



Establishment of Cool Chain System along National Trade Corridor

“Need and Options Report”

Prepared and Submitted By:

Anjum Asim Shahid Rahman
Chartered Accountants
1st floor, 2 Ali Plaza, 1-E, Jinnah Avenue
Blue Area, Islamabad
Tel: 051-2273883, 2271906, 2274665
Fax: 051-2273874

Submitted To:

Infrastructure Project Development Facility
(IPDF)
House # 2, Street 59,
F-7/4 Islamabad
Tel: 051-2270771-3

List of Acronyms

<i>BCR</i>	<i>Benefit to Cost Ratio</i>
<i>CA</i>	<i>Concession Agreement</i>
<i>CA</i>	<i>Controlled Atmosphere</i>
<i>CBR</i>	<i>Cost Benefit Ratio</i>
<i>CCS</i>	<i>Cool Chain System</i>
<i>CF</i>	<i>Corporate Finance</i>
<i>CFC</i>	<i>Common Facility Centre</i>
<i>CP</i>	<i>Concession Period</i>
<i>CS</i>	<i>Cold Stores</i>
<i>DSCR</i>	<i>Debt Service Coverage Ratio</i>
<i>EOS</i>	<i>Economies of Scale</i>
<i>EUREPGAP</i>	<i>Euro-Retailer Produce Working Group Agriculture Practices</i>
<i>FAO</i>	<i>Food and Agriculture Organization</i>
<i>FCFE</i>	<i>Free cash flow to equity</i>
<i>FCFF</i>	<i>Free cash flow to firm</i>
<i>GoP</i>	<i>Government of Pakistan</i>
<i>HACCP</i>	<i>Hazard Analysis and Critical Control Points</i>
<i>IRR</i>	<i>Internal Rate of Return</i>
<i>LLCR</i>	<i>Loan Life Coverage Ratio</i>
<i>MINFAL</i>	<i>Ministry of Food Agriculture and Livestock</i>
<i>MoC</i>	<i>Ministry of Commerce</i>
<i>NPV</i>	<i>Net Present Value</i>
<i>NTC</i>	<i>National Trade Corridor</i>
<i>PF</i>	<i>Project Finance</i>
<i>PH</i>	<i>Pack House</i>
<i>PHDEB</i>	<i>Pakistan Horticulture Development and Export Board</i>
<i>PLCR</i>	<i>Project Life Coverage Ratio</i>
<i>PPP</i>	<i>Public Private Partnership</i>
<i>PSDP</i>	<i>Public Sector Development Fund</i>
<i>RY</i>	<i>Refer Yards</i>
<i>TL</i>	<i>Testing Labs</i>
<i>WACC</i>	<i>Weighted Average Cost of Capital</i>

List of Tables

Table 1	<i>Agriculture Contribution in Pakistan Economy</i>
Table 2	<i>Area, Production and Export (2006-07)</i>
Table 3	<i>Existing Pack House Facilities</i>
Table 4	<i>List of Existing Testing Laboratories</i>
Table 5	<i>Cold Stores (Existing and Proposed)</i>
Table 6	<i>Fruits and Vegetables Export (2006-07)</i>
Table 7	<i>Distribution of Post Harvest Losses</i>
Table 8	<i>Post Harvest Losses in Monetary Terms</i>
Table 9	<i>Average Price differential between World and Pakistan Crop</i>
Table 10	<i>Principal Options Identified</i>
Table 11	<i>Identified Options (Revised)</i>
Table 12	<i>NPV Assessment Matrix</i>
Table 13	<i>IRR Assessment matrix</i>
Table 14	<i>Bankability Assessment Matrix</i>
Table 15	<i>BCR Assessment Matrix</i>
Table 16	<i>Implementation Plan and Project Cost</i>
Table 17	<i>Financial Snapshot</i>
Table 18	<i>Implementation Plan & Project Cost</i>
Table 19	<i>Financial Snapshot</i>
Table 20	<i>Implementation Plan and Project Cost</i>
Table 21	<i>Financial Snapshot</i>
Table 22	<i>Bankability Ratios</i>
Table 23	<i>Public Sector Assessment Measures</i>
Table 24	<i>Without Laboratories Comparative</i>
Table 25	<i>Bankability Ratio Comparative</i>
Table 26	<i>Implementation Plan and Project Cost</i>
Table 27	<i>Financial Snapshot</i>
Table 28	<i>Financial Snapshot</i>
Table 29	<i>Implementation Plan</i>
Table 30	<i>Financial Snapshot</i>
Table 31	<i>Bankability Ratios</i>
Table 32	<i>Benefit to Cost Ratio</i>
Table 33	<i>Financial Snapshot</i>
Table 34	<i>Implementation Plan</i>
Table 35	<i>Financial Snapshot</i>

Table of Contents

Executive Summary	<i>i</i>
1. Introduction and Project Overview	- 1 -
1.1 Agriculture Sector Overview	- 1 -
1.2 Horticulture Sector Overview	- 2 -
1.3 Pakistan Horticulture Development and Export Board	- 3 -
1.4 Cool Chain System (CCS)	- 5 -
2. Need Assessment	- 8 -
2.1 Project Overview	- 8 -
2.2 Production Statistics	- 8 -
2.3 Status of Existing Facilities	- 9 -
2.4 Proposed Facilities	- 12 -
2.5 Implication for Non Existence of Integrated Cool Chain Infrastructure	- 14 -
2.6 Socio-Economic Benefits to be derived from the CCS	- 18 -
2.7 Institutional Analysis of PHDEB.....	- 21 -
2.8 Need for Public Private Partnership (PPP)	- 22 -
2.9 Government’s Participation	- 22 -
3. Options Identification	- 23 -
3.1 Potential market players.....	- 23 -
3.2 Identified Options	- 25 -
4. Options Assessment	- 29 -
4.1 Introduction and Assessment Criteria	- 29 -
4.2 Consolidated Project.....	- 34 -
4.3 Consolidated Minus Laboratories	- 37 -
4.4 Province Wise.....	- 40 -
4.5 Province Wise Minus Labs	- 43 -
4.6 Provincial Mix.....	- 44 -
4.7 Provincial Mix minus Labs.....	- 47 -
4.8 Fruit Belt Wise.....	- 50 -
4.9 Fruit Belt Wise minus Laboratories.....	- 56 -
4.10 Activity Based.....	- 57 -
4.11 Activity Based excluding Laboratories	- 61 -
5. Recommendations	- 62 -
Annexure	- 65 -
Financial Summary.....	- 65 -

Executive Summary

Pakistan is an agriculture based economy and Horticulture plays a pivotal role in the economy by being the largest contributor to the National GDP and employing more than 40% of the total labor work force of the country. Horticulture as a sub sector of agriculture plays a significant role in the development of economies and holds great potential both in terms of revenues through the export of horticulture products and socio economic benefits through creation of employment all across Pakistan in general and rural areas in specific. In Pakistan the role of this sector is relatively small when compared with its true potential. This is emphasized by the fact that only about 6% of the total arable land is under horticulture cultivation despite having a higher yield per hectare when compared to agricultural crops.

In order to explore the true potential of this sector various studies have been carried out by Pakistan Horticulture Development and Export Board (PHDEB), an organization created with objectives to explore the potential of the horticulture produce including taking steps and measures to ensure creation of conducive environment through enabling policy/ regulatory measures; promote, expand and diversification of international markets; improve the Supply Chain System and to work for development of Value Addition industry. Since its inception it has actively been involved strengthening the infrastructure, marketing and promotion of the sector. It has projects waiting approval, some under study and a few that are undergoing execution.

It has been estimated that post harvest losses are the limiting factor hampering the growth and profitability, which in case of horticulture produce ranges from 20 % to 40 % of production resulting in a financial loss of approximately US \$ 900 Million per annum. The magnitude of post harvest losses in fresh fruits and vegetables is estimated at 5% – 25 % in developed countries. An assessment of the various components resulting in such high post harvest losses confirm the non availability of integrated cool chain in the production areas and urban markets. Similarly the existing infrastructure in place is outdated and technically obsolete. Isolated cool chain infrastructure facilities are available; however, the country lacks an integrated network of facilities that force a drawback to the benefits that the horticulture as a sector can provide to the national economy. These facilities are deficient in process and product standards and cannot meet the present demand which results in an imbalance between the demand and supply forces. In spite of all the draw backs the existing system comprising of Cold stores, pack houses, refrigerated container yard and testing laboratories cannot meet the demand and caters to a very small percentage of the production. Moreover, Pakistani produce is in the lower range in most export markets and with punitive tariff and protectionism implementation of WTO, food security and ISO standardization the export levels would drop if the proposed facilities are not established.

To address the issue of post harvest losses and achievement of other objectives like increase in foreign exchange earnings, price stabilization in the domestic market, PHDEB envisions establishing a network of post harvest supply chain facilities at a national level across the National Trade Corridor (NTC).

The estimated cost for establishment of the CCS is approximately USD 157 million, therefore the best suited options for timely rollout and effective management in such infrastructure projects is the public private partnership where the public sector recognized the economic and social importance of the project but due to financial and managerial constraints provides enabling environment and framework for private sector to intervene and carry out the project. Hence, several roll out strategies which ensures that the project's objectives are met, followed by various permutations and combinations were developed that addressed the maximum roll out of the project. Such options includes roll out as 'Consolidated' , 'Province Wise', 'Province Mix', 'Activity based and 'Fruit Belt Wise' which are extorted from geographical factors facing and area of expertise of the private sector.

For effective roll out of the project, a Base Case Financial Model was prepared reflecting the forecast of financial performance for each facility under an option, individually and collectively. Testing Laboratories component was seen to be a loss making activity that erodes the overall financial results of each option. To counter this impact and to keep the interest of the private sector alive, all options were analyzed with exclusion of testing laboratories.

Parameters drawn, divided between quantitative and qualitative aspects, were made subject for assessment of Options. Standard investment appraisal techniques (NPV, IRR and Project Payback Period), 'Bankability Factors' (set of financial ration evaluating options ability to service its debt) and Government perspective analysis (concession period, benefit to cost ratio) formed part of the quantities aspects where as qualitative distinction between Options was done bearing in mind project's integration and synergy, management and monitoring and its ability to attract private sector investment from markets with varying degree of capability and appetite to execute such a project.

All options assessed are ranked in order of preference in light of the objectives of private and the public sector. As many as three options (Consolidated minus laboratories, Consolidated and Provincial Mix minus Laboratories) have been emphasized upon to be used as roll out strategies as they are argued to achieve project success in terms of integration, ease of execution, monitoring and management and attracting market players.

1. Introduction and Project Overview

1.1 Agriculture Sector Overview

Agriculture has traditionally been the most dominant sector in Pakistan's economy. The reason for the agriculture sectors dominance over the years has been the presence of natural resources like fertile land, diverse climatic conditions and well established irrigation system. Today, agriculture continues to be the back bone of Pakistan's economy with a large share of its Gross Domestic Product (GDP) driven by this sector. The share of agriculture in the fiscal year 2007-08 accounts for 20.9% of the GDP which has fallen from 24.9% since the year 2000-01. However, in monetary terms, share of agriculture sector in GDP, has experienced growth over the same period.

Table 1: Agriculture Contribution in Pakistan Economy

Year	Value (PKR. Million)	GDP (%)	Labour force Employed (%)
2000-01	903,499	24.9%	-
2001-02	904,433	24.1%	-
2002-03	941,942	24.0%	-
2003-04	964,853	22.9%	-
2004-05	1,027,403	22.4%	43.0%
2005-06	1,092,098	22.5%	43.4%
2006-07	1,132,041	21.8%	43.4%
2007-08 (P)	1,148,871	20.9%	43.6%

Agri. Statistics of Pakistan, MINFAL, 2006-07, Economic Survey of Pakistan 2007-08

Agriculture and its associated activities provide employment opportunities to 43.6% of the country's labour force particularly in rural communities where an estimated 95% of the total employed population is attached directly or indirectly to agriculture. Recent data shows that agriculture sector employment growth was 0.4%.

Besides being the most labour intensive sector of the economy, the agriculture sector contributes 40% of the foreign exchange earning through export of raw materials, semi processed and processed agriculture products.

According to Government plan the current poverty level of 32.1% is to be reduced to 15% by 2011. To achieve this target, infrastructure projects in agriculture sector in general and horticulture and livestock in particular would create multiple job opportunities which in turn would enable the government to realize its target.

1.2 Horticulture Sector Overview

Horticulture as an industry, occupies a significant place in agricultural economies all over the world and likewise in Pakistan it contributes modestly to its economy. Out of the total cultivated area, 6% is under horticultural crops which produce as many as 28 different fruits and 30 different vegetables¹. Pakistan remains in the top ten producers list for mango, dates and citrus. The export of horticulture crops earned foreign exchange with a rupee value equal to 6.693 billion² with major exported commodities being citrus (122,760 tonnes for PKR 1.985 billion) followed by dates (97,322 tonnes for PKR 2.034 billion) and mangoes (61,631 tonnes for PKR 1.204 billion).

A considerable part of horticultural crop production deals with the small grower’s community, possessing the holding from one acre to few acres. There are about 25,000 orchards in the country, 96% of which are between 0.5-5 hectares of holding and only 0.3% of the total orchards are more than 20 hectares³.

In 2006-07, the total area under fruit cultivation was reported at 832,961 hectares where as 6,011,228 tons of fruits were produced in the same period (Figure 1). The average yield per hectare was recorded at 7.21 tons / hectare. Punjab province was witnessed to be the dominant province in terms of area under fruit cultivation with 395,244 hectares followed by Baluchistan (247,417 hectares), Sindh (143,377 hectares) and NWFP (46,923 hectares).

The production of fruits (Figure 1), was highest in Punjab province which contributed 3,744,858 tonnes of fruits followed by Sindh (888,790 tonnes), Baluchistan (861,434 tonnes) and NWFP (516,164 tonnes). The aggregate production of fruits in 2006-07 was 6,011,228 tonnes with major contributions coming in from Citrus (1,472,471), Mango, Dates, Guava and Apples.

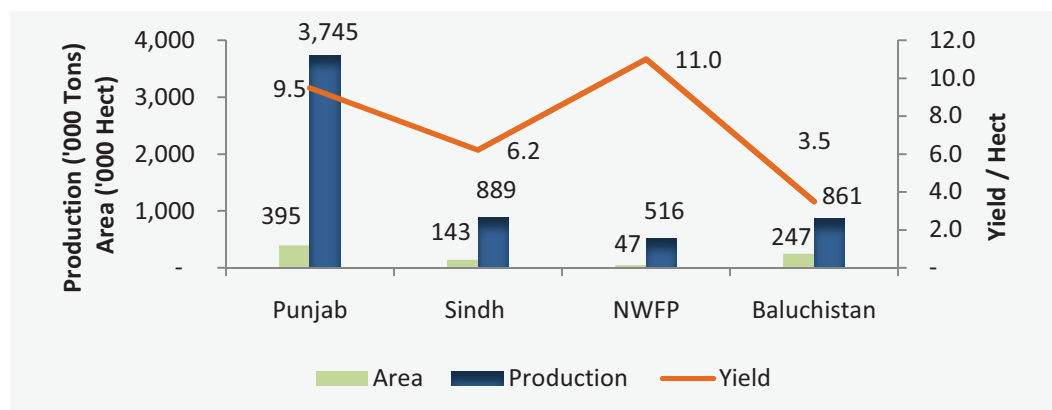


Figure 1: Province Wise Area, Production and Yield of Fruits (2006-07)

¹ Computed From Economic Survey of Pakistan (2007-08)

² Agri. Statistics of Pakistan, MINFAL (2006-07)

³ Agri. Statistics of Pakistan, MINFAL (2006-07)

A large variety of vegetables is grown in all four provinces of the country however the most dominant vegetables in term of production include potatoe, tomatoe and onion. Like in fruits, Punjab province has remained the dominant in terms of area under vegetable cultivation with 136,134 hectares. The rest of the provinces have area under cultivation equalling 109,372 hectares which is significantly smaller in number compared to Punjab province.

In 2006-07, the country’s vegetable production was recorded at 3,137,973 tonnes (Figure 2) with Punjab province proving to be the most lucrative producer of vegetable with 2,076,234 tonnes followed by Baluchistan with 446,908 tonnes which landed close to NWFP (402,478 tonnes) and Sindh (212,353 tonnes).

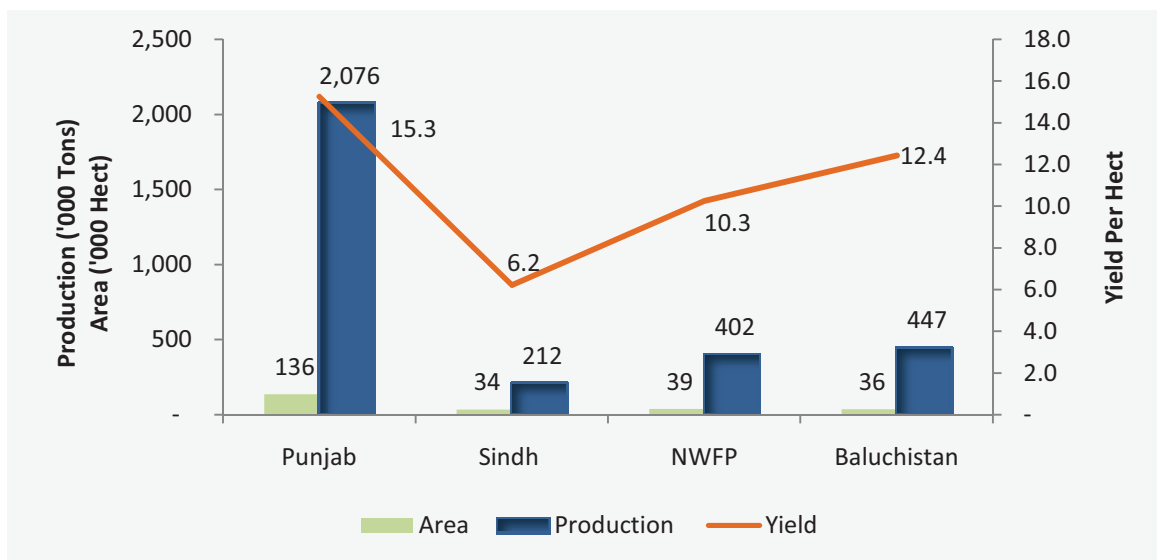


Figure 2: Province Wise Area, Production and Yield of Vegetables (2006-07)

It is estimated that 20-40%⁴ of the horticultural crops go waste before reaching in the hands of consumers. This loss in harvest is a result of lack of infrastructure including storage facilities, packaging and grading units and temperature controlled transportation.

1.3 Pakistan Horticulture Development and Export Board

Pakistan Horticulture Development and Export Board (PHDEB) have been created due to the enormous potential of Pakistan’s horticulture products in the global market. In the absence of a single ministry or institution responsible for development at all levels of the horticulture value chains it was considered important to set-up PHDEB to uplift this sector, especially in light of the impact of globalization and WTO regime.

⁴ Ibrahim and Anwar, 2004, Horticulture Education, Extension and Training System in Pakistan
Arch Vision: Pre-Feasibility Study – Volume 1
Anjum Asim Shahid Rahman
Chartered Accountants

1.3.1 Vision Statement of PHDEB

PHDEB envisions the vitalization of a dynamic and market driven horticulture sector, which is resilient, sustainable and responsive to meet the challenges of globalization.

1.3.2 Objectives

The primary objective of PHDEB is to address and resolve problems and issues of the Pakistan horticulture sector through long term and timely interventions aimed at improving quality at key areas of the horticulture value chain, ultimately leading to a substantial increase in exports from Pakistan. Some of the main areas of intervention include:

- Encourage and facilitate the growers to “grow for exports”.
- Impart new technologies and techniques to growers and processors.
- Develop/implement export marketing strategies.
- Create an export orientated environment facilitated through procedures and quality standards through regulations and incentive schemes.
- Attract local and foreign investment.
- Facilitate in setting up of necessary material and quality infrastructure including inter alia cool chain system all over the country.
- Develop linkages and networking with relevant institutions i.e. R&D, banks, training/HRD, joint venture arrangements/commercial linkages with international companies, technology transfer, sub-contracting.

Broadly, PHDEB has the following major objectives:

- i. To create conducive environment through enabling policy/ regulatory measures
- ii. Promotion/Expansion/Diversification of international markets
- iii. Improvement of Supply Chain System including establishment of modern infrastructure
- iv. To work for development of Value Addition industry

To achieve the above objectives listed at (iii) and (iv) above, PHDEB has initiated various projects in all the provinces. These projects will contribute towards products development thus ultimately helping in promotion / enhancement of share of horticulture in total exports of the country.

1.4 Cool Chain System (CCS)

Fresh horticulture products are perishable and thus warrant adequate care during post-harvest handling for efficient distribution. Therefore, a good supply chain management system has to be in place for domestic and export marketing which is a weak area in Pakistan. PHDEB, in line with its objectives, has proposed to strengthen the post harvest supply chain for the horticulture sector through the establishment of a network of CCS components across the National Trade Corridor (NTC) to operate as Common Facility Centers (CFC).

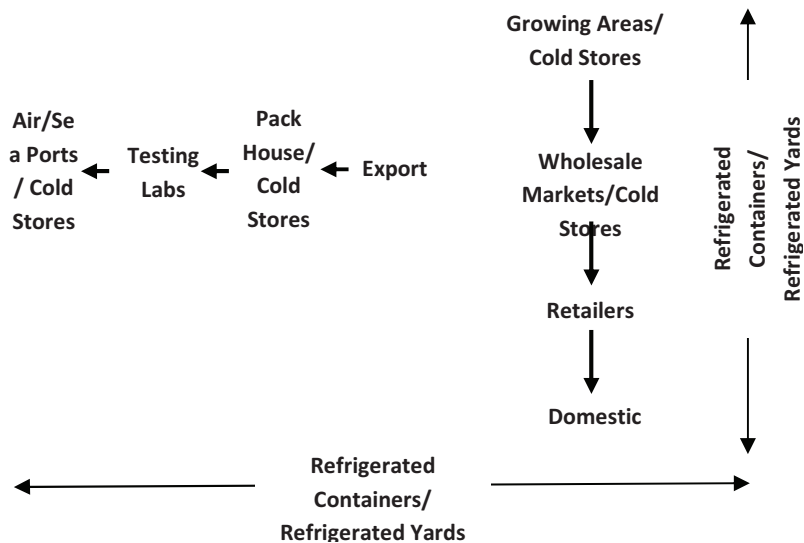


Figure 3: Supply chain

These components, which include Pack Houses, Cold Stores, Refrigerated Yards and Testing Laboratories, are bound to be a back bone for the supply chain infrastructure of horticulture produce. The diagram above represents the integration between the four components which works as follows

From the growing area, once the crop is harvested, it is sent to wholesale markets where they are picked by retailers and exporters. Exporters have the crop processed and packed in ‘Pack Houses’ and later, have it tested for quality and content via ‘Testing Laboratories’ before export through land and sea routes. Retailers, on the contrary, take the crop to domestic markets for local consumption.

Throughout the supply chain, ‘Cold Stores’ are available to store the crops that preserve its natural characteristics where as along the supply chain all transportation is made via refrigerated trucks which have parking facility available in shape of ‘Refrigerated Yards’. The specific role of each of the component of the CCS is as follows;

- i) **Pack Houses:** The role of Pack Houses in proposed Cool Chain System is to provide better packing facilities to the producers of horticulture crops. Such facilities are equipped with grading, washing, waxing, drying, hot water treatment, and packaging facilities. These functions not only add value to the crop which facilitate in fetching competitive prices when taken to domestic and international markets but also protects the crop from external hazards including ingress of gas, light and water vapours, which can result in deterioration of colours, oxidation of lipids, and unsaturated fats, denigration of proteins and a general loss of characteristics sensory quality.

- ii) **Cold Stores:** are storage facilities to keep the temperature of produce at optimal low temperature which lowers the crop’s respiration rate and extends its shelf life. These facilities are normally made available at locations in such a manner that users at various stages of the supply chain are facilitated initiating from the production area and following up till the point where the commodity is either exported or consumed. Typically the areas include the ‘Main Fruits and Vegetables Markets’, ‘Growing Areas’ and ‘Export Exit Points’ like Airports and Sea Ports (See figure 4).

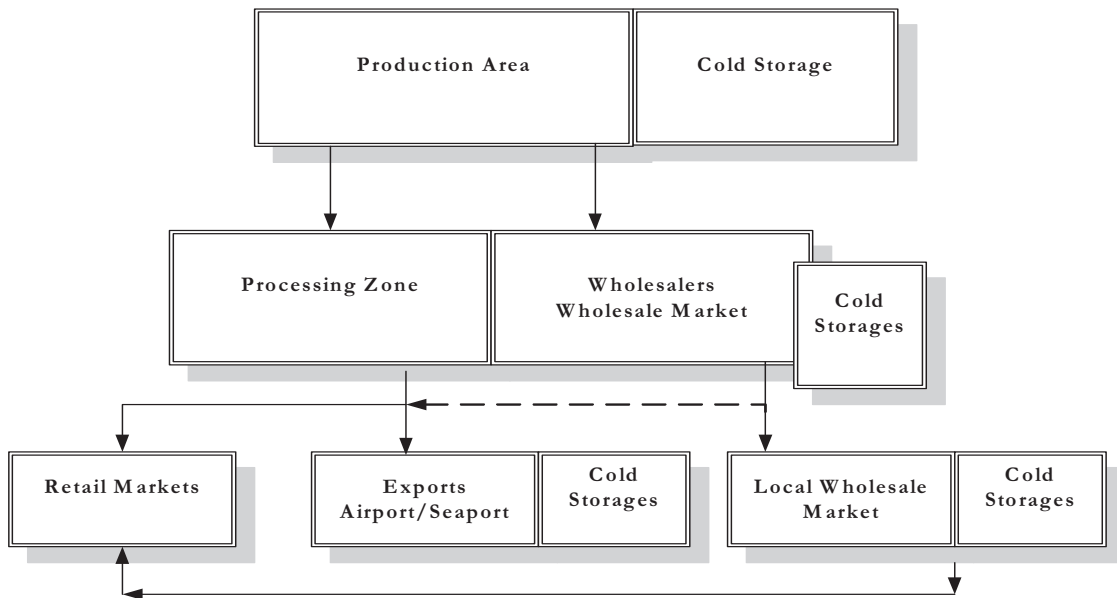


Figure 4: Role of Cold Stores in the Cool Chain System

- iii) **Refrigerated Container Yard:** The role of refrigerated container yards is to provide parking space for the controlled atmosphere (CA) container and refrigerated container or reefer (which is a shipping container used for the transportation of temperature sensitive cargo). These yards provide electrical power input that makes the CA and refrigerated container functional in maintaining the desired temperature. This facility is availed by containers for domestic and export purposes.

iv) Testing Laboratories: The role of Testing Laboratory in any CCS is to ensure that safety and quality of fruits and vegetables is met in line with standard food regulation requirements such as WTO, consumer protection and ISO standards. These laboratories are used for multipurpose testing like

- Examining adulterated materials,
- Food additives,
- Pesticides residual,
- Aflatoxin level,
- Pest and Other Diseases

2. Need Assessment

2.1 Project Overview

The need for horticulture infrastructure (components of the CCS) arises from farms (production areas), where crops are grown, right to point where the commodity is consumed domestically or internationally. This infrastructure development, is aimed to reduce the post harvest loss of horticulture produce during harvest and activities thereafter to an acceptable level along with improved quality and shelf life of the products; Price stabilization in the domestic market; Boost to the export volumes by increased production, quality control etc.; Entry into other high value markets by maintaining quality and adhering to international best practices. These factors will be revisited in detail later in this text.

The project has been conceived by the Pakistan Horticulture Development and Export Board (PHDEB), as a part of the National Trade Corridor (NTC) improvement initiative. The NTC, itself, is an initiative of the Government of Pakistan (GoP) to create a growth-facilitating infrastructure with the objective to revamp the whole transport sector including ports, roads, railway, aviation etc. The framework of NTC takes a holistic and integrated approach to reduce the cost of doing business in Pakistan by improving the trade and transport logistics chain and bringing it up to international standards.

All of the facilities in the Cool Chain System (CCS) project are proposed to be built across the national trade corridor on grounds that most of the urban markets are located on the NTC; Most of the fruits and vegetable production areas are located across the NTC; and NTC infrastructure can be utilized effectively for cost reduction of transportation of produce to nearby markets as well as for export purposes.

In this chapter we draw attention to justify the need of an integrated, state-of-the-art Cool Chain System (CCS) by focusing on the

- Existing production statistics and location proposed for the establishment of the facilities,
- Status of existing facilities;
- Factors that derive the need for such facilities; and
- Factors that are adversely affected by the non-existence of a CCS.

2.2 Production Statistics

The locations selected for establishment of the proposed CCS facilities are justified on the basis of production statistics for fruits and vegetables. Prima facie, horticulture crops selected under the CCS are grown in abundance and have a higher export

percentage than others. These fruits and vegetables are priority crops as can be seen from the statistical data below

Table 2: Area, Production and Export (2006-07)

Crop	Area (Hect.)	Production (Tons)	Export (Tons)	Export (% of Production)
Citrus	193,212	1,472,471	123,755	8.4%
Mango	164,558	1,719,177	61,632	3.6%
Apple	112,599	348,440	428	0.1%
Grapes	13,867	46,570	480	1.0%
Dates	84,695	426,281	104,090	24.4%
Apricot	29,214	177,266	664	0.4%
Peach	15,396	71,266	-	0.0%
Plum	7,493	60,449	263	0.4%
Potatoes	133,435	2,581,554	160,095	6.2%
Onion	11,501	91,314	191	0.2%

Source: Agriculture Statistics of Pakistan, MINFALL 2006-07

2.3 Status of Existing Facilities

Isolated cool chain infrastructure facilities are available; however, the country lacks an integrated network of facilities that force a drawback to the benefits that the horticulture as a sector can provide to the national economy. These facilities are deficient in process and product standards and can not meet the present demand which results in an imbalance between the demand and supply forces. In the following paragraphs, we look at the status and drawbacks of the existing facilities (highlighting justification for CCS establishment) followed by the benefits to be derived from the proposed state-of-the-art common facilitation centers.

2.3.1 Cold Stores

The existing cold stores facilities are unevenly distributed between the country with Punjab dominating with 512 units followed by Sindh (25 units), NWFP (16 Units) and Baluchistan (2 units)⁵. These facilities lag far behind the technological developments in the business such as the use of RCC structure in place of the Pre-Fabricated structures, the use of direct labour in place of fork lifters all of which contribute to the heat production in the facility and the foundation for heat/thermal shocks which leads to deterioration of the commodities present in the cold stores. Moreover, most of the facilities are not compartmentalized causing odor transfer between different commodities placed within the cold stores.

⁵ Department of Agriculture & Livestock Products Marketing & Grading, MINFAL
 Provincial Agriculture/Industries Department
 Anjum Asim Shahid Rahman
 Chartered Accountants

The existing facilities do not have a blast freezer that enables to bring down the temperature of the produce to a level that is maintained inside the cold store. Its absence causes the produce to be taken directly into the cold store which loses heat within the store that deteriorates the temperature of the commodities already present in the store.

2.3.2 Pack Houses

At present, there are 121 pack houses for as many as 6 horticulture crops. These facilities are mostly indigenous and rely on low technology with the exception of 2 facilities at Karachi that have mechanical grading. The summary of all these facilities is presented below

Table 3: Existing Pack House Facilities

Commodity	No.	Remarks
Citrus	92	90 in Sargodha - 85 Active 1 in Khanewal - active 1 in Peshawar - inactive Mostly Indigenous
Mango	4	All in Karachi 3 Certified for HWT by Iran and China
Date	9	9 Plants include 5 large and 4 small all in Khairpur Indigenous low-tech
Apple	1	1 in Quetta Recently activated by PHDEB
Onion, Potato	15	all in Karachi, 2 Equipped with Mechanical Grading

Source: PC -1 Cool Chain System

The only mentionable existence of Pack Houses is for citrus crops. These pack houses have been recently developed and located mostly in crop growing areas (Sargodha). Most of these pack houses are rudimentary in structure and process with the result the export made is mainly to the Middle Eastern countries. However, the presence of such value addition facilities for citrus has witnessed the value per ton fetched from the international market to increase from USD 206 in 2005-06 to USD 270⁶ in 2006-07.

For the rest of the crops the grading, packaging and labeling facilities is negligible. Those facilities which are present lack proper packing, washing and grading plants. Packaging is done in 10, 20 or 40 kg wooden boxes for fruit whereas hessian sacks are used in case of potatoes and onions, and in some cases mangoes. In many cases sacks are reused which is an extremely unhygienic practice.

⁶ Rupee values, taken from Agriculture Statistics of Pakistan 2006-07, converted at the rate 1USD = PKR 60.

Such facilities do not conform to the emerging requirements of the international markets in terms of hygiene and production management standards which make them ineligible to get Hazard Analysis and Critical Control Points (HACCP) certification for food security. This limits their marketing especially in Europe and other quality conscious markets creating an opportunity cost equal to the price differential that exists between high and low end consumer markets.

2.3.3 Refrigerated Yards

At the national level the country suffers from post harvest losses due to the use of non refrigerated container and opened truck for the transportation of produce from production points to either domestic purpose or for export purpose which causes the damages to fruits and vegetables before reaching the destination points during transportation. For the CCS project refrigeration yards play a secondary role by providing parking facility to those refrigerated container that await local movement and export as well. This role, seen to be as minute is overshadowed by the fact that there are limited facilities of such nature in the country. This facility would provide power supply and parking facilities to shipping containers.

2.3.4 Testing Labs

As the demand for food safety and quality increases, Pakistan with its limited and sub standard testing facilities fails to keep pace with the international requirements resulting in a higher rejection rate for exported horticulture produce. Moreover, this fact also limits the access to high-end consumer markets. Testing Laboratories / Facilities that are available in the country have little emphasis on adaptation of internationally recognized regulations such as Hazard Analysis and Critical Control Points (HACCP). Such facilities are primarily focused on institutional research and do not have all the testing facilities that assure compliance with the regulations.

Table 4: List of Existing Testing Laboratories

List of Existing Testing Laboratories
National Agriculture Research Centre (NARC), Islamabad
Nuclear Institute for Agriculture & Biology (NIAB), Faisalabad
Ayub Agriculture Research Institute, Faisalabad
Commonwealth Institute for Agriculture & Biological Control (CABI)
Department of Agriculture, Karachi
HEJ Research Institute of Chemistry, Karachi University, Karachi
University of Agriculture, Faisalabad
Pakistan Council for Scientific & Industrial Research (PCSIR), Lahore
Grain Testing Laboratory Karachi University, Karachi

2.4 Proposed Facilities

2.4.1 Cold Stores

23 independent cold stores are proposed to be built under the CCS project. These stores are proposed for 5 different fruits and vegetables at 9 production centers, 4 different fruit and vegetable markets and 10 exit point covering all major air and sea ports.

The fruits identified to be at priority include dates, kinnow and different combinations of crops including apple, peach and potato. For dates the proposed locations include Turbat, Khairpur and Sukkur which collectively account for 64.9% of the total date's production of the country. Similarly, for kinnow Kot Momin and Sargodha have been identified which contribute 51.92% of the total kinnow production. The fruit and vegetable markets cover Chitral, Islamabad, Chaman and Sargodha where as fruit combinations covering potato, apple and peach include Quetta, Waziristan, Peshawar and Mardan.

The major export centers which includes sea ports at Karachi (Port Qasim and Karachi Port) and Gawadar (Gawadar Port), airports at Lahore, Faisalabad, Multan, Karachi, Quetta, Peshawar and Islamabad. According to statistics collected from Pakistan Revenue Automation Limited (PRAL) the total export made was divided between sea (76.3%) and air (23.7%). Hence, the establishment of cold sores at these export points is envisioned by M/s Arch Vision (Volume-1: Horticulture Industry).

The proposed cold storage facilities are to be established as state of the art facilitation centers built around the prefabricated material with use of fork lifters for in-house transportation of the commodities. These facilities will have compartmentalized storage i.e. division of total storage space into different temperature zones depending upon local needs. All these factors represent international best practices with respect to cold stores.

In terms of benefit to the national economy, the proposed facilities are to take up the total capacity to 123,300 tons which is sufficient to facilitate 8.65% of the total production of 2006-07 (see table 5 below). Although, the total capacity of these facilities will still be insufficient to cater for majority of the production by leaving a gap of 91.35% however, post harvest losses caused due to non-availability of appropriate storage facilities is likely to fall below the 11% mark.

Table 5: Cold Stores (Existing and Proposed)

Qty ('000 tons)	Punjab	Sindh	NWFP	Baluchistan	Total
Fruits Production	3,744.90	888.8	516.1	861.4	6,011.20
Vegetable Production	4,483.70	215.1	532	488.7	5,719.50
Total F&V Production (2006-07)	8,228.60	1,103.90	1,048.20	1,350.20	11,730.80
CS – Installed Capacity	850.0	15.0	24.0	3.0	892.0
CS - Proposed Capacity	45.4	23	19.2	35.7	123.3
CS – Total Capacity	895.4	38	43.2	38.7	1,015.3
CS Capacity as % of F&V Production	10.88%	3.44%	4.12%	2.87%	8.65%

*Source: Department of Agriculture & Livestock Products Marketing & Grading, MINFAL
 Provincial Agriculture/Industries Department*

2.4.2 Pack Houses

39 pack houses with cold storage facilities are proposed to be built for 8 different fruits and vegetables at major crop growing regions. The 8 fruits and vegetables include kinnow at Bhalwal, TobaTek Singh, Mandi Bahudin which accounts for 12.64% of the total kinnow production; Dates at Panjghar responsible for 19.67% of total dates production; mangoes at Multan, RY Khan, Muzafar Ghar, Mirpur Khas and Hyderabad, collectively the production from these cities for mangoes is 68.25% of the total production; Potato at Sahiwal, Okara, Pak Pattan, Sialkot and Kasur (65.75% of potato production); Onion at Sanghar, Chagi, Kharan with 22.2% of total production; Apple at Peshawar and Quetta; Apple and Apricot at Kila, Killa saifullah, Lora Lai and Zhob with 35.56% of total apple production; grapes at Pashin and Mustang which produced 75.35% of total grapes production; and Khanewal, Sheikhpura, Gujranwala, Faisalabad and DI Khan for various fruits and vegetables.

The proposed pack houses are designed keeping in view the above so as to capitalize the immense potential of increasing exports, which currently stand at 4.8% of the total fruits and vegetables production for 2006-07 (see table 6 below). This will not only result in an influx of foreign exchange but also will make the produce eligible to be exported to high end consumer markets which have stiff grading and processing policies. Moreover, the establishment of these pack houses will result in reduction of post harvest losses pertaining to rough handling which currently stands at 4% of production.

Table 6: Fruits and Vegetables Export (2006-07)

2006-07	Tons
Fruits Production (2006-07)	6,011,228
Vegetables Production (2006-07)	5,719,527
Total Fruits and Vegetables Production (2006-07)	11,730,755
Total Export of Fruits and Vegetables	562,549
Percentage Exports	4.8%

2.4.3 Refrigerated Container Yards

Keeping in view the distances from sea port to market and linkages with other countries through which the flow of fruits and vegetables will take place, 2 locations have been identified namely in city of Karachi and Lahore for the establishment of refrigerated container yards. The selection of these two locations is primarily based keeping in view the reasons mentioned above, where by a parking and charging facility will be provided to refrigerated container in order to ensure that the horticulture produce during transportation along the NTC are preserved at optimal temperature and no deterioration can take place during transportation either in shape or shelf life or quality of the produce.

2.4.4 Testing Labs

As many as 6 testing labs are proposed to be built as part of the CCS project. Out of these laboratories, 3 are located in Punjab province (which is the highest producer of fruits and vegetables (see figure 1 and 2), where as 1 each in NWFP, Baluchistan and Sindh in proposed to be built. The locations include Multan, Bhalwal, Mirpur Khas / Hyderabad, Swat / Malakand, Quetta and R.Y. Khan.

Having these laboratories a part of the CCS would ensure PHDEB's objective of making the horticulture sector sustainable and responsive to meet the challenges of globalization and WTO regime. Their establishment would also give credibility to the exported crop.

2.5 Implication for Non Existence of Integrated Cool Chain Infrastructure

The implications for not having an integrated cool chain infrastructure, over the years have caused post harvest losses; loss in foreign exchange earnings, price destabilization, and quality deterioration (reduced shelf life of the produce). Each of these factors is elaborated in detail in the following sections.

2.5.1 Post Harvest Losses

In Pakistan, the total post harvest loss sums to 24% of production. Although this figure represents status as at the year 2004, no new study is conducted to establish the latest trend and experts and publications use this percentage to determine the annual loss of horticulture produce.

Similarly, applying the average post harvest loss at 24% to the total production of fruits and vegetables for 2006-07⁷ (i.e.11,730,755 tons) gives the annual loss equivalent to 2,815,381 tons. The major contributors to the total post harvest loss include poor

⁷ Latest Published Figures by the Ministry of Food Agriculture and Livestock (MINFAL)
Anjum Asim Shahid Rahman
Chartered Accountants

storage, inadequate transportation, rough handling and careless harvesting each of which contributes the following percentages.

Table 7: Distribution of Post Harvest Losses⁸

Factor	Percentage Share
Careless Harvesting	3%
Rough Handling	4%
Inadequate Transportation	6%
Poor Storage	11%
Total Post Harvest Losses	24%

In the pre-feasibility study conducted by M/S Arch Vision, an assessment was made to quantify the post harvest losses in monetary terms. The assessment was made around the work conducted earlier by Ibrahim and Anwar (2004), by using post harvest loss percentage of each fruit and then multiplying it with production (for 2005-06) and market committee rates. The following results were obtained.

Table 8: Post Harvest Losses in Monetary Terms⁹

Fruits	Production (‘000 Tons)	Value* (\$ million)	Post Harvest Losses (%)	Post Harvest Losses (\$ million)
Citrus	1,943.6	166.5	15.0%	24.98
Mango	1,673.9	473.8	25.0%	118.45
Dates	622.0	414.7	35.0%	145.15
Apple	351.9	106.8	15.0%	16.02
Pear	30.5	25.4	15.0%	3.81
Peach	69.6	58.0	15.0%	8.70
Plum	60.7	50.6	25.0%	12.65
Apricot	205.2	136.8	25.0%	34.20
Sub-total	4,957.4	1,432.6	25.3%	362.45
Other Total	1,679.2	792.3	24.4%	193.32
Fruit Total	6,636.6			555.76
Vegetables				
Potato	2,024.8	383.0	15.2%	58.22
Onion	1,764.8	289.6	20.0%	57.92
Tomato	426.1	85.3	40.0%	34.12
Sub-total	4,215.7	757.9	19.8%	150.07
Other Vegetables	2,808.1	707.6	30.5%	215.80
Total Vegetable				365.87
Total F&V				921.63

⁸ Ibrahim and Anwar, 2004, Horticulture Education, Extension and Training System in Pakistan

⁹ Ibrahim and Anwar, 2004, Horticulture Education, Extension and Training System in Pakistan, value as per market committee rates (2005-06) instead of current factor costs

Anjum Asim Shahid Rahman

Chartered Accountants

Evident from the table above, the post harvest loss in monetary terms is estimated at USD 921.63 million for 2005-06. This figure is likely to move in direct relation to production hence each year the post harvest loss in monetary terms is showing an upward trend.

The cost for setting up of the entire cool chain system is estimated to be US\$ 167 million (derived from the base case financial model). On the contrary, the post harvest loss accounts to more than US\$ 900 million per annum. Thus, the opportunity cost of not having a CCS is 5.3 times per annum of the capital investment which is one-off.

2.5.2 Loss in Foreign Exchange Earnings¹⁰

It is witnessed that prices fetched by Pakistani horticulture produce in the international markets are far lower compared to other countries. The following table gives the price differential that exists between average world prices and Pakistani horticulture crops.

Table 9: Average Price differential between World and Pakistan Crop

Crop	World Price (\$/t)	Pakistan Price (\$/t)	Price Gap Price (\$/t)
Citrus	492.8	290.6	202.2
Mango	861.0	315.2	546.0
Dates	671.3	489.7	181.6
Grapes	948.1	624.5	323.6
Apple	701.5	588.8	112.7
Apricot	692.9	381.7	311.2
Plum	761.1	392.6	368.5
Potato	358.3	148.6	209.7
Tomato	411.7	342.1	69.6
Onion	308.3	119.4	188.9

Source: Food and Agriculture Organization (FAO), 2005

The main reason behind the above price differential is the lack of Pack Houses with state of the art packaging, processing, grading and similar facilities; lack of sophisticated storage techniques such as controlled atmosphere storage (CAS); availability of internationally reputed testing labs for certification. Other impediments hampering higher export prices include lack of product uniformity, traceability, variation in cropping program, use of agro chemical. As a result, Pakistani fruits and vegetables create a loss in foreign exchange earning equivalent to the price difference between export vale and world average prices.

¹⁰ (* the production for the year 2006-07 has reduced therefore the difference between the post harvest loss value in US\$ terms as reported in table 8 and as estimated in 2.5.1 is present)

2.5.3 Price Destabilization

The post harvest losses create an environment of undetermined fluctuations between production and supply to the consumers. The reported figures of production may depict a stable supply of a certain produce which may later be subject to losses creating uncertainty with respect to supply. This will cause the supply to fluctuate proportionately with the post harvest losses, thus creating an imbalance between demand and supply resulting price destabilization.

To keep prices stable in the domestic market, adequate storage facilities are required at production centers as well as at main fruit and vegetable markets in order to store the produce when it is ready to flood the market. This will allow the supply to be controlled and the released of crop will be subject to market demand.

2.5.4 Quality Deterioration

As conventional methods such as the use of open trucks for transportation, non reliance on quality testing of the produce, lack of cold storage facilities are present in the country the shelf life of the produce is limited to its natural life only. Furthermore, the facilities have little emphasis on obtaining the Hazard Analysis and Critical Control Points (HACCP) certification.

HACCP certification is seen to enhance the value, credibility and consumer confidence for horticulture produce. Although PHDEB encourages exporters to obtain this certification however, most of the exporters refrain from such practice on grounds that the countries that they export to do not require such certification. This leads to entry into low end consumer markets and high rejection rate for exports from high-end consumer markets which are stringent on product quality standards.

The need to set up internationally recognized and accredited testing labs will assist exporters in ensuring quality and credibility such as offered by HACCP. Furthermore, in compliance to arising international awareness regarding quality, it is seen to be only a matter of time when such certifications become compulsory for export. Hence, setting up testing laboratories to ensure product quality will help increase sales into OECD markets and will make the horticulture sector ready for any change in export regulations with respect to quality.

2.5.5 Conclusion: Implication for Non Existence of Integrated Cool Chain Infrastructure

The existing cool chain infrastructure, with particular reference to facilities, lacks integration; administration; marketing; postharvest and processing technologies; and export development expertise. This has caused the sector to fail in providing adequate services to the users and has failed to contribute to its potential in facilitating economic

growth for the country. This can be emphasized by the fact that US\$ 900 million worth of horticulture produce is gone astray due to reasons explained earlier in this report.

The above problems are complemented by the fact that the private sector has not explored the horticulture sector in terms of its profit potential. Hence this has caused sector failure paving way for government to intervene and initiate the concept of an integrated, state of an art Cool Chain System with the following objectives;

- a) Reduce post harvest losses;
- b) Increase production surplus along with improving shelf life and quality of fresh produce;
- c) Stabilize prices in domestic markets; and
- d) Boost export to highly lucrative and competitive international markets

2.6 Socio-Economic Benefits to be derived from the CCS

The points elaborate in earlier part of this chapter justify the needs of a CCS on the basis of the objectives of PHDEB. However, there are other social and economical benefits derives the need for a CCS. Some of these are listed below

2.6.1 Improvement in Hygienic Conditions of Wholesale Markets

At present in Pakistan, there are four main categories of wholesale markets; primary wholesale (terminal), secondary wholesale, district wholesale and rural assembly markets. These markets are difficult to quantify as this sector is unregulated, however, 203 such markets are established under statutory acts¹¹ which comprise of 132 in Punjab, 68 in Sindh, 2 in Baluchistan and 1 in NWFP. These wholesale markets are witnessed to have poor hygienic conditions resulting from dumping of decaying fruits and vegetables.

In order to improve the current situation the supply of fruits and vegetables needs to be controlled. The establishment of cold stores at such locations will help restrict supply and ultimately reduce formation of decaying dumps and will be helpful in improving hygienic conditions in markets.

2.6.2 Poverty Alleviation through Job Creation

Pakistan being an underdeveloped country with a significant number of its population living below the poverty level is in dire need of projects that create source of employment for the unemployed.

¹¹ Agriculture Produce (grading and Marketing) Act 1937 and the Agriculture Produce Markets Act. work.
UNIDO SPS Report

With the establishment of the cool chain system, at least two to three thousand permanent job opportunities will be created followed by temporary job opportunities like in case of manual packing in the pack houses etc. As assumed in the base case financial model for the CCS project the number of direct employment will be approximately 4,000 which includes skilled, semi-skilled and unskilled workforce.

The development and operation of the proposed national pool of reefer containers, and improved marketing techniques would need skilled labour hereby creating further employment opportunities. Similarly, technical expertise will be developed through new technology to be adopted in Cold Storages and Pack Houses. All these projects would also result in indirect jobs in the form of development of processing industry, opportunities in construction industry, small workshops, roadside restaurants, and supplies of various items needed.

2.6.3 Increase in Direct and Indirect Revenue to the Government

If public sector contribution to the PPP structure is not in shape of tax exemption then additional revenue will flow to the Government in shape of direct tax through corporate profitability. Development of Cool chain system will increase the tax revenue that will be generated each year from major exporter, dealers of equipments and from the job opportunities that will be created as discussed above.

2.6.4 Sector Development

The CCS project is a pilot project to encourage private investors and corporations to invest in horticulture infrastructure. Upon its establishment, the profitability of the horticulture sector will be brought to the attention of the private sector. Thus, business prospects are likely to influence private investments that will further lead to sector development.

2.6.5 Technology Replication

Most of the existing facilities are based on old and obsolete technology. They are energy inefficient and thus involve high maintenance costs. Use of modern and efficient machinery allows the owners to meet output specifications. The proposed cool chain, because of its high-tech operating efficiency, will attract the domestic food preservation sector to invest in similar technology. This will help the local vendors and suppliers to develop some of the components locally reducing the machinery costs. With wider use, the operating costs will reduce further.

2.6.6 Prevent Export Dumping

Fruits and vegetables exporters in Pakistan procure their product from wholesales markets. They prefer that period for purchase when there is a glut in markets and prices are low. After procurement, they have no place to store their perishable commodity. Since the shelf life is limited, all exporters try to export it immediately. As a result, some of the traditional foreign markets are dumped with Pakistan's fruits and vegetables. Market of Dubai can be quoted here as an example. Because of these practices, we fetch very low price for our valuable crop. **(See Table 9: Average Price differential between World and Pakistan Crop)**

The proposed facility will smoothen out to some extent, the supply of fruits and vegetables to the wholesales markets. Market glut and urgency for the export of crop will be reduced. As a result, exporter will have an opportunity to enter the higher value segments in the existing markets in order to maximize unit value realization. Longer shelf lives and improved quality of packaging and processing would provide an opportunity to enter new markets. These markets have not been explored so far because of longer geographic distances or stringent quality standards.

2.6.7 Fair Rewards to Farmers

One of the constraints faced by the farmers is the shortage of storage facility near the farm area, therefore most of the products are sold to contractors through auctions prior to fruit maturity reducing the bargaining power of the producers. The price at which these products are sold are much less than the price at which the middle man/ Arthi takes the products to the market, thereby the disposable income in the hands of the growers is low.

With the establishment of the CCS the disposable income in the hands of the growers will increase due to the fact that during the season they can store their produce and keep on taking their produce to the market at regular intervals without the fear of the produce being damaged due to its perishable nature. Thus, they can sell at times when the prices are high and keep the crop stored, in temperature controlled environment, at times when the prices are low.

2.6.8 Improved Quality of Fruits and Vegetables

Field heat removal & timely placement of products inside cold storage will help preserve their quality and improve shelf-life. It will also avoid food contamination caused by microbial activity thus assuring improvement of food quality and hygiene. Furthermore, with improved access to testing laboratories and pack houses for processing it will be possible for the Government of Pakistan to regulate and ensure that the horticulture

crops are maintained at minimum quality standards requirement for sale even in the domestic markets.

2.7 Institutional Analysis of PHDEB

PHDEB human resource is divided between strategic, tactical and operational management. At the strategic level, there is the board of directors, chief executive officer and the chief operating officer. The chief operating officer looks after the tactical management (managers) for marketing, business development, technical, finance, administration and human resource. Following these are the lower management and field officers who are stationed in major cities of the country.

The reporting structure between the three levels of management is centralized which results in enhancing the work load of the CEO. This forces the CEO to be more involved in routine operational issues rather than emphasizing on the strategic planning and forecasting. This limits the ability of the institution to manage large scale projects however even with human resource constraints PHDEB, for small to medium sized projects, has been able to lead the way with respect to initiatives taken to strengthen the horticulture sector. This goes with the fact that it has 1 project approved, 7 in execution, 3 in approval stage from concerned authorities and 7 more under study. Moreover, it is implementing 4 projects in collaboration with other organizations.

PHDEB has budget allocation on an annual basis from Export Development Fund (EDF). This budget is released to cover operating expenditures and for implementation of small scale projects. The operating budget is utilized for providing salaries of staff, meeting office expenditures including utilities and stationery. For small scale project implementation, a development plan is prepared and submitted to EDF which then release funds. For large scale projects that go beyond the funds available with EDF, a PC - 1 is required to be developed and funds approval sought. Likewise, for CCS project, PHDEB initiated a PC-1 that was taken up by the Government of Pakistan through Ministry of Commerce

The initial concept was to roll out the project with funds to be provided by the Federal Government, however due to fiscal constraints it was agreed to implement this project through Public Private Partnership modality. This decision, partially driven by financial constraints, was also driven by the fact that PHDEB does not have enough manpower and technical expertise to build, develop and implement such complex large scale project. Moreover, due to the complexity of the project with each component of the CCS required to be established simultaneously, it was felt that having the project to be rolled out by the Public Sector alone might result in pace of investment being slower than expected. Furthermore project implementation may also lead to cost overruns and time delays. This would hinder the achievement of the project objectives in a timely and efficient manner.

2.8 Need for Public Private Partnership (PPP)

Hence, for the reasons mentioned above, need for a Public Private Partnership (PPP) was felt as the most appropriate mode for implementation of the CCS via Infrastructure Project Development Facility (IPDF) which will facilitate the implementation of the project in a planned and organized manner under its defined PPP guidelines. In general, project execution under a PPP is likely to bring in numerous benefits to the transaction which includes the following:

- Improved service delivery by allowing both sectors to do what they can do best. Government will be involved in setting policy and serving the public interest where as private sector takes responsibility for functions such as operating and maintaining the facilities.
- By taking advantage of private sector innovation, experience and flexibility, PPP can deliver services more cost-effectively than traditional approaches.
- Reduce public sector risk by transferring to the private partner those risks that can be better managed by the private partner.
- Deliver capital projects faster, making use of the private partner's increased flexibility and access to resources.
- Make better use of assets. Private sector partners are motivated to use facilities fully, and to make the most of commercial opportunities to maximize returns on their investments. This can result in higher levels of service, greater accessibility, and reduced occupancy costs for the public sector.
- On the other hand the private partner will have an edge in shape of public sector participation which could be in the shape of assets, cash and non cash contribution. The various modalities are discussed in the later part of this report.

2.9 Government's Participation

There are various forms of Public Private Partnerships, with varying degrees of government and private sector involvement and varying levels of public and private sector risk. The goal is to combine the best capabilities of the public and private sectors for mutual benefit. However, at this point in time, government's participation or use of any of its assets toward this project is undetermined and it will only be decided and finalized once one of the options, as identified and analyzed, in the following chapters is decided upon.

3. Options Identification

3.1 Potential market players

Project is to be rolled out under the PPP composition which requires huge investment from the private sectors. Therefore brain storming sessions and group discussions were held with industry personnel to identify categories that would gauge the interest of potential market players and investors. This process lead to identification of two broad categories under which project execution is expected. These categories include 'Geographical Proximity' and 'Area of Expertise', details of which are as under:

3.1.1 Geographical Proximity

The facilities envisaged under the CCS are spread to all corners of the country requiring potential investors to operate without negative preference towards geographical dynamics. Therefore in light of geographical preferences the following three categories of potential investors are identified:

- i) **Corporate Giants:** this includes category of investors / entrepreneurs who would be interested in the project as a whole and would not be affected by the geographical dispersion of the facilities. Such investors / entrepreneurs are capable of investing large sums of capital for higher returns and to benefit from vertical integration of the supply chain components.

Options Identified: Whole project to be rolled out as one 'Consolidated Option'. It is assumed that probably one large corporate giant will take up the entire Cool Chain project.

- ii) **Medium Sized Corporations and Investors:** Investors / entrepreneurs includes entities and individuals who are interested in investing handsome amount of capital and have a preference of operating in 'know areas' and 'boundaries'. Hence, such entities and individuals would be engrossed by projects at maximum, the provincial levels.

Options Identified: the project to be rolled out at the provincial levels in the following two categories:
 i) Facilities under each province to be rolled out as a single unit (Province Wise)
 ii) Facilities in two provinces to be rolled out as a single unit (Provincial Mix)

- iii) **Small scale corporations and investors:** such investors and entities are identified to be small operators who are best efficient in operating small business units. Their preference is to invest in projects executable in their own geographical proximity.

Option Identified: each facility to be rolled out as a separate business unit. This option is excluded from the following options analysis chapter on grounds that project execution would become complex and the purpose of setting up the CCS would not be met

3.1.2 Area of Expertise

Contrary to the argument of geographical proximity, there are other types of investors and market players who were identified to show interest in the project. Such investors and market players have no preference with respect to geographical remoteness or closeness of the facilities however their preference is driven by their own area of expertise. Such potential investors and market players can be categorized as under: -

- i) **Product Specialists:** This category of market players and investors are specialists in a particular product range and have a preference to invest and operate in only those products that they are familiar with. It is assumed that such investors and market players would be interested in projects with similar features. For example entities that are specialists in a particular fruit or vegetable would only invest in projects involving that particular fruit or vegetable.

Option Identified: facilities pertaining to a particular fruit belt to be clubbed together for execution (Fruit Belt Wise) where as facilities at different exit points (air ports and sea ports) to be executed separately for mix fruits & vegetables.

- ii) **Business/Service line Specialists:** unlike product specialist where the entity is an expert with respect to a particular product line, business/service line specialists are masters in a particular business/service line. For instance a corporation involved in the business of cold store would be a specialist in this area of business and would compete with competitors on the basis of its enhanced professional knowledge of that business. Such investors and entities have a preference of engaging themselves in similar projects over and over again.

Option Identified: each component of the cool chain system to be rolled out as a separate business unit (Activity Wise)

3.2 Identified Options

In light of ‘geographical proximity’ and ‘area of expertise’ factors covered above the following list of options are identified each of which is elaborated in the options assessment section (covered later in this chapter).

Table 10: Principal Options Identified

Category	Option Identified
Geographical Proximity	1. Consolidated Project
	2. Province Wise
	3. Provincial Mix
Area of Expertise	4. Fruit Belt Wise
	5. Activity Based

These options were subject to forecasting exercise (Base Case financial model) to evaluate the financial impact of each option without incorporating risk parameters. Initially, this base case model was developed for each facility under each component (cold stores, pack houses, refer yards and testing labs). Later, these individual models were translated into a consolidated version to reflect financial implication of the project as a whole. The salient features of base case model are as follows:

Disclaimer – Financial Model

The financial model for the Cool Chain System (CCS) has been prepared on the basis of data and assumptions agreed with Pakistan Horticulture Development and Export Board (PHDEB). This financial model will serve as a reference tool for preliminary analysis of the project by the IPDF and Stakeholders and does not purport to contain all the information that IPDF and /or Stakeholders may require. While all efforts have been made to incorporate all information relevant to the proposed transaction into the financial model, the consultants do not make any representations or warranties, express or implied as to the accuracy, completeness or reasonability of the financial results for future periods.

- i) **Project Cost Sheets:** Project cost for Cool Chain Systems has been segregated based on the activity / service line. Each activity / service line has its own separate project cost sheet with all location / unit based capital expenditure assumptions listed down. Project Cost for each location / unit includes:

- Land Cost Assumptions
 - Building and Civil Works Assumptions
 - Plant and Machinery Assumptions
 - Material Handling and Storage Equipment Assumptions
 - Ancillary Systems and Equipment Assumptions
 - Office Equipment Assumptions
 - Furniture and Fixtures Assumptions
 - Vehicles Assumptions
 - Initial Working Capital Assumptions
- ii) **Investment Plan:** Investment Plan is a dynamic feature through which investment in a particular unit can be varied within the five year plan. Each unit has a project development phase of one year.
- iii) **Financing Plan Sheets:** Financing plan is a month wise capital expenditure schedule for units installed as per the Investment Plan. Financing plan calculates month wise equity and debt drawdown according to cost incurred during that particular month. Based on debt drawdown during each month as per the financing plan, interest expense during project development phase is computed and capitalized with the fixed asset cost.
- iv) **Revenue & Expense Assumption Sheets:** Revenue & Expense Assumptions has been segregated based on the activity / service line. Each activity / service line has its own separate revenue and expense assumption sheet with all location / unit based assumptions.
- v) **Loan Schedules:** Loan Schedule provides details of markup and principal payments. All loan calculations are derived from the financing plan mentioned above.
- vi) **Financial Statements:** Financial Statements have been segregated based on the activity / service line. Each activity / service line has a separate financial statement sheet which comprises of the following Profit & Loss Account, Balance Sheet and Cash Flow Statement. In addition to individual financial statements for each activity, a consolidated financial statement for the entire project has also been prepared.
- vii) **Project Appraisal and Analysis:** Project Appraisal and Analysis includes the following:

a) **Valuation and Sensitivity Analysis:** Valuation and Sensitivity Analysis sheet includes investment appraisal for all activity based components and the overall project. Valuation for the overall project and for equity holders only has been carried out by the use of Discounted Cash Flow Method (DCF). Following methods of evaluating the investment through DCF have been used:

- Net Present Value (NPV)
- Internal rate of return (IRR)
- Payback Period
- Concession Period (Discounted Payback Period)

Cash Flows for the project have been discounted on the weighted average cost of capital for the project. Whereas, cash flows for equity holder has been discounted on the cost of equity.

b) **Ratio Analysis:** Calculation of various ratios is derived which includes bankability ratios (debt service, loan and project life coverage) and profitability ratios (gross & net profit margins and return on capital employed).

The entire project was made subject to financial scrutiny through the base case financial model which leads to the observation that testing laboratories are financially unviable units. Their exclusion from the project improved the financial results substantially. Hence for this reason a new option based purely on its financial impact was devised in order to make the project more attractive for investors and market players.

Option Identified: Rolling out the complete project under each option identified in table 11 with the exclusion of testing laboratories.

The above option identified implies that each option would be assessed on a consolidated basis as well as with the exclusion of testing laboratories. Thus, the above identified option increases the total available options from five to ten. These are tabulated in the following table:

Table 11 Identified Options (Revised)

Option Identified	
Category	
<i>Geographical Proximity</i>	1. Consolidated Project
	2. Consolidated Project minus Testing Laboratories
	3. Province Wise
	4. Province Wise minus Testing Laboratories
	5. Provincial Mix
	6. Provincial Mix minus Testing Laboratories
<i>Area of Expertise</i>	7. Fruit Belt Wise
	8. Fruit Belt Wise minus Testing Laboratories
	9. Activity Based
	10. Activity Based minus Testing Laboratories

4. Options Assessment

4.1 Introduction and Assessment Criteria

After the identification of options, next step is to assess each of these by taking into account quantitative and qualitative factors and then assessing its implication under option assessment. For the sake of simplicity the following are the objectives that each option has to meet in order for it to be considered as marketable.

- a) **Integrated**, taking into account all components of the cool chain system and ensure strong linkages with other national improvement plans.
- b) **Environmentally sound**, that it does not exert any pressure on people and the environment.
- c) **Flexible**, it permits variation and /or creativity on small and large scales investors looking forward to invest in project implementation.
- d) **Technically appropriate and viable**
- e) Contribute towards **Economic Growth**, in the sense that it fosters the development of horticulture, industry and markets.
- f) **Sustainable**, in the sense that it is financially affordable, socially adequate and politically supported.

To meet the above objectives, the following approach with respect to quantitative and qualitative factors is taken into account.

- i) **Quantitative Factors:** These factors provide a numeric basis for decision making there by reducing the decision to look at the monetary value placed on various options. Quantitative factors used for the cost and benefit analysis of options include statement of estimated financial cost and benefits that will be incurred and earned over the project life. All options are evaluated through investment appraisal, bankability and government appraisal factors using free cash flows.

Free Cash flow to equity (FCFE) estimates that how much cash a business can afford to return to its shareholders whereas free cash flow to firm (FCFF) is the amount of cash produced or consumed in business operations without respect as to how business is financed.

a) Investment Appraisal Factors

- **Net Present Value (NPV) of Future Cash Flows** – Involves calculating the present value of future cash in-flows and out-flows resulting from the project based on an appropriate discount rate. Following table illustrate various assessment criteria of NPV.

Table 12 NPV Assessment Matrix

NPV	Results	Implications
Highly Favorable	If $NPV > 0$, investment will add value to the firm	Project should be accepted.
Not Favorable	If $NPV < 0$, investment do not add value for the firm	Project should be rejected
Low to Medium	If $NPV = 0$, investment keeps the investor at its present position i.e. neither provide gain nor loss	Decision is at the discretion of the investor whether to accept or reject the project. This decision should be based on other criteria, e.g. strategic positioning of the firm in the current supply chain or other factors not explicitly included in the calculation.

- **Internal Rate of Return (IRR)** – IRR is most widely used technique for project appraisal; it is the rate of return that makes the net present value of all cash flows from a particular project equal to zero. It is an indicator of the **efficiency** or quality of an investment, as opposed to NPV, which indicates value or magnitude. A project is a good investment proposition if its IRR is greater than the rate of return that could be earned by alternate investments of equal risk (investing in other projects, even putting the money in a bank account).

Table 13 IRR Assessment matrix

IRR	Results
Extremely Favorable	$IRR > \text{Cost of Capital}$
Moderate	$IRR = \text{Cost of capital}$. It is at the discretion of the party whether to go ahead with the project or not. IRR equal to the cost of capital mean that the project is at breakeven with respect to time value of money.
Low	Reject the project when $IRR < \text{Cost of Capital}$

- **Payback Period (PP)** – It focus on recovering the cost of investment. It represents the amount of time that it would take a project to recover its initial cost. It is calculated by comparing the initial cost of the project with the annual inflows. The PP concept holds that all other things being equal, the better investment is the one with the shorter payback.

b) Bankability Appraisal Factors: - These are used to determine whether the project has a potential to raise and service its debt. Following bankability ratios has been assessed –

- **Debt Service Coverage Ratio (DSCR)** – The debt service coverage ratio, abbreviated as DSCR, is the most important ratio for lending institutions when making commercial loans. It measures the ability of a business to meet its regular debt obligations by comparing cash flows of the project after operating expenses (i.e. the cash flow available to meet the debt service) against the amount of debt service (interest plus principal) payable over the same period.

From a lender's viewpoint it should be clear that they want as high a DSCR as possible. The borrower, on the other hand, wants a loan as large as possible. As a general rule associated with this ratio the larger the loan, higher the debt service (debt payments) would be.

The ideal DSCR ratio ranges from 1.2 to 1.5 with any movement upwards from 1.2 being more favorable. A DSCR of 1.0 is called a break even cash flow. That is because the net operating income (NOI) is just enough to cover the loan payments (debt service). A DSCR of less than 1.0 would be a situation where there would actually be a negative cash flow. A DSCR of say .95 would mean that there is only enough net operating income (NOI) to cover 95% of the loan payment. This would mean that the borrower would have to come up with cash out of his personal budget every month to keep the project afloat.

- **Loan Life Coverage Ratio (LLCR)** – It measure the net present value of future cash flow available for the debt service against the outstanding amount of debt. Lender usually requires a minimum LLCR in the range of DSCR. This ratio gives an estimate of the credit quality of the project from a lender's perspective. It ranges from 1.25 in a highly geared infrastructure project to 2.5 or higher in other projects such as oil and gas transactions.
- **Project Life Coverage Ratio (PLCR)** - The Project Life Cover Ratio (“PLCR”) is commonly used debt metric in project finance. PLCR is akin to the LLCR and is the ratio of the net present value of the cash flow over the remaining full life of the project to the outstanding debt balance in the period.

Table 14 Bankability Assessment Matrix

Bankability factor	DCSR (times)
Extremely Favorable	2.0 or more
Moderate to Highly favorable	1.5 – 2.0
Moderately favorable	1 – 1.5
Unfavorable	0 – 1.00

c) **Government Appraisal Factors:** These are the factors that are normally used by the government to determine the viability of the project from public sector point of view. These factors includes the following –

- **Concession Period (CP)** – It’s the length of time during which the private sector will be permitted to operate and maintain the facility in order to recover its costs and earn adequate returns. From the public sector point of view a minimal concession period is beneficial as public sector has to provide its contribution for minimal period of time. In infrastructure project normally a concession period ranges form 20 to 30 years.
- **Benefit to Cost Ratio (BCR)** – Cost-benefit analysis (CBA) is an approach of decision making which compare all the relevant cost and benefits. It is calculated by comparing the present value of benefits to the total present value of cost incurred during the life of the project. The comparison of cost and benefits indicates whether the course of action is admissible or not. For BCR, a ratio of 1.0 is logically the lowest acceptable measure on the scale. Any value lower than 1.0 would indicate that the project's Present value of future cash flows is less than the initial investment.

Table 15 BCR Assessment Matrix

BCR Range	Consequences
> 1	Project is financially attractive
= 1	Lowest acceptability measure
< 1	Project is financially unattractive

ii) Qualitative Factors

Qualitative factors take into account of other factors that may influence the decision making about a particular option but normally they are very subjective in nature and can be wide ranging. In this regard primary consideration has been given to the following:

a) **Integration and Synergy Effect:** All the components of CCS are interrelated, development of all components together will not only create synergy but also the objective of integrated CCS will be achieved. As each component of the CCS is a support function of each other i.e. in order to export the produce testing labs

is a necessity for the pack house where as cold store and pack houses needs transportation facility which will be achieved by refer yards component.

- b) Management and Monitoring:** This aspect looks into the ease of managing and monitoring a number of concession agreements. In case if more number of concession agreements are made than it would be difficult for the implementing institution to effectively undertake the task of managing and monitoring these concessions. Therefore in order to achieve efficiency in managing and monitoring these concessions, it is desirable that minimum number of concession agreements may be done.
- c) Market capability and appetite:** This factor looks into the ease of the project to attract renowned international players and have the requisite scale to make the project bankable. Projects having a larger scale would have a higher probability of attracting equity as well as lender participation from both local as well as foreign players. On the contrary, projects done on smaller scale would mostly attract local entrepreneurs creating financing problems, as most of the financing for such small scale projects would be through equity contribution.

iii) Option Assessment

Under this caption all merits and demerits will be assessed to draw conclusion regarding options applicability as an acceptable marketing / roll out strategy. The primary options identified in table 10 (Principal Options Identified) will be subject to comments under the above given quantitative and qualitative aspects where as for secondary options driven from these primary option (presented in table 11: Identified Options (Revised)) an assessment may also will be made with respect to comparison made with its primary option.

NOTE: financial summary for all options clubbed together is given as annex to this report. It may be found help full when going through the assessment chapter.

4.2 Consolidated Project

Under this option, whole project will be rolled out as one unit rather than on facility to facility or component to component basis. This option includes Cold Stores (23), Pack Houses (39), Refer yards (2) and Testing Labs (6) to be implemented over a period of 5 years. The implementation plan, tabulated below, has been designed in a manner that facilities offering favourable financial results are established before the ones offering unfavourable financial results.

Table 16 Implementation Plan and Project Cost

Particular	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Cold Store	5	10	8	-	-	23
Pack House	10	10	8	5	6	39
Refer Yards	1	-	1	-	-	2
Testing Labs	2	1	1	1	1	6
Total (units)	18	21	18	6	7	70
Project Cost (PKR billion)	3.28	3.19	2.66	1.73	1.69	12.55

The total project cost under this option is PKR 12.55 billion divided between the four components at PKR billion 3.19, 8.12, 0.53 and 0.71 for cold stores, pack houses, refrigerated yards and testing laboratories respectively.

a) Quantitative Factors:

i) Investment Appraisal Analysis

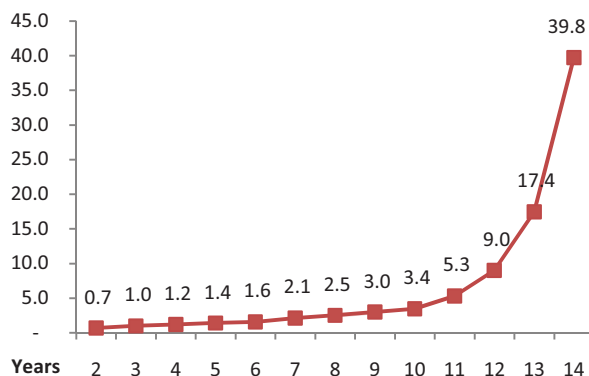
Table 17: Financial Snapshot

Option 1: Consolidated	NPV (PKR billion)	IRR (%)	Payback (years)
FCFF	7.28	27%	7.08
FCFE	3.02	35%	6.30

The snapshot above depicts the option to be financially viable at all forums with respect to investment appraisal. The rate of return for public (FCFF) as well for private participation (FCFE) has attraction enough to draw a fruitful PPP relation between the two sectors. On the basis of Net Present Value, returns for the private sector are hanging just over PKR 3 billion against an investment of PKR 12.55 billion. Similarly the option is favourable for the private sector as the investment will be paid back in 7.08 years (FCFF).

ii) Bankability Analysis

The debt to service coverage ratio is seen to be unfavourable in the initial years of operations however with improved financial performance over time the ability of the operator to service its debt payment is seen to progress (see graph on the following page).



Loan life coverage ratio is at 2.69 times. Both these indicators are representative of high project bankability.

iii) Government Perspective Analysis

Government’s interest in the project is derived when its participation in a PPP modality is at a bare minimum. Under this option the concession to be given to the private sector to bind it into a legal relationship is for a maximum period of 11.19 years. The benefit to cost ratio, estimates that costs benefits (in financial terms) associated with project outweigh the costs by more than 2 times. These indicators present an option favorable from the public sectors perspective.

b) Qualitative Factors:

- i) **Integration and Synergy Effect:** The prospect of rolling out a successful CCS project depends on the benefits derived from the interdependency of the four components on each other. Therefore the overall benefits accrued to the development of a consolidated project in terms of operational, technical, managerial and other aspects would be achieved.
- ii) **Management and Monitoring:** Since all components are to be rolled out as a single project, this implies that only one concession agreement will be made. Thus, the Implementing Institution can monitor and manage the project with ease given that limited human resource it has.

iii) **Market capability and appetite:** In terms of market capability and appetite, this option would require attention of investors having strong credentials of handling large scale projects apart from raising finance as well. In this regard International investors would be preferred over domestic investors. For the option under consideration probability of investment by International players already engaged in similar businesses is relatively higher than domestic investors due to the reasons explained earlier. Other benefits that International investors would bring may include International best practices (i.e. management processes, technology, access to international markets etc) and Foreign Direct Investment. However some domestic conglomerates might also take a leading role in building a consortium of local as well as foreign investors to undertake this option.

c) Option Assessment

As government's participation, at this point in time, is undecided it is assumed that a large sum of capital is likely to be brought forward by the private sector and raising debt under project finance methodology would become difficult. For the sake of argument, if the debt required to be raised is 30% of the total project cost which is PKR 12.55 billion, the private party to the transaction would be required to raise PKR 3.76 billion. Given the current global financial crisis where the financial institutions are facing liquidity problems raising this much of debt would be difficult. However, assuming that all goes well, the bankability ratios depict a picture that lenders prefer to see when financing an infrastructure project.

This option undertakes the execution of all components and facilities of the CCS which ensures the establishment of complete post harvest supply chain management. This means that all facilities pertaining to these components of the supply chain will be set up and operated at a consolidated level under a single management which can replicate best management practices brought in by it self or learnt over time. This standardization may result in the long run average cost of the company to reduce resulting in economies of scale. Such a practice, will give cash flow gains to the company and actual financial results from operations may be better than those forecasted.

The only drawback foreseen in this option is the time period it takes to implement it self. This extends to 5 years. Contrary to this argument, as mentioned in market capability and appetite section above, this project has all the financial characteristics to attract international investment. If this possibility materializes then there will be influx of direct foreign investment in the country on an annual basis totaling approximately USD 158 million over a time span of five years. This would be a welcome relief for the GoP in the prevailing economic recession.

4.3 Consolidated Minus Laboratories

Evident from its name this option involve establishment of the entire Cold Chain System with the exclusion of laboratories. This option has been worked out on the assumption that large corporate giants will be willing to invest in such sort of project given its quantitative and qualitative credentials.

Table 18: Implementation Plan & Project Cost

Particular	Year 1	Year 2	Year 3	Year 4	Total
Cold Store	5	10	8	-	23
Pack House	10	10	8	11	39
Refer Yards	1	1	-	-	2
Total (units)	16	21	16	11	64
Total Cost (PKR billion)	3.08	3.35	2.25	3.0	11.67

In comparison with the consolidated option, implementation period of the project has reduced from 5 years to 4 years. This is because testing labs has been excluded from this option. Exclusion of testing lab and reduction in the implementation plan reduced the cost of the project by PKR 0.88 billion. Total cost of PKR 11.67 billion is segregated into three components of the project, Cold stores 3.19, Pack houses 7.98 and refer yards 0.50 billion.

a) Quantitative Factors

i) Investment Appraisal Analysis

Table 19: Financial Snapshot

Option 1: Consolidated	NPV (PKR billion)	IRR (%)	Payback (years)
FCFF	7.40	28%	6.8
FCFE	3.19	36%	6.0

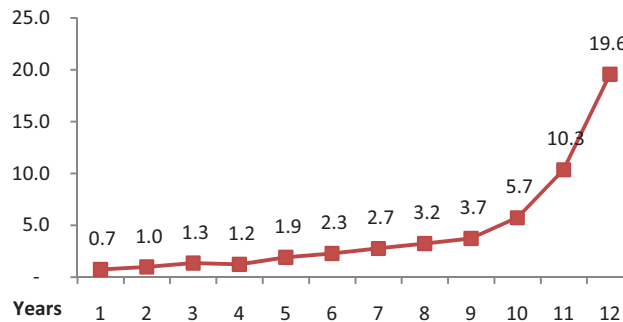
The exclusion of testing laboratories from the entire CCS has improved the financial picture of this option. The laboratories, as a whole, represented a negative NPV component under the previous option hence for the reason NPV of this option has increased from PKR 7.28 to 7.40 billion (FCFF). The private sector interest in this project would further enhance as compared to the first option, as the NPV (FCFE) shows a growth of 5.6% when compared to the consolidated option.

As a complete option i.e. with no sub segments applicable to this option, the internal rate of return is highest at 28% (FCFF) and 36% (FCFE) with regard to other options assessed. These returns ensure to draw attention of the private

sector. The payback period has improved from 7.08 to 6.8 (FCFF) and 6.3 to 6 (FCFE).

ii) Bankability Analysis

These ratios are normally used by the lenders to judge the financial health of the project. Analysis of these ratios indicates that project has a good probability of raising finance. In comparison to the consolidated option this option requires a lower debt because of the exclusion of the testing labs. Cash flow of the option improves as loss making unit of testing labs is not part of the project therefore DSCR improves. Year on year comparison of the ratios suggest that this option has a better chance of raising and then paying off the debt with out putting un due burden on the investor to cover the initial years short fall through alternate source. Progress in DSCR ratio over the period of time can be seen from the graph below:



iii) Government Perspective Analysis

Government usually assessed a project on the basis of BCR. Comparison of cost and benefits shows a ratio of 2.18; this furthers the chances of the option to be adopted as a preferred mean of project implementation. Concession period of the project is minimal i.e. 10.6 years (FCFF) and 9.7 (FCFE), these concession period indicates that government has to provide its inducement for the minimum period of time.

b) Qualitative Factors

- i) Integration and Synergy Effect:** Although Testing labs play a major role in the export of the Fruits & Vegetables, its exclusion does not hamper the overall benefits accrued to the development of a consolidated project in terms of operational, technical, managerial and other aspects. Even with the exclusion of testing laboratories the project will maintain its integration and synergy factor as the remaining components represent the major part of post harvest supply chain.

- ii) **Management and Monitoring:** Under this option, all components with the exception of testing laboratories are to be rolled out as a single project. Whereas, it is assumed that the development of Testing Labs would be done by the Public Sector. This implies that only one concession agreement will be done. Thus, the Implementing Institution can monitor and manage the project with ease.
- iii) **Market capability and appetite:** This option has the full characteristics to attract the same market players as the consolidated option. As a result of exclusion of the lab private sector will be more willing as he do not has to involve in to those requirement attached with the development and then the operation of the testing lab business.

c) Option Assessment

Exclusion of the testing lab results in public sector to come and develop this component but considering the current scenario of the country when government is slashing down its PSDP puts an extra burden on the public sector. Although, exclusion of testing labs will disturb the establishment of the post harvest supply chain management but the effect of this is so minimal because of the fact that there are various other testing labs already operational under the banner of government that may offset this effect.

Implementation time frame and cost of the project reduces but the cost of developing the other components is still substantial that requires some big market player preferably with the experience of this business line to come and bid for the project. Sound bankability ratios of the project further support the argument that the large investor will come for the project because in case conditions change it has the ability to raise funds from alternate source that may also include corporate financing.

Project will be marketed to a single investor; there is high probability that each facility will be run using standardized techniques and management style. This will cause replication of good practices throughout the network of facilities. The result of such practice will be the reduction of overheads (caused by improved management and operational efficiency) that will bring economies to overall financial results.

This option has a large private focus with the exclusion of testing labs, thus labs require a highly qualified human resource to run the facilities. Such human resource is not readily available in the country. Furthermore,, being a –ive NPV component private sector may be reluctant to take up the consolidated option. Hence this component has been excluded with special attention given to private sector motives such as high returns, early investment payback and easy management.

4.4 Province Wise

Each province contributes to horticulture production and has a competitive advantage over the other. For example Apples are normally grown in higher altitude with lower temperature that are available in NWFP & Balochistan where as mangoes are mostly grown in Punjab. Hence, each province is segregated & facilities clubbed together to form four different clusters.

Project is designed in such a way that investor or market player having the knowledge of the area or a particular line of business will participate in this option. Project will be implemented over a time span of 3 years whereas the cost of each component amounts to PKR 3.12 for cold stores, pack house 7.34, refer yards 0.48 and testing labs 0.66 billion.

Table 20: Implementation Plan and Project Cost

Particular	Year 1	Year 2	Year 3	Total
Cold Store	5	15	3	23
Pack House	17	17	5	39
Refer Yards	1	-	1	2
Testing Labs	1	4	1	6
Total Location	16	25	25	70
Total Cost (PKR)Billion	4.59	5.45	1.56	11.6

a) Quantitative Factors:

i) Investment Appraisal

Table 21: Financial Snapshot

Option		NPV (PKR billion)	IRR (%)	Payback (years)
Baluchistan	FCFF	2.4	29%	5.7
	FCFE	1.10	37%	4.9
Sindh	FCFF	0.77	23%	7.3
	FCFE	0.02	28%	6.9
Punjab	FCFF	3.88	27%	6.5
	FCFE	1.59	34%	5.8
NWFP	FCFF	0.08	19%	8.2
	FCFE	(0.16)	22%	8.8
Aggregate	FCFF	7.13	24.5%	6.92
	FCFE	2.55	30.25%	6.6

Project on a consolidated basis has a good NPV but when each cluster is consider in isolation, the cluster of NWFP offers just a marginal return of 0.5% over the

weighted average cost of capital (18.5%) where as Baluchistan cluster offers high premium of 11%. Similarly Baluchistan has the earliest pay back period.

- ii) **Bankability Analysis:** Table below depicts the range of the following bankability ratios.

Table 22: Bankability Ratios

Description	DSCR	LLCR	PLCR
Baluchistan	0.6 - 10.4	2.35	4.07
Sindh	(0.5) - 7.1	1.67	3.13
Punjab	0.1 - 17.1	2.33	4.03
NWFP	0.5 - 8.2	1.33	2.31

From the table it is evident that in Sindh cluster, at the initial stages of the project, there is a cash problem which with the passage of time improves. For the other three clusters, the same applies however, Punjab is not followed by Balochistan & NWFP in terms of debt service coverage ratio.

- ii) **Government Perspective Analysis:** In order to make this cluster attractive for private sector, the government has to provide some sweeteners in the form of concessions. Concession period of NWFP cluster (25.1) stresses this need. Therefore government has to build, not only the loss making units but also the marginal return clusters in order to rollout the project.

Table 23: Public Sector Assessment Measures

Description	Concession Period (Years)	BCR
Baluchistan	9.1	2.21
Sindh	14.5	1.85
Punjab	10.4	2.11
NWFP	25.1	1.8

b) Qualitative Factors

- i) **Integration and Synergy Effect:** Under this option the projects would be rolled out on the basis of geographical proximity in terms of Provinces. This option would require an investor taking up the operations of a province to set up all components i.e, Cold Storage, Pack Houses and Refrigerated Yards & testing labs. Almost half of the facilities under the CCS are located in the province of the Punjab where as the remaining half of the facilities are located in the rest of the three provinces. Rolling out the project on the basis of facilities located within a particular province may cause problems in terms of integration on the national

level. Thus, by default it may create provincial boundaries between the CCS that may make integration at the national level difficult.

- ii) **Management and Monitoring:** Under this option, all components are rolled out through four concession agreements. Therefore it may be difficult for the Implementing Institution to monitor and manage the project with limited human resource.

Having too many facilities in one segment and too less in others would shift the focus of the Implementing Institution to the Punjab cluster. This may result that small segments may be neglected and mismanaged.

- iii) **Market capability and appetite:** In terms of market capability and appetite, this option would require attention of a strong investor for the Punjab cluster where as regional players for the other clusters. Professional, technological and managerial skills that accompany the strong Foreign and/or domestic investor for Punjab may or may not be present for other provinces resulting in substantial variation in the standards. In terms of market appetite, there is a possibility that Punjab being more profitable and lucrative is taken up by potential investors where as the other provinces which are not that lucrative may or may not be opted for investment by the private sector.

c) Option Assessment

This option has little potential to achieve the objective of CCS establishment. The negative NPV of NWFP cluster supports the argument given. This implies that there will not be private sector interest to take up the negative NPV component, hence there might be a situation where this component is left for execution by the public sector. Moreover, Sindh cluster has an NPV close to zero. This signifies that two out of four clusters might not be able to attract private sector participation leading to project failure.

4.5 Province Wise Minus Labs

Following is the list of variation in this option as compared to province wise that includes the development of this component. Exclusion of testing labs makes no difference in the implementation plan of the project hence the difference in project cost is only equal to the capital investment of testing labs. This reduces the overall project cost from PKR 11.6 to PKR 10.94. This option involves development of only three component (Cold store, pack house & refer yards) of CCS on provincial basis.

- Striking out the testing labs from the project improves the NPV and returns of all clusters except Punjab. This cluster is already a profit able unit and exclusion of these labs (3 in units) from this cluster has little impact on its viability. On the contrary, results of other clusters improve as can be seen in the table below

Table 24: Without Laboratories Comparative

Province Wise	FCFE		NPV		IRR	
	From	To	From	To	From	To
Baluchistan	1,104,473,887	1,245,166,697	37%	39%		
Sindh	201,760,131	301,604,796	28%	30%		
Punjab	1,590,931,611	1,515,071,313	34%	35%		
NWFP	(164,668,965)	(22,593,700)	22%	25%		

- Improved bankability ratios in all clusters.

Table 25: Bankability Ratio Comparative

Province Wise	DSCR		LLCR		PLCR	
	from	to	from	to	from	to
Baluchistan	0.6 - 10.4	0.6 - 11.5	2.35	2.51	4.07	4.34
Sindh	(0.5) - 7.1	(0.5) - 8.1	1.67	1.83	3.13	3.39
Punjab	0.1 - 17.1	0.1 - 17.5	2.33	2.37	4.03	4.08
NWFP	0.5 - 8.2	0.5 - 11.3	1.33	1.56	2.31	2.7

- Major draw back of this option is the monitoring and management of the project as it will be rolled on provincial basis, each province may have its own legislative & other requirements, therefore management of the project will be a difficult task for the implementing institution.

Integration objective of the CCS will be hampered as a result of the exclusion of testing labs as well as rolling of the project to different parties. As each party has its own interest, that may conflict with the interest of other cluster. Furthermore, involvement of the public sector is highly desirable not only for the testing lab but also for the low return component of the project like NWFP and Sindh which because of their returns will fail to attract private investor. Hence, this option is not feasible.

4.6 Provincial Mix

It's the mixture of province having all the components incorporated in the mix. Two clusters has been formed namely Baluchistan – Sindh and Punjab – NWFP. Rationale behind this option is the geographical proximity as it encourages the local investors to invest in the area about whom they are fully aware of.

- **Baluchistan – Sindh:** This cluster is the mixture of all the components of the CCS which includes Cold stores (10), Pack houses (15), a refer yard and testing laboratories (2). Crops in this cluster are Apple, Peach, Apricot, Plum, Grapes, Dates, Onion and Mango.
- **Punjab – NWFP:** Cold stores (13), Pack house (24), a refer yard in Lahore and testing labs (4) will be developed at various locations in this cluster. Major crops in this cluster are Kinnow, Mango, Potato and Apple. Punjab being the largest fruit and vegetable production area of country justify the number of facility being developed in this cluster.

Table 26: Implementation Plan and Project Cost

Particular	Year 1	Year 2	Year 3	Total
Cold Store	3	12	8	23
Pack House	10	13	16	39
Refer Yards	1	-	1	2
Testing Labs	2	2	2	6
Total Location	16	27	27	70
Total Cost (PKR)Billion	2.84	4.17	5.09	12.09

Total cost of PKR 12.09 billion is segregated among four components of the project i.e. Cold store PKR 3.23, Pack house 7.67, Refer yards 0.53 and testing labs 0.66 billion.

a) Quantitative Factors:

i) Investment Appraisal:

Table 27: Financial Snapshot

Option		NPV (PKR billion)	IRR (%)	Payback (years)
Baluchistan – Sindh	FCFF	3.20	27%	6.60
	FCFE	1.38	35%	5.70
Punjab – NWFP	FCFF	3.97	26%	7.00
	FCFE	1.48	32%	6.50
Aggregate	FCFF	7.17	27%	6.80
	FCFE	2.86	34%	6.10

As the project will be rolled out in two clusters, project development time will be minimal as all the components of the CCS system will be developed in parallel on geographical basis. Minimal development time improves the financial result as all facilities become operation earlier and the benefit of full project starts to accrue from year 3 end. Project offer a premium of almost 8% over its cost of capital i.e. 18.5% where as when assessed from the equity participants prospective premium reaches to 8.5% over the cost of equity i.e. 25%. At aggregate level, the project has the capacity to payback its investment in just 6 year.

ii) Bankability Analysis

Lender normally requires a ratio ranging from 1.25 to 1.5 where as option results in LLCR of 2.14 and PLCR 3.74. Such favourable results help raise finance. Therefore these ratios depicts that the option has the muscle to be implemented under the project finance initiative.

iii) Government Perspective Analysis

An option is beneficial to the government that out weight it cost. BCR of the project is 2.07 shows that project rolling under this option is not only beneficial for the private sector but also for the government. Concession period of the project is 11.2 years (FCFF) and 10.9 years (FCFF) states that public sector inducement if any will be required for a shorter period of time.

b) Qualitative Factors – For provincial mix, the qualitative arguments in favour of the option are illustrated as under: -

- i) **Integration and Synergy Effect:** purpose of integration would be achieved with respect to geographical factors. This means that components in the northern part of the country (Punjab and NWFP) would achieve integration in their area of operation where as the same would hold true for Sindh and Baluchistan. However, this option would not create integration at the national level due to the division of the project on provincial basis.
- ii) **Management and Monitoring:** Project will be rolled out into two components divided between northern and southern parts of the country; the need will be to create two concession agreements. This will make management and monitoring relatively complicated for the Implementing Institution when compared to options having one concession agreement to be done.

iii) **Market capability and appetite:** In terms of market capability and appetite, this option would require attention of investors having reasonably strong credentials of handling large scale projects apart from raising financing as well. In this regard domestic conglomerates might take a leading role in building a consortium of local as well as foreign investors to undertake this option.

c) Option Assessment:

The option has been developed considering the geographical proximity of the provinces, which segregate the project into two major parts. These two parts can only be taken up by medium or large size investors because of extensive geographical coverage and large capital expenditure. These factors will also encourage inward foreign investment as local investor may not have the capacity or capability to manage such clusters neither financially or in terms of operation.

If foreign investor comes in to invest in such mode of project implementation then domestic medium and small investors can gain benefit because of localized nature of the business lines and markets. Because of separate clusters two concession agreements will be required, as the project is marked on the geographical boundary there may be a chance that concession of varying clauses will be required thereby increasing the burden on the implementing agency to manage and monitor the project.

Project will be developed in shorter period of time thus reducing the opportunity cost to the government in account of post harvest losses.

Major draw back of this option is the integration and synergy factor. Development of the project on geographical basis like mentioned above although create integration and synergy on the cluster basis (as both clusters involve development of all component of CCS) but if we look at from broader prospective geographical distribution of the project may add disadvantage to this option because of cultural, political and security factors attached to it.

4.7 Provincial Mix minus Labs

This option as its name indicates is mixture of province (Baluchistan – Sindh & Punjab – NWFP) having only three components (Cold Stores, Pack House & Refer yards) of CCS incorporated in the mix.

Table 27: Implementation Plan and Project Cost

Particular	Year 1	Year 2	Year 3	Total
Cold Store	3	12	8	23
Pack House	10	13	16	39
Refer Yards	1	-	1	2
Total Location	16	25	25	64
Total Cost (PKR)Billion	2.64	3.95	4.84	11.43

Although testing labs has been eliminated from this option but the over all time frame for the project development remains the same. The only difference arise is the reduction in the project cost. Cost of the project with the testing lab was PKR 12.09 which has reduced to PKR 11.43 billion.

a) Quantitative Factors:

i) Investment Appraisal

Table 28: Financial Snapshot

Option		NPV (PKR billion)	IRR (%)	Payback (years)
Baluchistan – Sindh	FCFF	3.52	29%	6.3
	FCFE	1.61	38%	5.4
Punjab – NWFP	FCFF	3.86	26%	6.9
	FCFE	1.52	33%	6.3
Aggregate	FCFF	7.42	27.5%	6.6
	FCFE	3.13	35.5%	5.85

Project not only as a whole, but also in isolation, offers high return from the project and equity participants' point of view. As a whole it results in a premium of 9.5% on cost of capital 18.5% and 10.5% on cost of equity 25%. Returns of the project increase after the exclusion of testing lab but when viewed on cluster basis, NPV and IRR of the Punjab - NWFP cluster fall because testing labs in this cluster is a marginally profit able units. Majority of the pack house in the entire CCS are located in Punjab region and operation of testing lab is dependent on it. Thus justify the fall in the returns. NPV of the Baluchistan - NWFP cluster has increased by PKR 0.3 billion (FCFF) and PKR 0.24 billion.

ii) Bankability Analysis

These ratios for Baluchistan – Sindh cluster ranges from 0.8 – 13.6 from inception till the time debt reaches its maturity, where as Punjab – NWFP cluster this ratio ranges from 1 to 9.9. These ratios increase because debt requirement has reduced as a result of testing labs exclusion. Similarly LLCR ratio 2.4, 2.11, PLCR 4.16 & 3.63 for Baluchistan – Sindh and Punjab - NWFP cluster respectively has improved thereby enhancing the likelihood of raising debt easily in this option.

iii) Government Perspective Analysis

Under the said option, concession period has decreased to 10.5 from 11.5 years than in provincial mix option. The benefit to cost ratio strengthens governments perspective towards this option as the revenue earned are more than double the cost incurred over the life of the project.

b) Qualitative Factors – For provincial mix, the qualitative arguments in favour of the option are illustrated as under: -

i) Integration and Synergy Effect: Under this option the purpose of integration would be achieved with respect to geographical factors. This means that components in the northern part of the country (Punjab and NWFP) would achieve integration in their area of operation where as the same would hold true for Sindh and Baluchistan. However, this option's ability to integrate at the national level is questionable.

ii) Management and Monitoring: Under this option, all components with the exception of testing laboratories are to be rolled out into two components divided between northern and southern parts of the country; the need will be to create two concession agreements. This will make management and monitoring relatively complicated for the Implementing Institution in comparison to having one concession agreement.

iii) Market capability and appetite: issues under this option are the same as for Province Wise option.

c) Option Assessment

The only benefit that can be achieved by the exclusion of testing lab is that increasing number of investors will bid for the project as they do not undertake loss making testing labs as part of the option. On the contrary this puts the burden on

the public sector to develop and deliver this component in a timely manner. This factor has been elaborated earlier hence needs no revision.

This option represents the second largest, facilities wise, mode of project implementation. Such an option does not only have a larger marketability at the international level but also the type of investors and market players it is able to attract, have capital backing and expertise to successfully execute large scale projects.

Being divided between two regions of the country, it will establish two zones in the country for supply chain management i.e. northern zone (Punjab – NWFP) and southern zone (Sindh – Baluchistan). Each of these zones or clusters will have a large number of facilities to be established. This will create synergy and integration at ‘zone’ level for the investor. More or less, due to the target market this option appeals to, it has similar benefits attached to it as the consolidate option. Hence, it is equally recommended to be taken up as the roll out strategy for the CCS project

4.8 Fruit Belt Wise

All components of the CCS will be established under eight separate clusters. Seven out of these eight clusters will cater to the requirement of similar fruits and vegetables where as the remaining one cluster will accommodate mix fruits and vegetables at export exit point consisting of air and sea ports. The salient features of each cluster are as follows

a) Cluster – 1: Apple, Peach, Apricot, Plum, Grapes & dates

It comprises of far flung areas of Baluchistan with facilities catering to apple, peach, apricot, plum, grapes & dates. The total capacity of the cluster is to process 34 tons per hour of the identified fruits along with storage to hold 15,000 tons at any point in time. The geographical dispersion of facilities within this cluster is approximately 120 Km.

b) Cluster – 2: Apple, Peach, Apricot, Plum & Grapes

Nine facilities are clubbed under this cluster which includes three exports pack House with storage facilities, five independent cold stores including the one in Islamabad (at the fruit and vegetable market) and one testing laboratory in Swat/Malakand. The Total processing capacity of the cluster is 20 tons per hour and storage capacity to hold 24,000 tons of crops. This cluster is spread over a geographical dispersion of 170 km.

c) Cluster – 3: Apple, Peach, Apricot, Plum, Grapes & onion

Seven export pack house along with storage facility, two independent cold stores and one testing laboratory in Quetta are clubbed together to form this cluster over a geographical dispersion of 110 km. Total processing capacity of the cluster is 55 tons per hour with storage capacity of 17,500 tons.

d) Cluster – 4: Kinnow Belt

This cluster comprises is specifically developed to serve the requirements of Kinnow which is one of the leading exported horticulture crop of Pakistan. The region (belt) at which Kinnow is grown mainly in upper parts of Punjab province (Sargodha / Bhalwal). Along the Kinnow belt, a total of ten facilities comprising of three cold storages, six pack houses one testing laboratory will be established having a collective capacity to process 45 tons per hour with storage capacity of 26,500 tons. This cluster has geographical dispersion of approximately 150 Km.

e) Cluster – 5: Mango Belt

Its geographical spread is in main productions areas of Mango in Punjab i.e. Multan and its surrounding areas within 200km radius. This cluster includes seven export pack houses along with cold storage facilities and two testing laboratory in Multan and Rahim Yar Khan. The proposed processing and storage facilities in this cluster will be able to process approximately 65 tons/hr and have a storage capacity to store 8,000 tons at all times.

f) Cluster – 6: Dates, Mango & Onion

This cluster comprises of seven facilities including two cold storage facilities, three export pack houses and one testing laboratory in Hyderabad (Mirpur Khas). Total processing capacity of the cluster is 40 tons per hour and storage capacity of 12,500 tons. The cluster has the geographical dispersion of approximately 200 Km.

g) Cluster – 7: Potato Belt

This cluster consists of seven potato processing and storage facilities located in the main productions areas of Punjab geographically spread at a radius of approximately 160 km. The aggregate processing capacity of this cluster is 70 tons/hr and a storage capacity of 12,000 tons.

h) Cluster – 8: Mixed Fruits & Vegetables (Sea port, airports & ports)

All facilities at export exit points i.e. air and sea ports and facilities accommodating refrigerated containers (refer Yards) are clubbed in this cluster. It consists of seven cold stores at air port, three at sea port and two Refer yards (one each in Karachi and Lahore). This component will function to accommodate mix fruits and vegetables.

Total cost of the project under this option amounts to PKR 11.08 billion divided between cold stores (PKR 2.99 billion), pack houses (PKR 6.95 billion), refer yards (PKR 0.5 billion) and testing laboratories (PKR 0.64 billion). As there are 8 clusters within this option, which means rolling out of the project under 8 concessions, would ensure early implementation of the project. Hence, the following implementation plan has been devised to fit this option.

Table 29: Implementation Plan

Particular	Year 1	Year 2	Total
Cold Store	16	7	23
Pack House	35	4	39
Refer Yards	1	1	2
Testing Labs	2	4	6
Total Location (units)	54	16	70
Project Cost (PKR billion)	8.39	2.69	11.08

a) Quantitative Factors

i) Investment Appraisal Analysis

Table 30: Financial Snapshot

Cluster		NPV (PKR billion)	IRR (%)	Payback (years)
1. Apple, Peach, Apricot, Plum, Grapes & Dates	FCFF	0.95	30%	8.2
	FCFE	0.45	38%	7.1
2. Apple, Peach, Apricot, Plum & grapes	FCFF	0.18	20%	22.5
	FCFE	(0.14)	23%	N/A
3. Apple, Peach, Apricot, Plum, Grapes & Onion	FCFF	1.42	29%	8.7
	FCFE	0.65	37%	7.7
4. Kinnow	FCFF	2.06	31%	7.6
	FCFE	0.99	41%	6.3
5. Mango	FCFF	1.23	26%	11.3
	FCFE	0.02	31%	12.1
6. Dates, Mango & Onion	FCFF	0.08	22%	16.2
	FCFE	0.15	26%	24.1
7. Potato	FCFF	0.49	25%	11.4
	FCFE	0.08	30%	13.1
8. Mix Fruits & vegetables	FCFF	0.55	22%	16.7
	FCFE	0.08	26%	21.2
Aggregate Result	FCFF	6.96	26%	13.09
	FCFE	2.28	32%	13.08

Collectively, the NPV of the project is highest in comparison to all other options. This is so because the option is designed to be undertaken by 8 different set of investors through equal number of concessions. This increases the likelihood of each project to be implemented at a faster pace (see table 30 above). Thus, reducing the overall timeframe for the project implemented. This consecutively reduces extra costs associated with implementation delays.

Internal rate of return is directly affected with this increase in the NPV. For equity providers, the return offered under this project is averaged to be 32% which is 13.5% more than the weighted average cost of capital (WACC) rate. Amongst the clusters 'Mango' offers the most favourable returns to equity providers with an IRR of 41%. This is a direct consequence of high availability of the crop during the harvest season. In addition, mangoes are high valued crops and are exported in larger quantities from the country. Therefore, its availability and movement along the supply chain ensures high revenues for pack houses

and cold storages which are reflected by a higher IRR. On the contrary, cluster 2 - Apple, Peach, Apricot, Plum & grapes offers most unfavourable returns reflected by an IRR of just 23% (FCFE). This gives the equity provider an edge of only 4.5% over weighted average cost of capital (WACC) rate. According to the IRR assessment matrix, given earlier in this chapter, any thing above the 0 (zero) mark shall be an acceptable return to the investor however his investment decision will be driven by risk factors that will influence his judgement to take up a cluster such as this.

Payback Period Under cluster 6 (Dates, Mango & Onion) and cluster 8 (Mix Fruits & vegetables), the payback period is 24.1 years and 21.2 years respectively (FCFE). Moreover, analyzing the fact that 4 out the 8 cluster have a payback period of more than 10 years, such time span for investment to payback is unacceptable to attract equity from the private sector.

Concluding the appraisal, it is important to mention that clusters available within this option have a high degree of variation between them. This makes some aspects (clusters) of the option attractable where as makes the rest of the clusters look unattractive to the private sector.

ii) Bankability Factors

Each cluster under this option has favourable bankability features. The loan and project life coverage ratios along with debt to service coverage ratios, for each cluster, falls within the lending institutions expectation brackets. The following table gives the numbers and range for the said ratios:

Table 31: Bankability Ratios

#	Cluster	DSCR	LLCR	PLCR
1	Apple, Peach, Apricot, Plum, Grapes & Dates	1.7 - 5.2	2.35	4.16
2	Apple, Peach, Apricot, Plum & grapes	(0.7) - 43	1.31	2.38
3	Apple, Peach, Apricot, Plum, Grapes & Onion	0.2 - 71.1	2.39	4.19
4	Kinnow	0.2 - 5.6	2.5	4.56
5	Mango	0.1 - 6.4	2.01	3.44
6	Dates, Mango & Onion	(0.1) - 3.4	1.45	2.65
7	Potato	(0.6) - 3.7	1.85	3.26
8	Mixed Fruits & Vegetables	(1.0) - 5.8	1.45	2.93

iii) Government Sector Perspective

For the government, the following tabulated Benefit to Cost Ratios for each cluster proves the project to provide more benefits than costs associated with it.

Table 32: Benefit to Cost Ratio

Cluster #	Cluster	BCR
1	Apple, Peach, Apricot, Plum, Grapes & Dates	2.23
2	Apple, Peach, Apricot, Plum & grapes	1.87
3	Apple, Peach, Apricot, Plum, Grapes & Onion	2.18
4	Kinnow	2.21
5	Mango	2.24
6	Dates, Mango & Onion	1.77
7	Potato	1.84
8	Mixed Fruits & Vegetables	1.84

b) Qualitative Factors:

- i) **Integration and Synergy Effect:** under this option integration may not be achieved within clusters as each cluster is representative of a particular product and offers services limited to only that fruit and or vegetable. Thus, there might be barriers established between clusters that will not allow treatment and facilitation to fruits clubbed under other clusters. Hence, integration under this option may not be achieved leading to failure of the object of establishment the CCS.

The fundamental flaw in this option is that under this option, investors would be sought on basis of fruit belt wise and not on the basis of their expertise in a particular activity. This would create problems in finding private sector participation to the transaction since under the concession an investor acquiring a fruit & vegetable belt may have to build the three components (Cold Stores, Pack Houses and Refrigerated Yards) unwillingly. This will create an environment where he will run facilities that he was initially interest in and may neglect those that he did not wish to form part of the concession at the first place. Hence, this action would put the investor at a disadvantage and he would lose out on the synergy effect that he would have attained by running all facilities in an efficient manner.

- ii) **Management and Monitoring:** as there are 8 different segments to be rolled out under this option the management and monitoring duties of the implementing institution will increase drastically. It will have to look over activities of all concessions which may require additional manpower requirement. This would also put the institution at a disadvantage as its revised budget allocation (to

service salaries of the additional manpower) through the concerned ministry may or may not get approval.

iii) Market capability and appetite: In terms of market capability and appetite, this option would open the room for investors who have financial resources but may or may not have professional, technology or management skills to run these segments in accordance to the concession agreements. It is envisaged that the scale of the segments would be at a level where we may not experience any interest from International investors. This option would be reduced to investors and entrepreneurs who operate at regional levels and do business by emphasizing more on equity rather than debt.

c) Option Assessment

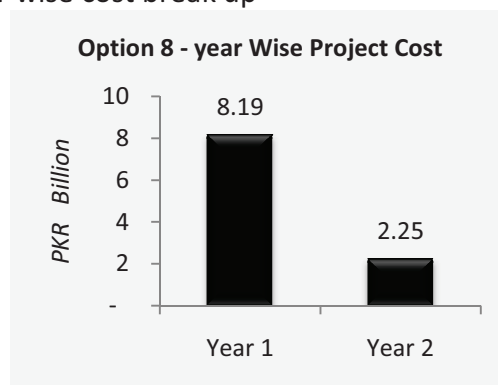
This option opens room for small scale investors to take advantage of the project as it has to be done through a PPP modality with government's concession to be agreed upon. This will result in the private party's participation to be at a scale smaller than what it would have to contribute had the project's implementation been done privately. Furthermore, this option can be implemented at a considerably shorter time period as compared to other options because of simultaneous implementation /construction by numerous investors.

The above positive features attached to this option are overshadowed by the financial results when the project is broken down into clusters. As can be seen from the table 30, four clusters (1,2,6 and 8) have net present values close to zero that detracts private sectors interest from the project. If this holds true then facilities under the mentioned clusters would be unable to attract private investment and hence not be established. Therefore, the synergy and integration between different clusters would not be achieved.

Clusters that remain unattended by the private sector could be implemented under the sole responsibility of the public sector. However, the public sector may not be able to implement, operate and accommodate these clusters effectively and efficiently due to dawdling bureaucratic approvals and procedures. In a nut shell, the purpose of having an integrated cool chain infrastructure would not be attainable here. Thus, this option even with flattering consolidated financial results, at cluster level is assessed to be non implementable.

4.9 Fruit Belt Wise minus Laboratories

This option differs from the preceding options by the exclusion of testing laboratories from the clusters. Cluster 2 (Apple, Peach, Apricot, Plum & Grapes), 3 (Apple, Peach, Apricot, Plum, Grapes & onion), 4 (Kinnow) and 5 (Mango Belt) had a single component of testing laboratories where as cluster 6 (Dates, Mango & Onion) had two such facilities. In comparison with the previous option, the removal of testing laboratories has caused the project cost to be revised to PKR 10.44 billion from PKR 11.08 billion. The differential between the two figures is the cost of the excluded facility. The implementation plan remain, the same at 2 years from project inception with the following illustrated year wise cost break up



Like with the case of all primary options, the exclusion of testing laboratories would hamper the integration factor within the CCS. However, this exercise enables flexibility to be implemented in order to attract different set of investors for project execution. Similar the case is with this option. Investors that would want to invest in CCS under fruit belt wise composition are expected to be entities and corporations specialists in this line of business. These will most likely include horticulture driven supply chain management corporations. Having the testing laboratories excluded under this option would ensure that such investors take full part in project bidding process.

The financial results, although not improved significantly under this option do however, witness an increase. The following table gives the comparison of these factors.

Table – 33: Financial Snapshot

FCFF Cluster	NPV		IRR		Payback Period	
	From	To	From	To	From	To
Apple, Peach, Apricot, Plum & grapes	0.39	0.18	21%	20%	17.5	22.5
Apple, Peach, Apricot, Plum, Grapes & Onion	1.63	1.42	31%	29%	7.6	8.7
Kinnow	1.78	2.06	31%	31%	7.7	7.6
Mango	1.28	1.23	27%	26%	9.9	11.3
Dates, Mango & Onion	0.41	0.28	24%	22%	12.2	16.2

4.10 Activity Based

Segregation of all facilities by virtue of their respective components which are cold stores (23), export pack houses (39), refer yards (2) and testing labs (6). This encourages the business specialists having expertise to invest in their respective business line enabling execution and operations of components to the best of their ability and capability.

The implementation plan for this option extends to 3 years from project inception at a cost of PKR 11.83 billion (Cold Stores PKR 3.02 billion, Pack Houses PKR 7.68 billion, Refrigerated Yards PKR 0.48 billion and Testing Laboratories PKR 0.66 billion). Year wise implementation plan and break of cost is tabulated as under

Table 34: Implementation Plan

Particular	Year 1	Year 2	Year 3	Total
Cold Store	11	12	-	23
Pack House	11	14	14	39
Refer Yards	2	-	-	2
Testing Labs	2	2	2	6
Total Location (Units)	26	28	16	70
Project Cost (PKR Billion)	4.23	3.90	3.70	11.83

a) Quantitative Factors

i) Investment Appraisal Analysis

Table 35: Financial Snapshot

Activity		NPV (PKR billion)	IRR (%)	Payback (years)
Cold Store	FCFF	0.62	21%	7.80
	FCFE	0.03	25%	7.50
Pack House	FCFF	6.02	30%	6.30
	FCFE	2.69	38%	5.50
Refer Yards	FCFF	0.57	28%	6.40
	FCFE	0.20	32%	6.20
Testing Labs	FCFF	(0.16)	16%	13.30
	FCFE	(0.24)	17%	14.70

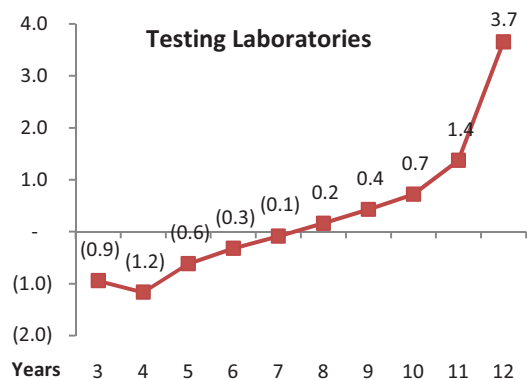
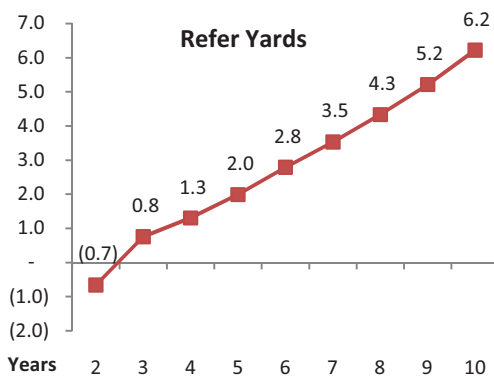
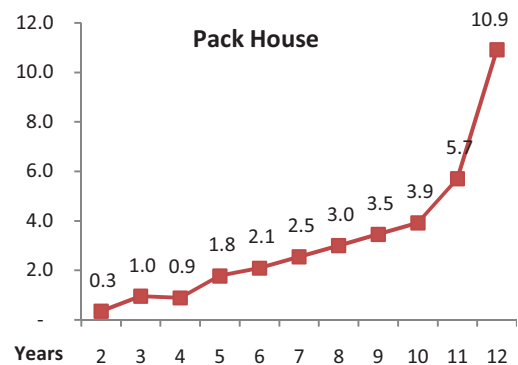
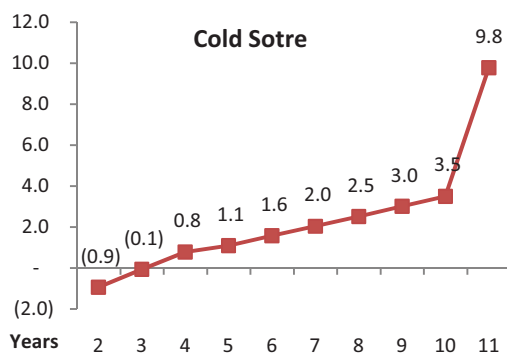
Under investment appraisal, there are only three components that offer positive with respect to NPV. Testing laboratories is seen to be a loss making that will out rightly be reject for investment by the private sector. This is further emphasized by the fact that the cost to setting up the facility will pay itself back in maximum of 14.7 years (FCFE) and a minimum of 14.3 years time (FCFF).

Comparatively, cold stores and refer yards show NPVs that are close to zero. Thus, this fact will be closely looked at by the private sector which may, on its risk assessment, refrain from investing in these segments.

ii) Bankability Analysis

The debt to service coverage ratio for cold stores ranges from negative 0.9 and rises up to 9.8 in 11th year when the debt is fully paid off. Pack houses, likewise, show a similar trend by increasing from 0.3 to 10.9 over the same period.

However, with respect to Refrigerated yards the debt will be fully paid off in the 10 year since inception with DSCR rising from negative 0.7 to 6.2 in the last year. Testing laboratories on the other hand have negative DSCR that runs from inception to year 7 and reach a maximum of 3.7 in the 12th year of its operations. Such unfavorable indicators would definitely hinder its ability to raise finance in the form of debt. For more details see graphs below



With respect to project and loan life coverage ratio, testing laboratories have LLCR of 0.36 and PLCR of -1.54. These ratios indicate that testing laboratories are highly risk component of the option as available cash flows is not able to meet the debt service requirements. However, for the other components of this option the LLCR and PLCR show ratios above 1.4 (in FCFF and FCFE scenarios) which are within the favorable range from the perspective of the lending institution.

iii) Government Perspective Analysis

The non viability of testing labs will put its responsibility on the shoulders of the public sector. Which, as has been emphasized in several other parts of this report, is faced with financial crisis hence, it will be reluctant in ensuring its commitment to take up this segment of the option.

b) Qualitative Factors

- i) **Integration and Synergy Effect:** As each component in this option is proposed to be rolled out as a separate line of business, the integration factor will be best achieved within and not between the other components of the CCS. The existing infrastructure is based around this phenomenon which lacks integration. Thus, having the project rolled out under this option would leave the integration factor between components on market forces and chance. The result could be that integration may or may not happen between components.
- ii) **Management and Monitoring:** Under this option, all components with the exception of testing laboratories are to be rolled out in three different segments based on activity. Whereas the development of Testing Labs would be done by the Public Sector. This implies that three concession agreements will be made. Thus, it may be relatively easy for the Implementing Institution to monitor and manage it with its limited human resource.
- iii) **Market capability and appetite:** In terms of markets appetite, there may be many interested entrepreneurs to invest under such mode of project implementation as they are representative of a single component within the complete CCS. Many organizations (internationally) are actively operating in similar businesses that may show interest for this rollout strategy. However, their can be a likely hood that Pack Houses being more profitable and lucrative is taken up by potential investors where as the other components i.e. Cold store and Refer yards, which are not that lucrative may or may not be opted for investment by the private sector.

c) Option Assessment (activity Based)

The activity based model to implement the CCS, sounds interesting at first with the view that business / service line specialists would be highly attracted to invest in this roll out strategy however, when the consolidated version of the option is broken down into components and segments testing laboratories are proved financially unstable business unit.

If the government under a concession offers its participation in a method that makes this unit financially appealing to the private party then this option for the roll out of the project can be a serious contender for selection. Similarly for cold stores and refer yards, sweeteners are required by means of concession agreement to improve the financial indicators for these units.

4.11 Activity Based excluding Laboratories

It involves development of all components of Cool Chain System with the exception of laboratories and all other details remains the same as discussed under activity based option. The project implementation and costs with the removal of testing laboratories is amended as follows

- i. Number of facilities to be established in year 1, 2 and 3 are reduced by 2 units representing exclusion of testing laboratories.
- ii. Cost of the project will now be PKR 11.17 billion instead of PKR 11.83. billion

All quantitative factors remain the same for this option as presented under Activity Based Option. This is so because; the change in implementation plan is only representative of exclusion of testing laboratories. Hence, no cost changes occur for the other components of the CCS.

The only qualitative concern that arises under this option is the ability and commitment of the public sector to establish this component on its own. Not having the testing laboratories will weaken the integration between and export lead supply chain of the horticulture sector. The new infrastructure development under the CCS initiative will have to avail the services of the existing laboratories whose credibility and credentials are not up to the standards as required for the CCS project.