cost limited to 500 sq.m per beneficiary
	Cost of planting material of high value flowers for poly house	Rs.500/sq.m	50% of the cost limited to 500 sq.m per beneficiary
6	**Precision Farming** development and extension through Precision Farming Development Centers (PFDCs)	Project based	100% of the cost to PFDCs
	Promotion of INM/IPM		
(i)	Sanitary and Phytosanitary Infrastructure (Public Sector)	Rs.500 lakh/unit	100% of the cost.
	Promotion of INM/IPM	Rs. 2000/ha	50% of cost subject to a maximum of Rs. 1000/ha limited to 4 ha/beneficiary.
(iii)	Disease forecasting unit (public sector)	Rs. 4 lakh/unit	100% of the cost
	Bio Control Lab	Rs. 80 lakh/ unit	100% of the cost to public sector and 50% of the cost to private sector
(v)	Plant Health Clinics	Rs. 20 lakh/ unit	100% of the cost to public sector and 50% of the cost to private sector
	Leaf / Tissue analysis labs.	Rs. 20 lakh/ unit	100% of the cost to public sector and 50% of the cost to private sector
8	**Organic Farming**		
	Adoption of organic farming	Rs. 20,000/ha	50% of cost limited to Rs. 10000/ha for a maximum area of 4 ha per beneficiary, spread over a period of 3 years involving assistance of Rs. 4000/- in first year and Rs. 3000/- each in second & third year. The programme to be linked with certification.
(ii)	Organic Certification	Project based	Rs. 5 lakh for a cluster of 50 ha which will include Rs. 1.50 lakh in first year, Rs. 1.50 lakh in second year and Rs. 2.00 lakh in third year.
	Vermi-compost unit	Rs. 60,000/unit for permanent structure and Rs. 10,000/unit for HDPE Vermibed	50% of cost conforming to the size of the unit of 30'x8'x2.5' dimension of permanent structure to be administered on pro-rata basis. For HDPE Vermibed, 50% of cost conforming to the size of 96 cft (12'x4'2') to be administered on pro-rata basis.
9	**Certification for GAP, including infrastructure**	Rs. 10,000 / ha	50% of the cost
	Center of Excellence for Horticulture	Rs. 500 lakh/centre	100% of the cost.

S. No	Item	Maximum Permissible Cost	Pattern of Assistance#
11	**Pollination Support through Bee Keeping**		
	Production of nucleus stock (Public Sector)	Rs. 10 lakh	100% of the cost.
(ii)	Production of bee colonies by bee breeder	Rs. 6 lakh	50% of cost for producing minimum of 2000 colonies / year
	Honey bee colony	Rs. 1400 per colony of 4 frames	50% of cost limited to 50 colonies / beneficiary
(iv)	Hives	Rs. 1600 per hive	50% of cost limited to 50 hives / beneficiary
	Equipment including honey extractor (4 frame), food grade container (30 kg), net, etc.	Rs. 14,000 per set	50% of the cost limited to one set per beneficiary
12	**Horticulture Mechanization**		
	Power operated machines / tools including Power Saw and Plant Protection equipments etc.	Rs. 35,000/set	50% of cost limited to one set per beneficiary.
(ii)	Power Machines (upto 20BHP) with rotavator / equipment	Rs. 1.20 lakh/set	50% of cost limited to one set per beneficiary.
	Power machines (20 HP & above) including accessories / equipments	Rs. 3 lakh/set	50% of cost limited to one set per beneficiary.
(iv)	Import of new machines & Tools for horticulture for demonstration purpose (Public sector)	Rs. 50 lakh/ machine	100% of the total cost
13	**Human Resource development (HRD)**		
	Training of Farmers including women		
a)	within the district	Rs. 400/day per farmer excluding transport.	100% of the cost
b)	Within the State	Rs. 750/day per farmer excluding transport	100% of the cost
c)	Outside the State	Rs. 1000/day per farmer excluding transport	100% of the cost
	Exposure visit of farmers including women		
a)	Within the district	Rs. 250/day per farmer excluding transport	100% of the cost
b)	Within the State	Rs. 300/day per farmer excluding transport	100% of the cost.
c)	Outside the State	Rs. 600/day per farmer excluding transport.	100% of the cost
d)	Outside India	Rs. 3 lakh/ participant	Project based. 100% of air /rail travel cost
	Training / study tour of Technical officers / field functionaries involved in implementation of the scheme at central / state level including women		
a)	within the State	Rs.200/day per participant plus TA/ DA, as admissible.	100% of the cost.
	Study tour /training in progressive states / units (group of minimum 5 participants) including women	Rs.650/day per participant plus TA/ DA, as admissible	100% of the cost

S. No	Item	Maximum Permissible Cost	Pattern of Assistance#
c)	Outside India	Rs. 5 lakh/ participant	100% of the cost on actual basis.
	Information dissemination through publicity, printed literature etc and local advertisements	Rs. 0.40 lakh per block	100% of the total cost
(v)	Development of technology packages in electronic form to be shared through IT network	Rs. 1.00 lakh per district	100% of the total cost
	Technical Collaboration with International agencies like FAO, World bank etc	Project based, on actual cost	100% assistance.
14	**Special Interventions**		
	Special interventions: such as land development, transportation on case to case basis (from farm-gate to processing units / market places and transportation centers) projects of need based.	Rs. 200 lakh	Project based and restricted to 10% of outlay for the State proposal under the scheme.
II.	Tackling of emergent/unforeseen requirements of State Government/ implementing agencies	Rs. 10 lakh	100% of the total cost.
15	**Mission Management**		
	Project management including additional manpower & project preparation cost, Institutional strengthening, hire / purchase of vehicle, hardware / software etc.	Project based	100% assistance
(ii)	Technical Support Group (TSG) at Head Quarter at TM Cell and at SHM	Project based	100% of the total cost
	Seminars, Conferences, exhibitions, Kissan Mela, Horti. Expo, Honey Festivals etc.		
a)	State Level Event	Maximum of Rs.3 lakh/ event	100% of cost limited to Rs. 3.00 lakh per event to public sector / State Governments / SAUs / Research institutions / Recognized Growers Association by MOA
	District Level Event	Maximum of Rs.2 lakh/ event	100% of cost limited to Rs. 2.00 lakh per event to public sector / State Governments / SAUs / Research institutions / Recognized Growers Association by MOA
16	**Support to Technology Mission Cell at DAC HQ**		
	Technical Support Group i.e. evaluation/monitoring/ printing campaign/data base generation/ services/ infrastructure to TM cells /other misc. activities etc.	Project based	100% of the cost, maximum limit of Rs. 500.00 lakh
C.	**Mini Mission – III**		
	Post Harvest Management		
(i)	On farm collection and sorting unit (pack house)	Rs. 3 lakh/unit with size of 9Mx6M	50% of the capital cost
	Pre-cooling unit	Rs. 15 lakh for 6MT capacity	Credit linked back-ended subsidy @ 50% of the cost of project.

S. No	Item	Maximum Permissible Cost	Pattern of Assistance#
(iii)	Mobile pre cooling unit	Rs. 24 lakh/ unit for 5 MT capacity	Credit linked back-ended subsidy @ 50% of the cost of project.
	Cold storage units (construction / expansion / Modernization) with insulation, humidity control, fin foil cooling system with multi chamber	Rs. 6000/MT for 5000 MT capacity	Credit linked back-ended subsidy @ 50% of the cost of project.
(v)	Integrated CA chamber with facilities like pre cooling, cleaning, sorting & grading etc.	Rs. 70,000/MT for maximum up to 5000 MT capacity	Credit linked back-ended subsidy @ 50% of the cost of project.
(vi)	C.A Storage units	Rs. 32,000/MT for 5000 MT capacity	Credit linked back-ended subsidy @ 50% of the capital cost of project.
(vii)	Reefer vans / containers	Rs. 24 lakh/unit for 6 MT capacity	Credit linked back-ended subsidy @ 50% of the cost of project.
	Primary/Mobile /Minimal processing unit	Rs. 24 lakh/unit.	Credit linked back-ended subsidy @ 50% of the cost of project.
(ix)	Ripening chamber	Rs. 6000/MT for 5000 MT capacity	50% of the cost of project.
	Evaporative / low energy cool chamber (8 MT)	Rs. 4.00 lakh per unit	50% of the total cost.
(xi)	Preservation unit (low cost)	Rs. 2.00 lakh/unit for new unit and Rs. 1.00 lakh/unit for upgradation	50% of the total cost.
	Low cost onion storage structure (25 MT)	Rs. 1.00 lakh / unit	50% of the total cost.
(xiii)	Pusa Zero energy cool chamber (100 kg)	Rs. 4000 / unit	50% of the total cost
	Integrated project on production and post harvest management of horticultural crops.	Rs.50.00 lakh	50% of the project cost
2	**Establishment of Marketing Infrastructure for horticultural produce in Govt./ Private / Cooperative sector**		
	Terminal Markets	Rs. 150 crore/ project	25% to 40% (limited to Rs.50.00 crore) as Public-Private Partnership mode through competitive bidding, in accordance with operational guidelines issued separately.
(ii)	Wholesale Markets	Rs. 100 crore	Credit linked back-ended subsidy @ 33.33% of the capital cost of the project.
	Rural Markets / Apni mandies/Direct markets	Rs. 20.00 lakh/unit	50% of the capital cost.
(iv)	Retail Markets / outlets (environmentally controlled)	Rs. 10.00 lakh / unit	50% of the capital cost.
	Static / Mobile Vending Cart / platform with cool chamber.	30,000/unit	50% of the total cost.
(vi)	Functional Infrastructure:		
	For collection, grading, etc.	Rs. 15 lakh	50% of the total cost.
b)	Quality control/analysis lab	Rs. 200 lakh	100% of the total cost to public sector and 50% of the cost to private sector.
	Market extension, quality awareness & market led extension activities for fresh products	Rs. 3 lakh/event	100% assistance to State Government / SHM/ Public Sector Agencies

ANNEXURE II

Details of facilities

Basis of Design of CA Store in Kashmir

BASIS OF DESIGN (6000 MT Cold Store

COLD STORE (APPLE) 30 X 200 MT		
Sl. No.	Description	Parameters
1	Chamber Size in mt.	15.0 Mtrs (L) x 7.0 Mtrs (w) x 9.0 Mtrs (ht).
2	Chamber Temperature in deg.C	+0 to 2 deg.C
3 (a)	No. of Chambers	Thirty (each Chamber 200 MT Capacity)
3 (b)	No. of Sub Floors	4
4	Products details	Apple
5	Total Products Capacity in MT	200 MT
6	Products Incoming rate in MT / day	20 MT
7	Incoming Products Temperature in deg.C	+30 Deg.C
8	Final Products Temperature in deg.C	+0 to 2 Deg.C
9	Ambient Temperature in deg.C	35 Deg.C
10	Wall Insulation	100 mm thk PUF
11	Ceiling Insulation	100 mm thk PUF
12	Floor Insulation	Mm thk PUF slab finished with 100 mm VDF
13	Material operation Door	2.0 m (w) x 3.0 m (ht) x 80mm thk
14	Door type	Manual Sliding type
15	Refrigeration Load/ per Chamber	13.2 TR
16	Total Refrigeration Load for 30 Chambers	396 TR

Sorting Grading Line 10 TPH (with Optical Component for Size, Weight & Color)

APPLE WORKING LINE

Capacity 10-12 Tons/hour

01 01 WATER TANK mod. 1.500 x 6 .000 in Stainless Steel
Complete with: – pump, pipes and filter – hot water generator – leaves collector – By-pass roller table mod. 1.500 x 6.000

02 01 CRATES SUBMERGER
Crates are pushed by hands With adjustable guides

03 01 ROLLER ELEVATOR mod. 1.300 x 2.500
Complete with: – Speed variator; – Galvanized frame – Electric installation

04 01 WASHING BRUSHING AND PREDRYING MACHINE mod. 1.300 x 34 BRUSHES
Machine for washing, brushing of the fruits. It is provided by a plane of cylindrical brushes with transversal, soft, synthetic bristles fixed to lateral rests and rotating in the same direction of the fruits. The fruits themselves rotate and move forward on the plane without collisions and abrasions. To allow the fruits drying the last brushes are rollers made of sponge complete with inferior squeezing gears. The machine emptying occurs by a gear which accompanies the fruits placed on an inox chain. Width: 1.300 mm. Including: – speed variator for the brushes rotation; – Galvanized frame – motorized emptier; – metering pump with nozzles for soap. – washing pipes; – Gathering tank for water in Stainless steel; – Electric installation.

05 01 SORTING TABLE mod. 1.300 x 5.000

Complete with:
– Aluminium rollers;
– Speed variator;
– Electric installation;
– Sorting Platforms;
– Chutes for culls;

06 01 BELT CONVEYOR FOR REJECTED mod. 300 x 4.500

07 01 BELT CONVEYOR FOR REJECTED mod. 300 x 2.500

08 02 LATERAL PLATFORM with stairs

09 01 WAXING MACHINE MOD. 1.300 x 13 BRUSHES

Including:
– speed variator for brushes rotation;
– motorized emptier
– waxing device with metering pump;
– electric installation.

10 01 DRYING TUNNEL MOD. 1.500 X 7.000

Complete with:
– speed variator ;
– hot air generator (burner excluded)
– hot air recycling device;
– motorized brush for roller cleaning;

11 01 PRE-ALINING BELT, mod. 4 LANES, WITH "V" FORM DOUBLE BELTS, WITH DOUBLE SPEED, L= 3.000 mm

Belt conveyor with lining system for fruits.

The machine is composed by couples of belts with different speeds, placed on reduced diameter pulleys to reduce the passages.

Including:
– Motorization with different speeds;
– Electric installation.

12 01 ELECTRONIC GRADER with ROLLERS Pitch 95mm, 4 LANES, 8 +1 EXITS, SIZING BY WEIGHT and COLOR
Electronic grading machine with cups in soft rubber for the grading of delicate fruits . Sized fruits are unloaded by means of motorized brushes or plastic flaps or directly to the packing bins. Complete with: – Recycling belts. – Feeding brush. – Solenoids “waterproof” for trolley inclining. – Cleaning device for trolleys. – Frequency inverter for speed regulation. – Unit power supply – Pc with video, keyboard and printer. – Electric board

Fruit Grading System

Computers and several types of electronic sensors are used in combination with dedicated software. The system is capable of measuring weight, colour, dimensions (length, width, surface) and other product properties (e.g. quality, orientation, curvature). These measurements can be combined to classify the product in several classes.

A user friendly interface with which an operator is able to add different products to the system. This enables very rapid production switches.

Feedback of measurements for easy adjustment of system parameters.

Real-time operating system enabling user commands to be executed during the sorting process.

Main technical features:

– Remote service through telephone connection

– Easy to connect to the customer network

– Extended statistic information

– Possibility to define packages and see how many packages have been graded

– Extended exit control to control groups

– Possibility to connect weighing belts (for 2nd class) and weighing hoppers (culls)

– Results are shown per fruit for all measuring methods

- Flexible distribution of fruit of one class on several exits

– Possibility to interface the labelling system driven by the grader computer

Weight grading System.

– Digital signal processing eliminates the vibrations of the machinery.

– Transmission of that signal in tension.

– Multi-reading system of weight for each fruit (program from 1 to 100 reading).

– Each empty cup is measured dynamically to get an accurate empty weight is subtracted from the measurement of the cup with fruit .

– All temperature and empty weight variation of the cup are compensated.

– Testing to check and to program the exact weights of the fruits.

– Max tolerance: +/- 2 gr. at the speed of 11 trolleys/second.

Colour grading system

– Based on colour CCD cameras allowing detection of: basic/main colour and secondary colour (e.g.

– Percentage of red on the total area of an apple).

– The fruit is rotated under the camera to show every part of the surface.

– Direct processing of selected colours on the fruit

– colour reading by means of flexible strip width and number of images

– The scans can be observed on the monitor.

16 08 PACKING BELT mod 450 x 5000
5 packers each Complete with: – packing benches – Gravity conveyor for empty packages – Motorized chain conveyor for full packages Each machine is provided with an instruction and maintenance manual and declaration of conformity in compliance with the CEE regulations in force.

CONTROLLED ATMOSPHERIC EQUIPMENT FROM F.C.E. , ITALY					
CELL N°.	Tons/ea.	Length M	Width m.	Height m.	Volume mc.
30	200	15	7	9	945
Considering the number of rooms, we have preferred to install 2 units of CO2 adsorbers (each one on 15 rooms) and provide the centralized computerized control system of GC5000.					

N. 4 CO2 CENTRALISED ADSORBERS MOD INTELLIGEM® IG 660 V15

(EACH ONE ON 15 ROOMS)

The INTELLIGEM® adsorbers represents the most avant-garde system for CO2 adsorption in ULO stores. The apparatus consists of two tanks filled with active carbons which give continuous adsorption on the room.

The advantages of the system are the following:

- Energy saving using a patented system for the optimal application of the regeneration and the adsorption cycles
- Interception valves already pre assembled inside the machine to connect several rooms
- Electronic control panel complete with touch screen and PLC that can be connected to the analysis and management system via network cable
- Oxygen control inside the rooms using our patented system (this means that there is not necessity to have a supplementary hole inside the room to push fresh air thanks to our patented system)
- Touch screen (that is not present on the machines of our main competitor) includes also the possibility to increase the pressure simply pushing a botton to make the gas-tightness of the room.

Accessories:

The machine is complete with interface for the external main control board GAC5000 and PC.

Technical Data:

- Dimensions: cm. 240 x 325 x 200 h
- Weight 2500 KG
- Yield: 660 Kg CO2/ 24H at 3% in cell
- Electric supply: 3-phase network 380 V - 50 Hz
- Compressed air supply: 6 bar pressure connection with 6 x 8 piping
- Cell connection: delivery and return to be executed using PVC piping
- Electrical energy: KW/h 6.2

The machine it's ready to be connected to the external GAC5000 +PC for check and program the system.

Accessories

INTELLIGEM CONNECTIONS

The connection of the GEM series of absorbers to the cells is carried out using PVC piping. For the passage of the pipes through the cell walls special iron crop ends and plate ,suitable for gas tightness, are provided.

N. 30 SIPHON SECURITY VALVES

These valves make it possible to limit the small positive or negative variations in pressure (10÷20 mm. of a column of water), which can be created during the conservation period, between the values tolerated by the structure, according to the calibration fixed by the operator. The calibration of the valves is carried out by modifying the level of antifreeze liquid inside the valves themselves

N. 30 MANOMETERS

These manometers make it possible to measure the pressure differential, expressed in millimeters of a column of water, between the cell and the external environment.

It is foreseen that the manometer will be already mounted on the hydraulic security valve, connected to the cell by means of a section of tube of diameter 10 mm.

N. 1 MOTOR COMPRESSOR ASSEMBLED FOR COMPRESSED AIR

The compressor has a capacity of 25 lt. at 8 bar and is equipped with a thrust meter of minimum and of maximum, overload cut-out and manometer.

COMPRESSED AIR DISTRIBUTION

Connection between the pneumatic valves, the electric pneumatic valves and the compressor, is made using calibrated semi-rigid rylsan pipes Ø 6x8mm.

The pipe joints are made using super rapid gas tight joints. Working precision is regulated, during start-up, using a regulator fitted with manometer.

N. 30 COMPENSATION LUNGS

Realized in a special lightweight polyester material, gas-tight, of a volume equal to 5‰ of the cell volume, so as to limit greatly the variations in pressure, either negative or positive, that may occur inside the cell itself.

The compensation lungs are normally mounted above the cells, and connected to the cell with a special appropriately dimensioned sleeve.

N. 1 GAC 5000: AUTOMATIC SYSTEM FOR THE ANALYSIS OF THE GASES CO2 AND O2 WITH COMPUTERIZED CONTROL SYSTEM OF CO2 & O2

Consisting of a compact containing:

–1 CO2 GAS ANALYZER

The gas sample to be analyzed is passed through the analysis cell of the instrument which is situated between an infrared ray source and the detector.

The carbon dioxide present in the sample absorbs the energy from the source, reducing the amount of rays which reach the detector.

The output of the detector is therefore dependent on the concentration of carbon dioxide present in the sample.

An optic filter ensures the selective response of the detector to carbon dioxide.

Characteristics:

a) Precision: +/- 1% full scale

b) Field of measurement: 0 to 10% CO2

c) Ambient temperature: from 5 to +35 deg C

–N° 1 O2 GAS ANALYSER

The measurement of the percentage of oxygen present in the sample of air is carried out using an electrochemical cell.

A diffuser permits the air to flow over the cathode where oxygen is reduced to ions.

During this phase the metal anode is oxidized generating an electric signal proportional to the analyzed oxygen concentration.

Characteristics:

a) Precision: +/- 1% full scale

b) Field of measurement: 0 to 25% O2

c) Ambient temperature: from 5 to +35 deg C

1 UDA® ELECTRONIC CONTROL AND ANALYSIS DATA ELABORATION

APPARATUS consisting of an electronic Compact as follows:

Technical Characteristics

- Industrial PLC master connected with bus cable to the PLC slave of the plant and connected to the supervisor PC for recorder and set up of all the parameters
- Microprocessor PENTIUM IV
- Color video 17”
- Keyboard
- Digital cards I/O for the control and regulation of the analog input parameters
- Modem for data transmission (option)

Basic Functional Characteristics

- In the industrial computer we are using a new programme specifically designed for data management of an industrial plant or an experimental C.A. plant.
- 8 Analog input terminals with the possibility of insertion of an alarm set-point on all channels, in increase and decrease and relative print-out.
- Control and scanning of the analysis of analog inputs
- The equipment checks, at predetermined intervals, the zero of the analyzers and if necessary automatically corrects them (zero check)
- Imposition of fixed parameters (configuration of the machine) and for the operator with video menu driven by the equipment.
- Programming of the CO2 plant with dynamic set-point functioning of the user machines is piloted by the computer with the possibility of varying the established data set-point.

Data Management Characteristics

Configuration of the plant parameters

- Possibility of registering the plant
- Set-up of the number of channels and the real numbering of the cells
- Time variation of the analyses of each cell, depending on distance
- The programme may be visualized in the language desired (standard: Italian/English/French/Spanish)
- Possibility to correct the errors on the temperature values due to the distance between the sensor and the computer. (Also with MT card)

Configuration of the operator parameters

- Cell programming (set point, regulation band, alarm band, alarm print-out, volume, quality and quantity of stored products)
- Possibility of exclusion of one or more cells from the analysis cycle
- Programming of the automatic zero calibration (analysis interval, analysis time)
- Programming of data memorization (sampling times)
- Possibility of five automatic print-outs of the last values memorized

Visualization and printing

- Visualization of all alarms with specifications for the cell and for the input channnel
- Visualization of the values of the last analyses for all the cells and for all channels
- Visualization of all the data memorized for the cell indicated during the period “x” indicated.
- For each specific cell, all data relative to the functioning of the output requested (ON and OFF positions with relative data, duration of the period and values analyzed) are visualized.

Graph of a cell for a period requested: this is the graph of the analog entities.

- Histograms relative to the state of the output
- Graph showing the respiration rate of the fruit
- Print-out on an 80 column printer of all that is available in the visualisation phase.
- Possibility of telephone connection via modem and data transmission for tele-assistance (OPTION)

Electrical Data

- Power supply 110/220 V ± 10%
- Frequency: 50 - 60 Hz
- Power: 300 W
- Operating temperature: 5-35 °C.
- 1 MEMBRANE PUMP for the removal of the samples of gas from the cells
- 1 FILTER
- 1 COLLECTOR provided with 1 electro-valve for each cell)
- 1 ELECTRICAL VALVE for the entry of the sample gas to set the full scale of the carbon dioxide analyzer
- 1 ELECTRICAL VALVE to draw the gas sample to set the full scale of the oxygen analyzer
- 1 ELECTRICAL VALVE for the entry of the sample gas to set the zero of the two analyzers.

CALIBRATION KIT consisting of:

1 GAS CYLINDER complete with reducer for end of scale calibration of the CO2 analyzer

1 GAS CYLINDER complete with reducer for zero calibration of the two analyzers (99, 99 N2)

All the above mentioned equipment is mounted in an appropriately dimensioned pack, to be installed in the machine room, preferably in a location where the temperature is not subject to sudden or frequent variations, and in any case does not go below zero.

The GAC 5000 is complete with:

- ACS: automatic scrubber control
- AVC: automatic ventilation control (air emission)
- AAC: automatic analyzer control (zero check)
- FCS: Fruit Control Show 3 (software)

ANALYSING PIPES, TO THE 30 ROOMS

1 PRINTER

N. 1 FIGHTER 300: SEPARATOR OF THE ELEMENTS OF ATMOSPHERIC AIR USING HOLLOW FIBER MEMBRANES, PRISM ® SEPARATORS BY AIR PRODUCTS

The equipment has been developed to resolve definitively and using avant-garde technical methods the problem of rapid regulation of cells in controlled atmosphere (RAPID CA) as a function of the U.L.O. formula in the complete absence of CO2 during the processing phase.

The apparatus consists of one or more modules containing the tightly assembled hollow fiber membranes.

The modules are contained in an appropriately dimensioned cylinder, in which the separation of oxygen from the nitrogen occurs by means of filtering, under a pressure of 13 Bars, generated by an appropriately powered air compressor as specified below.

Dimensions:

Length	cm	55
Width	cm	95
Height	cm	200
Weight	Kg	178

Operating characteristics:

The system operates at the maximum pressure of 13 Bars at environmental temperature with the following yields:

Nitrogen	– 40 mc/h with purity adjustable 95%
Carbon dioxide	– 0,0%
Carbon monoxide	– 0,0 p.p.m.
Nitric oxide	– 0,0 p.p.m.

The purity of the nitrogen may be regulated according to the minimum level of O2 to be reached in the cell.

The equipment obviously does not need fuel and is powered solely by the atmospheric air at 13 Bars which is separated into the two components of nitrogen and oxygen.

The equipment is complete with electronic control panel.

N. 1 COMPRESSED AIR GROUP, AUTOMATIC, SILENCED, AIR COOLED, WITH ELECTRIC COMMAND AND CONTROL

The compressed air groups have been projected and constructed conforming to the most advanced technology in this field.

They guarantee:

- maximum sturdiness and therefore reliability
- high efficiency and reduced working cost thanks to the electronic regulation system
- noise level below that of international and national standards

The oil circuit is equipped with 2 highly efficient oil-trap filters which permit that only a small amount of oil residue remains in the out-going air.

The pressure and volume are automatically regulated by the electrical circuit.

Technical Characteristics Of The Compressor

- Maximum working pressure: 13 bar
- Installed power: 22 kw approx.

Fighter Installation

With relative connecting piping to the cells realized using PVC pipes, in by pass with the pipes adsorbers

For each cell the following are foreseen:

- n° 1 pneumatic valve for insertion of the cell onto the delivery circuit of the generator
- n° 1 pneumatic valve for over pressure discharge, pressure created inside the cell during the gaseous pull-down. Recirculation system will be provided for better work of the system.

Resins And Fiberglass

We forecast that the materials necessary for the gas tightness of the joints of the panels, the corners between ceilings/wall and the corners between floors/wall of the cold stores.

In order to guarantee a perfect application of the resin we will supply also fibre glass to reinforce the joints of the cold rooms. The fibreglass will be applied in combination with the resin to guarantee perfect gas tightness for very long time.

N. 14 MANUAL SLIDING DOORS
The doors are made of pre-painted iron sheeting and are thermally insulated with 90 mm. of insulating material. The doors are equipped with locking devices that guarantee hermetic closure. Each door is provided with a Plexiglas hatch which allows entry into the cell for eventual product sample extraction.

Dimension MT 2 x 3

Basis of Design of CA/MA Store in Jammu

Basis of Design (2000 MT Cold Store)

COLD STORE (APPLE) 10 X 200 MT		
Sl. No.	**Description**	**Parameters**
1	Chamber Size in mt.	15.0 Mtrs (L) x 7.0 Mtrs (w) x 9.0 Mtrs (ht).
2	Chamber Temperature in deg.C	+0 to 2 deg.C
3 (a)	No. of Chambers	Ten (each Chamber 200 MT Capacity)
3 (b)	No. of Sub Floors	4
4	Products details	Apple
5	Total Products Capacity in MT	200 MT
6	Products Incoming rate in MT / day	20 MT
7	Incoming Products Temperature in deg.C	+30 Deg.C
8	Final Products Temperature in deg.C	+0 to 2 Deg.C
9	Ambient Temperature in deg.C	42 Deg.C
10	Wall Insulation	100 mm thk PUF
11	Ceiling Insulation	100 mm thk PUF
12	Floor Insulation	mm thk PUF slab finished with 100 mm VDF
13	Material operation Door	2.0 m (w) x 3.0 m (ht) x 90mm thk
14	Door type	Manual Sliding type
15	Refrigeration Load/ per Chamber	13.2 TR
16	Total Refrigeration Load for 10 Chambers	132 TR

Basis of Design (10000 MT Cold Store)

COLD STORE (FRESH FRUITS & VEGETABLES) 10 X 1000 MT		
Sl. No.	**Description**	**Parameters**
1	Chamber Size in mt.	27.4 Mtrs (L) x 24 Mtrs (w) x 9.0 Mtrs (ht).
2	Chamber Temperature in deg.C	+2 to 6 deg.C
3 (a)	No. of Chambers	Ten (each Chamber 1000 MT Capacity)
3 (b)	No. of Sub Floors	4
4	Products details	Fresh Fruits & Vegetables
5	Total Products Capacity in MT	10000 MT
6	Products Incoming rate in MT / day	1000 MT
7	Incoming Products Temperature in deg.C	+30 Deg.C
8	Final Products Temperature in deg.C	+2 to 8 Deg.C
9	Ambient Temperature in deg.C	42 Deg.C
10	Wall Insulation	100 mm thk PUF
11	Ceiling Insulation	100 mm thk PUF
12	Floor Insulation	mm thk PUF slab finished with 100 mm VDF
13	Material operation Door	1.8m (w) x 2.1m (ht) x 80mm thk
14	Door type	Manual Sliding type
15	Refrigeration Load/ per Chamber	33 TR
16	Total Refrigeration Load for 10 Chambers	330 TR

BASIS OF DESIGN (100 MT Ripening Chamber)

DESIGN ASSUMPTIONS FOR 5 X 20 MT RIPENING CHAMBERS		
Sl. No.	**Description**	**Parameters**
1	Products	Banana/ Mango
2	Crates Size	600mm (l) x 400mm (w) x 300mm (ht)
3	Capacity per Crate	16 Kgs
4	No. of Crates per Pallet	5 x 6 = 30 Crates
5	Pallet Size	1200mm (l) x 1000mm (w) x 150mm (ht)
6	Capacity per Pallet	16 x 30 = 480 Kgs (0.48 MT)

Basis of Design

Sl. No.	Description	Parameters
1.	Room Size in mt (External)	5.0 (L) x 10.0 (W) x 3.5 (H)
2.	Room Temperature in deg.C	+10 to +16 deg.C
3.	Room RH in %	85 to 95%
4.	Products details	Banana/ Mango other fruits
5.	Total Products Storage Capacity In MT	20 MT
6.	Products Incoming rate in MT /Batch	20 MT
7.	Product Incoming Temperature in deg.C	30 Deg C
8.	Final Pre-Cooler Air Temperature in deg.C	+10 to +16 deg.C
9.	Pull Down period in hours	24 hrs
10.	Light Load in watts	0.50 watt / sq.ft
11.	Amb. Temp. in Deg. C	42 Deg C
12.	Infiltration Air temperature in deg.C	35 Deg C
13.	Wall Insulation	80 mm thk PUF Panels
14.	Ceiling Insulation	80 mm thk PUF Panels
15	Floor Insulation	50 mm thk PUF Slab
16	Floor Finish	100 mm RCC
17	Door Size in mtr	1.8 (w) x 2.4 (ht)
18	Door thickness in mm	80 mm thk PUF
19	Door Type	Manual Sliding type
20	No. of Doors / Room	Two
21	No. of Ripening Rooms of similar Capacity	Five
22	Refrigeration Load per Room	10 TR
23	Total Refrigeration Load (5 Ripening Chambers)	50 TR

BASIS OF DESIGN (16 MT Pre Cooling)

Ambient Temperature Max.	:	40°C
Dimension	:	10.0 (L) x 6.0 (W) x 4.0 (H) Mtr
No. of Chambers	:	Two
Product to be Stored	:	Fruits & Vegetables
Room temp to be maintained.		3 to 6 Deg. C.
Pull Down Time	:	4 to 6 Hours
Product Incoming rate in MT / Batch	:	8 MT / Batch
Product Incoming Temperature	:	35 Deg. C
Refrigeration load per Chamber.	:	16.0 TR
Total Refrigeration Load	:	32.0 TR
Wall Insulation	:	100 mm thick PUF Panel
Ceiling Insulation	:	100 mm thick PUF Panel
Floor Insulation	:	100 mm thick PUF Slab
Door Size	:	2.0 M (W) x 3.0 M (H)
Door thickness	:	80 mm thick PUF Panel
Door Type	:	Manual Type Sliding Door
No of Doors per Chamber	:	One

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Confederation of Indian Industry

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the growth of industry in India, partnering industry and government alike through advisory and consultative processes.

CII is a non-government, not-for-profit, industry led and industry managed organisation, playing a proactive role in India's development process. Founded over 115 years ago, it is India's premier business association, with a direct membership of over 8100 organisations from the private as well as public sectors, including SMEs and MNCs, and an indirect membership of over 90,000 companies from around 400 national and regional sectoral associations.

CII catalyses change by working closely with government on policy issues, enhancing efficiency, competitiveness and expanding business opportunities for industry through a range of specialised services and global linkages. It also provides a platform for sectoral consensus building and networking. Major emphasis is laid on projecting a positive image of business, assisting industry to identify and execute corporate citizenship programmes. Partnerships with over 120 NGOs across the country carry forward our initiatives in integrated and inclusive development, which include health, education, livelihood, diversity management, skill development and water, to name a few.

CII has taken up the agenda of "Business for Livelihood" for the year 2010-11. Businesses are part of civil society and creating livelihoods is the best act of corporate social responsibility. Looking ahead, the focus for 2010-11 would be on the four key Enablers for Sustainable Enterprises: Education, Employability, Innovation and Entrepreneurship. While Education and Employability help create a qualified and skilled workforce, Innovation and Entrepreneurship would drive growth and employment generation.

With 64 offices and 7 Centres of Excellence in India, and 7 overseas offices in Australia, China, France, Singapore, South Africa, UK, and USA, as well as institutional partnerships with 223 counterpart organisations in 90 countries, CII serves as a reference point for Indian industry and the international business community.

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