PRE-FEASIBILITY STUDY

INDIVIDUAL QUICK FROZEN (IQF) VEGETABLES/FRUITS

Agriculture Department
Government of Punjab

March 2017

Acronyms

Acronym	Description
CPEC	China Pakistan Economic Corridor
GST	General Sales Tax
IMF	International Monetary Fund
IQF	Individual Quick Freeze
IRR	Internal Rate of Return
NPV	Net Present Value
SMEDA	Small and Medium Enterprise Development Authority
UK	United Kingdom
USA	United States of America

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Disclaimer

This document has been prepared with the objective to provide basic information about the subject business proposition. The content of the document has been derived from data and information collected from various reliable secondary and primary sources and is based on certain assumptions. While reasonable due diligence has been carried out during information collection and working out the presented calculations, the reader is strongly encouraged to carry out any further scrutiny and diligence to collect any other information that may be deemed necessary to take an informed decision. Professional advice from qualified technical expert/consultant should preferably be sought before taking any decision to act upon the information presented in the document. Department of Agriculture, Government of Punjab does not assume any liability for any financial or other loss in consequence of undertaking any activity on the basis of the information provided in the document.

1.0 EXECUTIVE SUMMARY

Processing of fresh vegetables and fruits is carried out to produce high value added products that have a prolonged shelf life and offer convenience of transport, storage and sourcing to the final consumers. Freezing is an important process to effect this value addition to fresh produce. The technology used for this purpose is known as Individual Quick Freezing (IQF); since it allows freezing of small pieces of fresh produce individually; thereby preventing the formation of larger lumps of frozen products which become inconvenient to use and are not very appealing aesthetically.

Frozen vegetables and fruits are produced in large quantities around the world.There is a growing international trade of these products. In 2015, the total export market of frozen vegetables was USD 6.07 billion. Common products traded under this category include frozen peas, potatoes, beans, spinach, strawberries, raspberries, sweet corn and variety of other vegetables and fruits. Expanding international market of frozen vegetable and fruits offers an attractive opportunityto private investors. It also opens a window for the vegetables and fruits farmers of Punjab to sell their surplus produce that is available in large quantities during peak production seasons and usually gets wasted. The subject document presents the findings of the pre-feasibility study to establish an Individual Quick Freezing unit for vegetables and fruits; destined for the export market.

The product line selected for the purpose of this study includes frozen peas, potatoes, carrot, spinach, bitter gourd, okra and mango. Production capacity of 2 tons per hour frozen product has been assumed. The plant will operate in two 8-hour shifts to produce 16 tons of frozen products per day. The IQF process will use Fluidized bed freezing technology. Different products will be processed during different months corresponding to their peak production seasons to get maximum benefit of low prices during those periods.

The project has been proposed to be established in Lahore since major vegetable production clusters lie in and around this largest city of Punjab. The project has a total cost of PKR 293 million. It is proposed to be financed with 100% investor's equity. Working capital constitutes 38% of the total project cost. The project is assumed to operate at 60% capacity utilization during the first year of operations and is expected to generate revenues of PKR 321 million and gross profit of PKR 131.5 million. Net profit after interest and tax deductions is PKR 64.1 million.

The project is found to be financially feasible with an IRR of 39.0% and a positive NPV of PKR 238.7 million. The viability is sensitive to fluctuation in vegetables/fruits prices and the selling prices of the frozen products in international markets.Project Summary Sheet provides information on key highlights of the project.

1.1 Project Summary Sheet

Project's Concept	
Objective	The project aims to produce frozen vegetables and fruits using Individual Quick Freeze technology
Product Line	Individual Quick Frozen (IQF) Peas, Potatoes, Spinach, Carrot, Bitter Gourd, Okra, Mango Slices
Operative Capacity	16 Tons per day (2 tons per hour, running single shift of 8 hours per day)
Location	Lahore
Target Market	Export Market
Technology Employed	IQF through fluidized bed freezing technology

Project Cost (PKR Million)	
Total Project Cost	293.4
Capital Cost	180.8
Working Capital	112.6

Financing Plan (PKR Million)		*% Share*
Equity	293.4	100%

First Year's Summary Income Statement (PKR Million)		*% of Revenues*
Revenues	321.5	100.0%
Cost of Sales	189.9	59.1%
Gross Profit	131.6	40.9%
Operating Costs	32.9	10.2%
Earnings Before Interest and Tax	98.7	30.7%
Earnings Before Tax	98.7	30.7%
Tax	34.5	10.7%
Net Income	**64.1**	20.0%

Financial Feasibility	
Internal Rate of Return (IRR)	39.00%
Net Present Value (NPV) @ 20%	238,709,976
Payback Period (years)	3.62

Conclusion
The project is financially viable keeping in view all the bases and assumptions used for marketing, technical and financial assessments/calculations.

2.0 INTRODUCTION

2.1 Context

With a population of over 190 million people, Pakistan is the sixth most populous country and the 43rdlargest economy in the world. In the current global economic scene, Pakistan is being seen as the top emerging market economy in South Asia that is progressing towards a more advanced stage through rapid growth and industrialization. Pakistan is being classified as one of the Next Eleven (N-11) countries that have the potential to become one of the world's large economies in the 21stcentury. Economic growth of the country has been on a rise during recent years; being 4.0% in 2014 and 4.2% in 2015. The IMF projects that the growth trend will continue and reach 5.2% by the year 2020.The World Bank projects that by 2018, Pakistan's economic growth will increase to 5.4% due to greater inflow of foreign investment from China-Pakistan Economic Corridor (CPEC). The present government is fully committed to capitalize on the emerging growth trend and is working hard to ensure implementation of all the necessary steps in the right direction to increase the flow of private sector investment. Strengthened macroeconomic outlook, improved law and order situation and facilitative government policies are contributing to improve the investment climate for foreign and local investors.

For private sector investment to flow, identifying and providing information about the feasible business opportunities is an important starting point. Investment promotion materials are developed to introduce the investors to potential business opportunities, provide basic information about the projects' capital and operational costs and work out basic financial feasibility of the presented propositions. Agriculture, being the mainstay of Pakistan's economy, offers host of attractive opportunities which can be converted into profitable businesses by mobilizing private sector investment. The current document discusses the pre-feasibility of one such option.

2.2 Agriculture Sector Overview

Pakistan is an agriculture-based economy. Agriculture accounts for 20.9 percent of the GDP and provides livelihood to 43.5 percent of the rural population. Agriculture GDP is derived from four major subsectors. Livestock is the biggest contributor to GDP accounting for 56.3% of the total value (2014-15). Crops was the second largest subsector accounting for 39.6%; followed by two smaller subsectors, Fishing and Forestry, respectively accounting for 2.1% and 2.0% respectively. The distribution is shown in Figure 1.

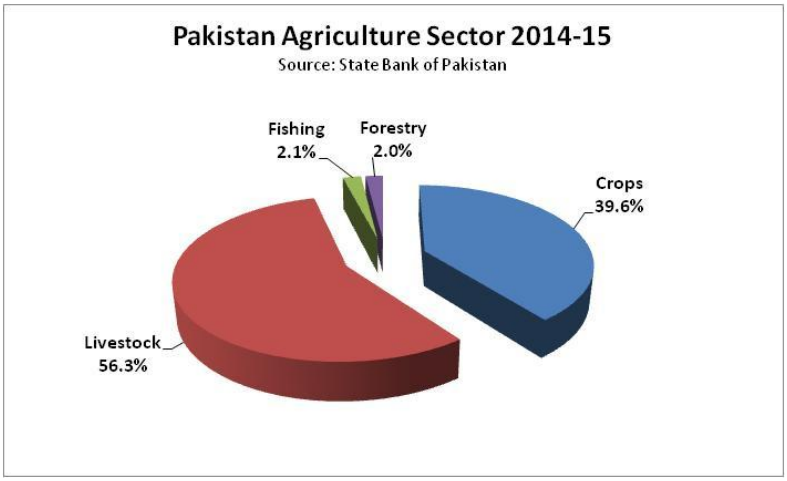


Figure 1 - Pakistan Agriculture Subsectors Distribution

The crops subsector is further divided into three categories. 'Important Crops' accounted for 64.5 percent, 'Other crops' 28.1 percent and 'Cotton Ginning' 7.4% of the total value of crops in 2014-15. Horticultural crops, including fruits, vegetables and condiments are included in the 'Other crops' category.

Punjab is the most populated province and the largest agriculture producer in the country.Figure 2 and Figure 3provide a snapshot of Punjab's contribution in the production of different agriculture commodity groups during the year 2014-15.

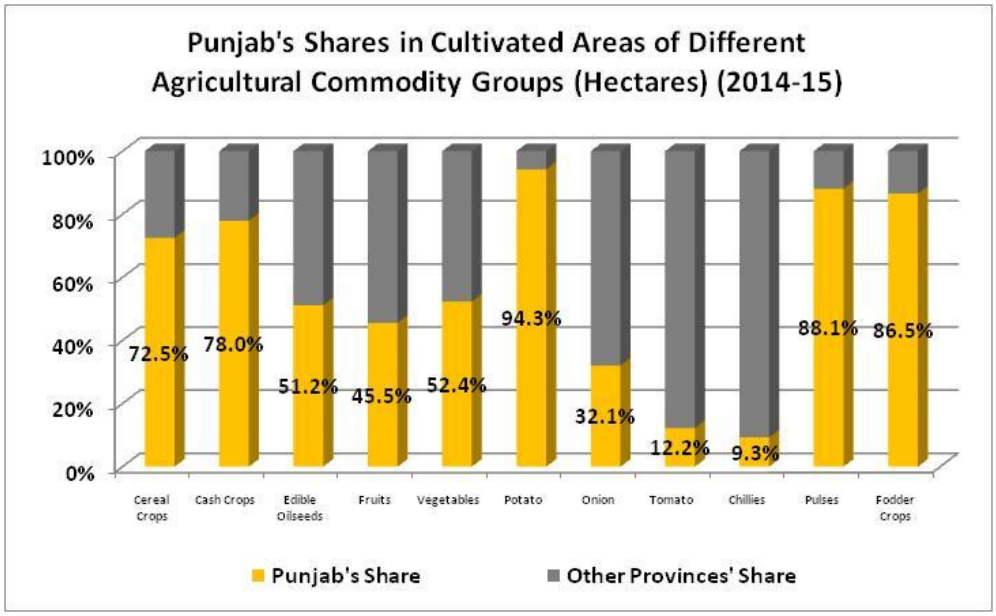


Figure 2 - Punjab's Share in Cultivated Areas of Different Commodity Groups

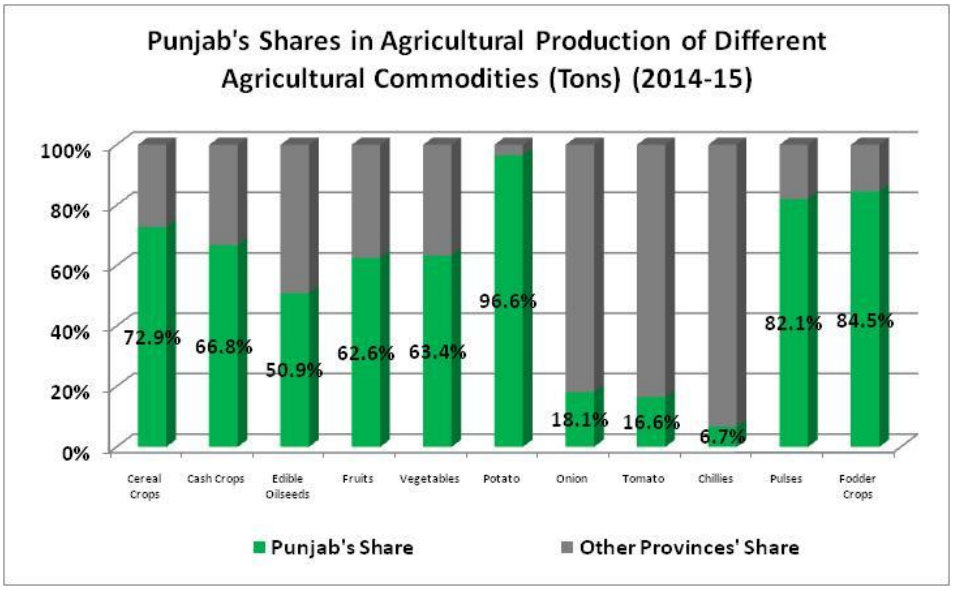


Figure 3 - Punjab's Share in Production of Different Commodity Groups

Punjab holds the biggest shares in cultivated areas and productions of majority of the agricultural commodities. Cereal crops[1] were cultivated over an area of 10.13 million hectares to obtain a produce of 27.32 million tons. That translates into 72.5% share in cultivated area and 72.9% share inthe overall national production of cereal crops. Similarly, the province has a leading position in cash crops[2] where it produced 51.5 million tons; that accounted for 66.8% of the national production. During the same year, Pakistan's total production of edible oilseeds[3] was 581 thousand tons of which 51% was contributed by Punjab. In horticultural production as well, Punjab maintains a leading position. Fruits cultivation in Pakistan was carried outon an area of 775 thousand acres to produce6.79 million tons fruit. Punjab held a share of 45.5% in total cultivated area and 62.6% in totalnational fruit production. Vegetable production in Punjab was1.96 million tons that accounted for 63.4% share of the total national production.In case of potato, Punjab holds the lion's shares of 93.4% and 96.6% in the total national cultivated area andthe total production of potato. A similar situation also exists for pulses and fodder crops where Punjab's shares in total national productionrespectively are 82% and 84.5%.

In some horticultural commodities, Punjab is a smaller producer; such as onion, tomato and chillies; where in 2014-15, the province held 18.1%, 16.6% and 6.7% shares in the total national production respectively.

2.2.1 Horticulture Sector of Punjab

Pakistan's horticulture basket is diverse containing large variety of fruits, vegetables and condiments.[4] Pakistan's total horticultural production in 2014-15 was 15.84

[1]Includes Wheat, Rice, Maize, Jowar, Bajra and Barley
[2] Includes Cotton, Sugarcane, Tobacco, Jute, Sugar beet, Guar and Sunhemp
[3] Includes Rapeseed, Mustard, Canola, Sesame, Groundnut, Soybean, Sunflower and Safflower
[4] Include onion, garlic, coriander, chillies and turmeric

million tons from a total cultivated area of 1.46 million hectares. Fruits accounted for 44.4% whereas vegetables accounted for 44.9% of the total national horticultural production. The vegetables included potato as the largest product accounting for 56% of the total vegetables production. Condiments accounted for 10.7% of the total national horticultural production. Figure 4shows the split between three main horticultural product categories.

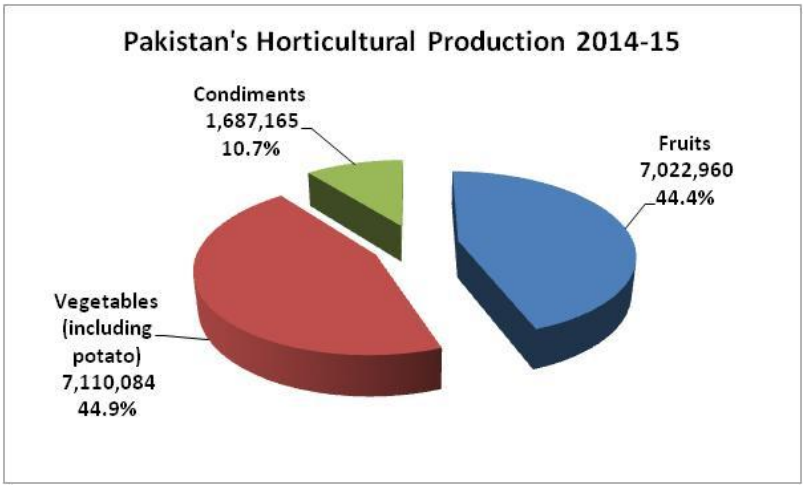


Figure 4 - Punjab's Horticultural Production Distribution

Punjab is the major contributor in most of the horticulture product categories. In 2014-15, Punjab's total horticultural production was 10.67 million tons which accounted for 67.4% of the total national production. 63.7% of the national fruit production was contributed by Punjab. Citrus and mango are the two main contributors in Punjab's total fruit production.Punjab's share in national vegetable production (excluding potatoes) is 62.8%.

Punjab enjoys a monopolistic position in potato production by producing 3.83 million tons and claiming 96% share in the total national production in 2014-15. Condiments is the only horticultural product category where Punjab is not the largest producer. In 2014-15, the province produced 0.4 million tons of condiments to contribute 23.7% to the national condiments basket.

Figures 5 to 8 show the share of Punjab in total national production of different horticultural products.

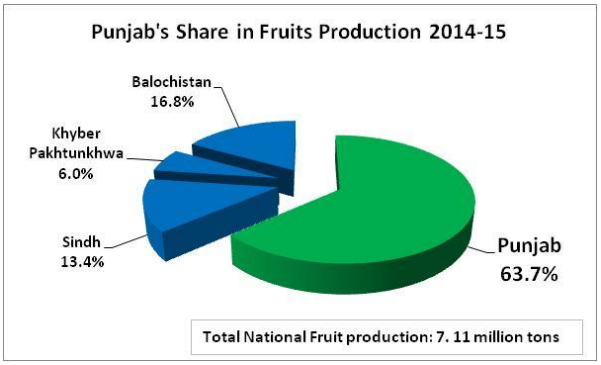


Figure 5 - Punjab's Share in Fruit Production

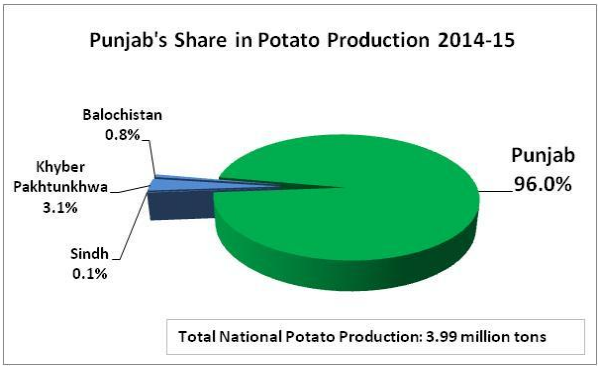


Figure 7 - Punjab's Share in Potato Production

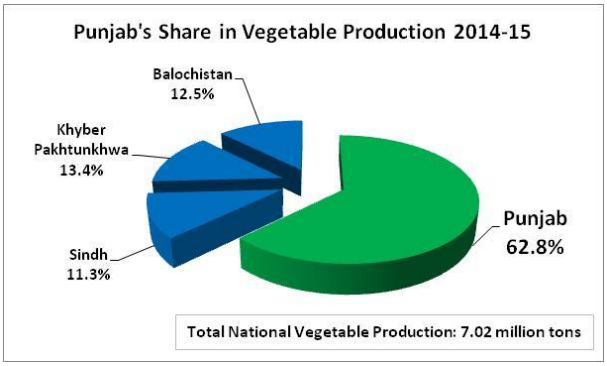


Figure 6 - Punjab's Share in Vegetable Production

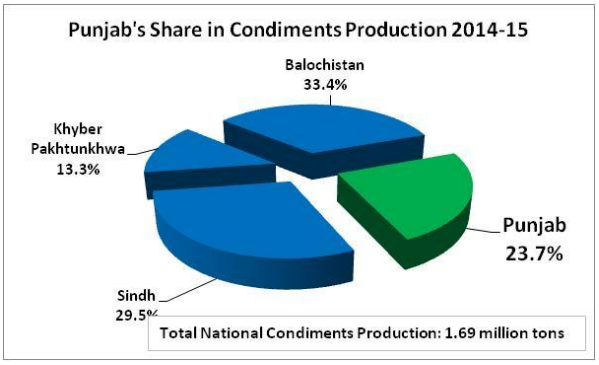


Figure 8 - Punjab's Share in Condiments Production

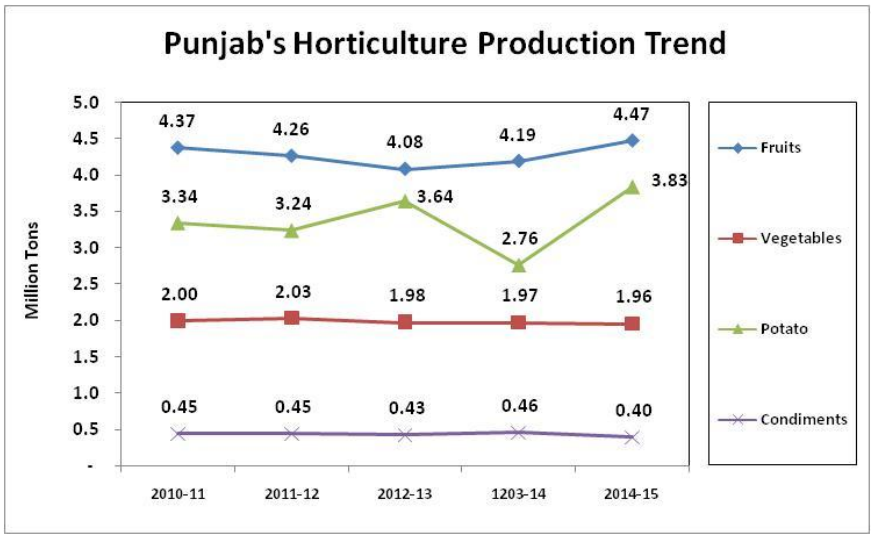


Figure 9 - Punjab's Horticultural Production Trend 2011-15

During the five year period from 2011 to 2015, the horticultural production of Punjab has been almost stable. There was a small increase of 2.3% in fruit production; whereas potato production increased by 14.8%. There was a drop of 2.3% in vegetables production and decrease of 10.3% in condiments production during the five year period being considered.

3.0 VEGETABLES AND FRUITS FREEZING

Horticultural products are perishable with limited shelf life. The entire production of fruits and vegetables cannot be consumed in fresh form and needs to be preserved by processing theminto value added products. In Pakistan, only a small share of the surplus produce is being preserved which is leading to heavy postharvest losses. Freezing is one of the many preservation methods. When some food item is kept at extremely low temperature (freezing), the microorganisms cannot act to spoil it. Similarly, freezing significantly ceases those chemical and biochemical reactions which can spoil the food if kept at ordinary conditions. In freezing method of preservation, the product keeps its own individual form, texture, taste and nutritional value better than any other way of preservation. Freezing can be successfully employed for long-term preservation of many foods. The process involves lowering the product temperature generally to -18C or below.

3.1 Individual Quick Freezing of Vegetables and Fruits

During freezing process, fruits and vegetables tend to stick with each other resulting in lumps formation which is undesirable in handling, storage and usage. For ease of the process as well as for handling and usage convenience, it is desirable to have each piece of frozen product in separate form; instead of lumps. Technically, it is only possible when pieces of the produce are quickly frozen in individual form. The technique of ***Individual Quick Freezing (IQF)*** prevents the small pieces of products from sticking together; thereby producing 100% individual quick frozen product throughout the freezing process.

3.1.1 Process Flow

Freezing of fruits and vegetables is carried out in multiple steps. Process flow chart of IQF is shown in Figure 10.

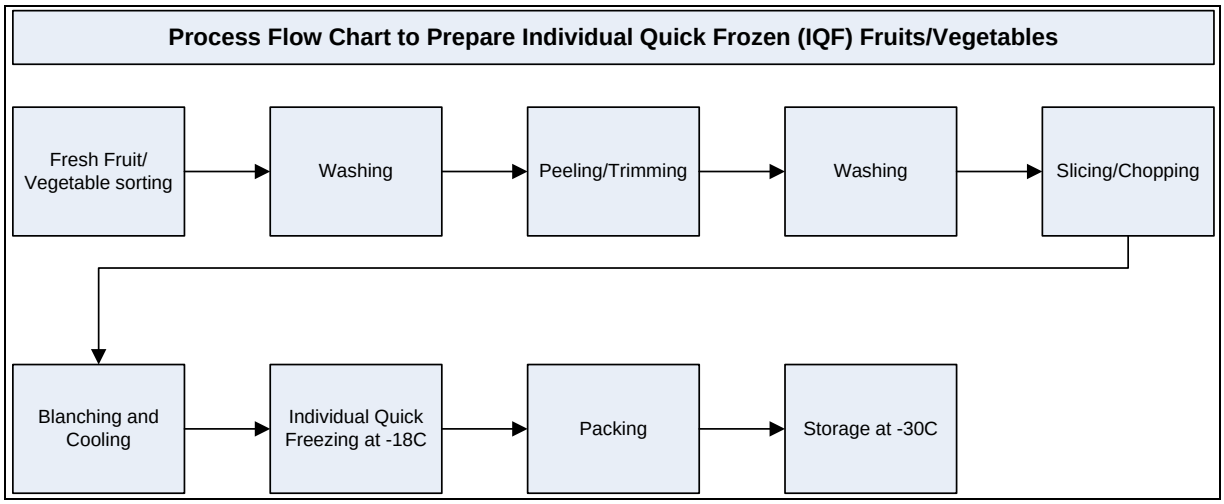


Figure 10 - Process Flow of Individual Quick Freezing of Vegetables and Fruits

3.1.1.1 Selection of Raw Material

Quality of raw fruits and vegetable is the most important factor in determining the quality of frozen product. It is influenced by varietal characteristics, climate of the growing area, irrigation, cultural practices and ripeness level at harvesting time. Freezing preservation only helps retain the inherent quality present initially in the rawmaterial and cannot itself improve the product quality.The choice of the right cultivar and maturity are the two most important factors affecting raw material quality. Uniform maturity, color and desirable texture are important factors in the selection of fresh produce used as raw material for freezing.

3.1.1.2 Preparation

Fruits/vegetables are mostly washed by using rotary washers to remove dirt/dust by using drinkable water. Besides mechanical peeling, some of the raw material items are subjected to scalding by hot water, steam or hot lye solutions. Cutting and dicing/slicing is achievedmostly by mechanical means. However, some manual work may also be involved at pre-freezing stage of raw material preparation.Sizes of the slices or dices affect the rate of freezing. Rate of freezing can be increased by decreasing the size of products frozen, especially for large fruits.

3.1.1.3 Blanching

The fresh horticultural produce contains biochemical elements called enzymes, which deteriorate color, flavor, texture, and cause loss of nutrients in the frozen product. These enzymes are inactivated prior to freezing. Vegetables can be blanched in hot water, steam, and in the microwave. Hot water blanching is the most common way of processing vegetables.Steam blanching takes longer than the water method, but helps retain water-soluble nutrients such as water-soluble vitamins. Before

freezing, most of the vegetables and some fruits are exposed tohot water or steam for a few minutes and then rapidly cooled. Besides inactivating enzymes, blanching also destroys microorganisms on the surface of some vegetables, such as broccoli and spinach. Blanching is essential for producing quality frozen vegetables except green peppers.Lack ofenzymes inactivation by proper blanching may cause the vegetables to toughen.Blanching also soften the vegetables, making them easier to pack.

The process conditions for blanching dependon the size of individual vegetable/fruit pieces. Generally, blanching is carried out between 75 and 95C for 1 to 10 minutes. After blanching,materials are promptly cooled down to control and minimize the degradation of soluble and heat-labile nutrients. Optimum combination of time and temperature for blanching followed by prompt cooling is vital for quality frozen product.

3.1.1.4 Freezing

Freezing of the prepared fruit/vegetables can be achieved by different freezing techniques.

Air Freezing
Packaged or unpackaged fruits and vegetables can be frozen in air at temperatures ranging from -18C to – 40C.

Sharp Freezing
The products are placed in a room maintained at –15C to –29C. The air within the room circulates by convection. The relatively still air is a poor conductor of heat and foods placed in even these low temperatures are frozen comparatively slow, many hours or even days being required before the products are complete solidified.

Air Blast Freezing
Vigorous circulation of cold air enables freezing to proceed at a moderately rapid rate. Products are placed on trays, either loose or in packages, and the trays are placed on freezing coils in a low temperature room with cold air blowing over the product.

Fluidized-bed Freezing
Fluidized bed freezing is a modification of air-blast freezing. Solid food particles ranging in size from peas to strawberries can be fluidized by forming a bed of particles 1-5 inch deep on a mesh belt or mesh tray placed in the IQF tunnel. The cooled air is forced upward through the bed at a rate sufficient to partially lift or suspend the particles in the air.This is the most suitable process to produce Individual Quick Frozen fruits and vegetables.

Figure 11 - Fluidized IQF Freezer

Product	Time required to reduce temperature from 22C to -18C (minutes)
Peas	3-4
Diced carrots	5-6
Strawberries	9-13
French fries	8-12
Mango slices	5-7

Table 1 - Freezing Time for Fruits and Vegetables

3.1.2 Storage of Frozen Product

The frozen product is packed in plastic bags/pots/containers. For long term storage, the frozen product after packaging is stored at –30C. This temperature halts the growth of microorganisms and spoilage caused by them. Similarly, changes caused by chemical and bio chemical reactions in the product during storage are significantly reduced.

4.0 MARKET ANALYSIS

Individual Quick Frozen vegetables have commercial potential in both local and export markets. However, export market is a more attractive market compared to the local.

4.1 Local Market Overview

Local market for frozen fruits and vegetables is not very large. Commonly sold IQF products in the local market include peas, carrots, spinach, potato and sweet corn. Another popular product is assorted vegetablesincluding different IQF products. Some other lesser common products are frozen okra, cauliflower and beans. These vegetables are available in the form of evenly cut small pieces. The products are available in different packing sizes; with 400 gram, 1 kg and 2.5 kg packing sizes being more common. IQF vegetables are available in all major urban centers of the country. However, their availability is limited to large departmental stores and

grocery malls; since they are high value added products targeted at population segment with medium to high disposable incomes.

IQF units are not common in the country. There is one unit in Lahore with the name of *Icepac*which produces variety of frozen vegetables. The company markets its products in both local and export markets. Another IQF facility has been installed near Lahore by *Fauji Foundation* which is in the process of streamlining its operations. These units export major share of their production and a smaller share is sold in the local market. Majority of the IQF products being sold in the local market are imported.

4.2 Export Market Overview

'Individual Quick Frozen vegetables' is a major category in the world export market of horticultural products.

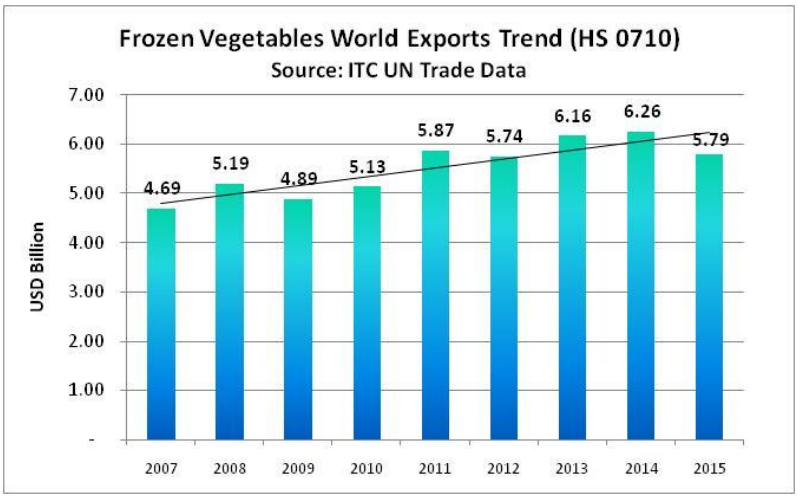


Figure 12 - World Exports Trend of Frozen Vegetables

International trade of edible vegetables, roots and tubers is reported under broader code HS 07. Total world export market of edible vegetables in 2015 was USD 65.6 billion. Overall export growth of this category during the 9-year period from 2007 to 2015 was 47.4%. There are fourteen subcategories (4-digit HS code level); one of which(HS 0710) representsthe trade of frozen vegetables. World export trend of the last ten years is shown in Figure 12.

The world market of frozen vegetables was USD 5.8 billion in 2015 increasing from USD 4.7 billion in 2007; translating into an overall growth of 24%. Potatoes, leguminous vegetables, sweet corn, spinach and mixture of vegetables are reported under separate subcategories. All these categories account for 44.8% of the total exports. While the other 55.2% is represented by one category (HS 071080) and it includes all other types of frozen vegetables.The categories and the exportvalues under different sub categories of HS 0710 are shown in Table 2.

Product code	Product label	Export Value USD Million	Share of Total	Overall Growth
'071080	Vegetables, uncooked or cooked by steaming or by boiling in water, frozen (excluding potatoes)	3,198	55.2%	26.6%
'071090	Mixtures of vegetables, uncooked or cooked by steaming or by boiling in water, frozen	712	12.3%	3.6%
'071021	Shelled or unshelled peas "PisumSativum", uncooked or cooked by steaming, boiling frozen	445	7.7%	14.9%
'071040	Sweetcorn, uncooked or cooked by steaming or by boiling in water, frozen	392	6.8%	43.8%
'071022	Shelled or unshelled beans "Vigna spp., Phaseolus spp.", uncooked or cooked by steaming, frozen	363	6.3%	17.5%
'071029	Leguminous vegetables, shelled or unshelled, uncooked or cooked by steaming, by boiling, frozen	279	4.8%	39.3%
'071030	Spinach, New Zealand spinach and orache spinach, uncooked or cooked by steaming, by boiling, frozen	273	4.7%	44.5%
'071010	Potatoes, uncooked or cooked by steaming or by boiling in water, frozen	129	2.2%	12.8%
	Total	**5,791**	**100.0%**	**23.6%**

Table 2 - Frozen Vegetables World Exports in Different Subcategories

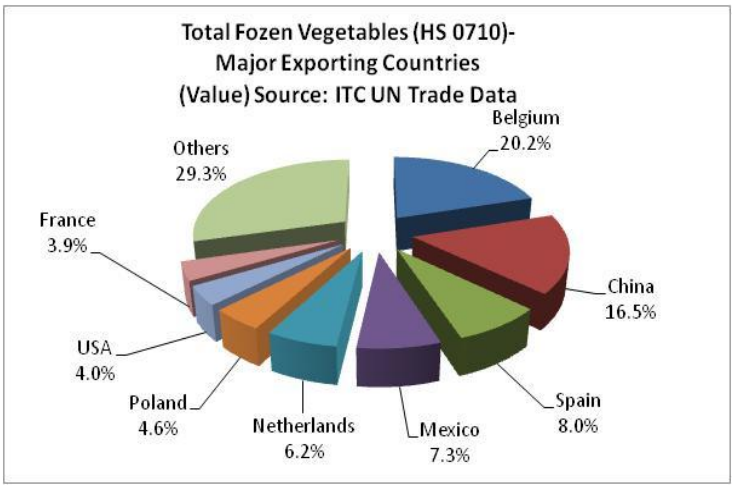


Figure 13 - Frozen Vegetables - Major Exporting Countries

Frozen spinach exports grew by 44.5% during the ten year period; however, its share in total exports of this category was only 4.7%. A comparable growth was exhibitedby frozen sweet corn exports (43.8%) and it had a relatively larger share of 6.88% in the total exports reported under HS 0710. 'Frozen potatoes'was the smallest category and it showed an increase of 12.8% during the considered ten years period.

Belgium was the largest exporter of frozen vegetables. In 2015, its total exports were USD 1.17 billion claiming a 20% share of the international market. China was the second largest exporter with exports of USD 957 million and a market share of 16.5%. Spain, Mexico and Netherlands were respectively the third, fourth and fifth largest exporters in the exports of frozen vegetables.

4.2.1 IQF Peas

The international trade of frozen peas is classified under HS 071021 (071021 Shelled or unshelled peas "PisumSativum", uncooked or cooked by steaming or by boiling in water, frozen). Total world exports of frozen peaswere USD 445 million in 2015; increasing from USD 387million in 2007; representing an overall growth of 15% and an average annual growth rate of around 1.5%. The export trend was not unidirectional and exhibited various increasing and decreasing trends during this period; however, the overall trend during this ten-year period was upward. During the most recent three years, from 2013 to 2015, the exports have followed a declining trend. Figure 14shows the ten year world export trend of frozen peas.

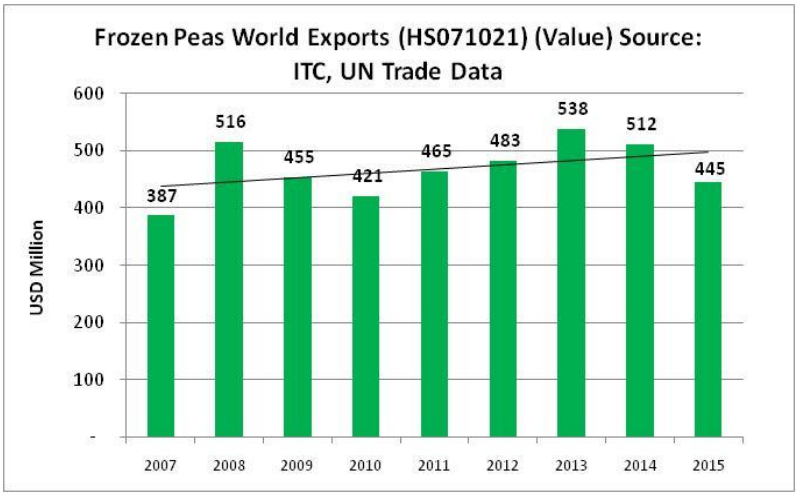


Figure 14 - Frozen Peas World Export Trend (Value)

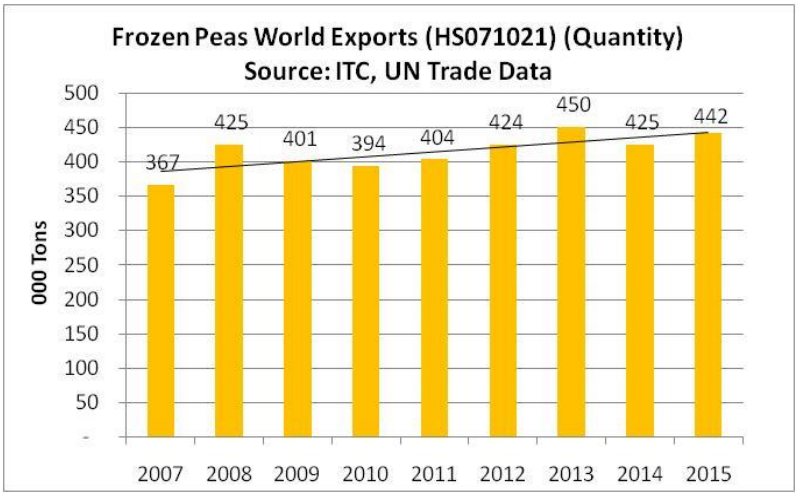


Figure 15 - Frozen Peas World Export Trend (Quantity)

In terms of export quantity,the overall trend was also positive. 442,000 tons of frozen peas were exported in the year 2015. Overall growth in exported quantity during the period from 2007 to 2015 was 20%; higher than that of the export value, which indicates that the average export price decreased during this period. Export quantity export trend is shown in Figure 15.

Major exporters of frozen peas are all the developed countries. Belgium is the largest exporter with USD 146 million exports and share of 40%. New Zealand is the second largest exporter with 10% share; followed by Spain, Sweden and France with 9%, 7.6% and 7.4% shares respectively.Figure 16shows the shares of main exporting countries of frozen peas.

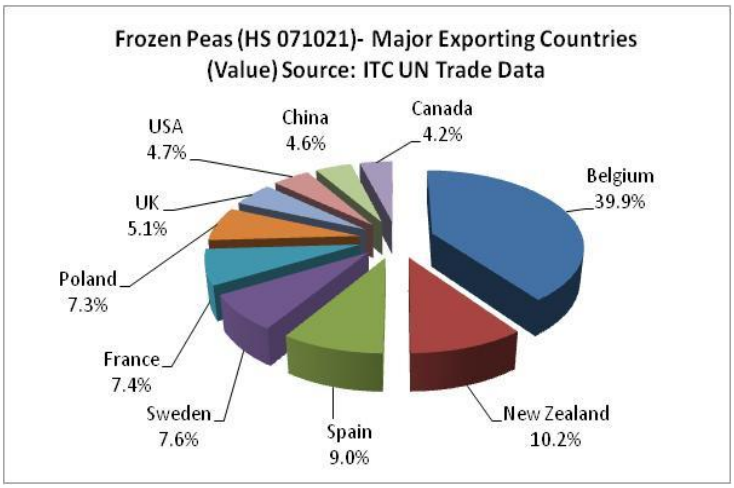


Figure 16 - Frozen Peas - Major Exporting Countries

4.2.2 IQF Potato

Frozen potato is the smallest sub category of frozen products reported under HS 0710. Total exports of frozen potatoes grew from USD 114 million in 2007 to USD 212 million in 2011 and since then declined continuously in each following year till it dropped to USD 129 million in 2015. However, in spite of this, the overall trend of frozen potato exports has been positive during the considered ten year period. Drop in value was lesser than that in quantity which shows that the average price increased during this period. Export value and quantity trends are shown in Figure 17 and Figure 18.

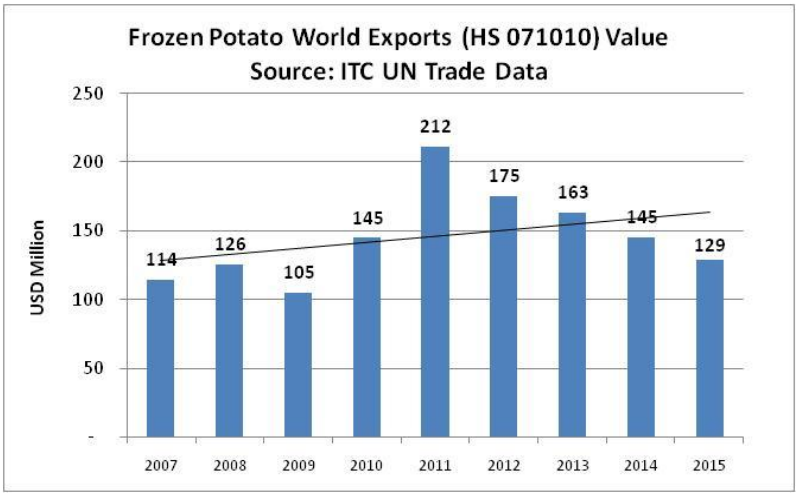


Figure 17 - Frozen Potatoes World Exports (Value)

A similar trend was followed in export quantity of frozen potatoes when the quantity increased from 239 thousand tons in 2007 to 465 thousand tons in 2011 and fell consistently in the following years till it dropped to 179 thousand tons in 2015.

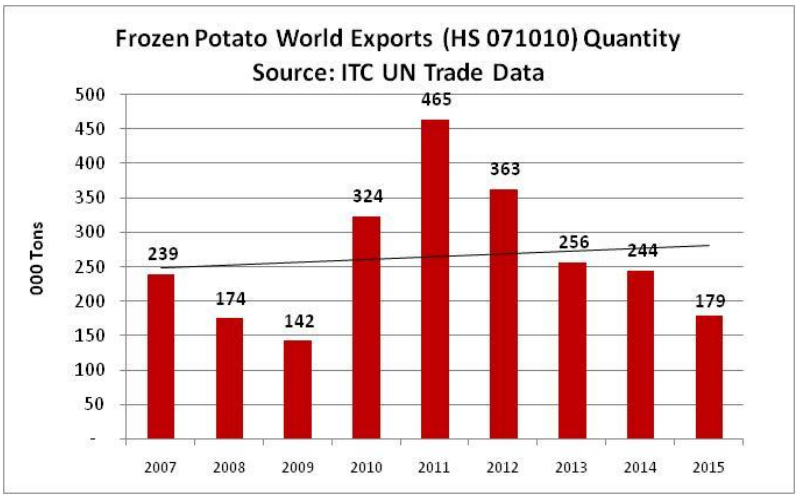


Figure 18 - Frozen Potatoes World Exports (Quantity)

USA was the largest exporter of frozen potatoes claiming 18% share by realizing exports of USD 23 million in 2015. It was followed by Belgium with exports of USD 13.7 million. Spain, China and UK respectively held 10%, 9.75 and 8.7% shares of frozen potatoes export market. Share of major exporting countries of frozen potatoes are shown in Figure 19.

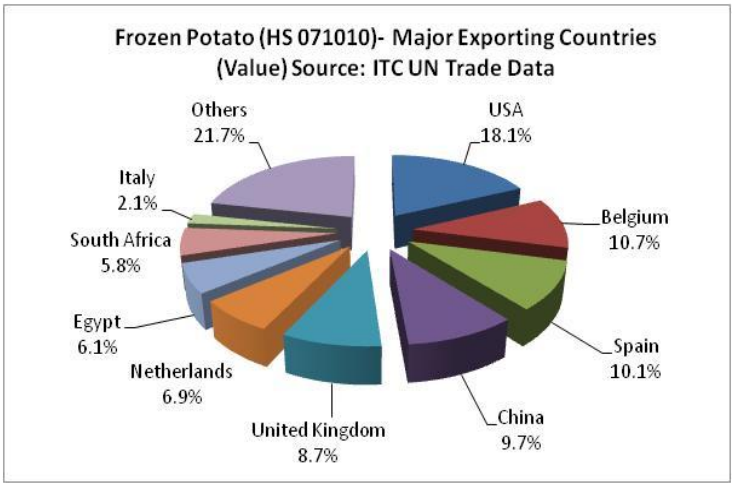


Figure 19 - Frozen Potatoes-Major Exporting Countries

4.2.3 IQF Spinach

The world exports of frozen spinach rose continuously from USD 189 million to USD 297 million in 2014; following which the exports dropped to USD 273 million in 2015. Export trend is shown in Figure 20.

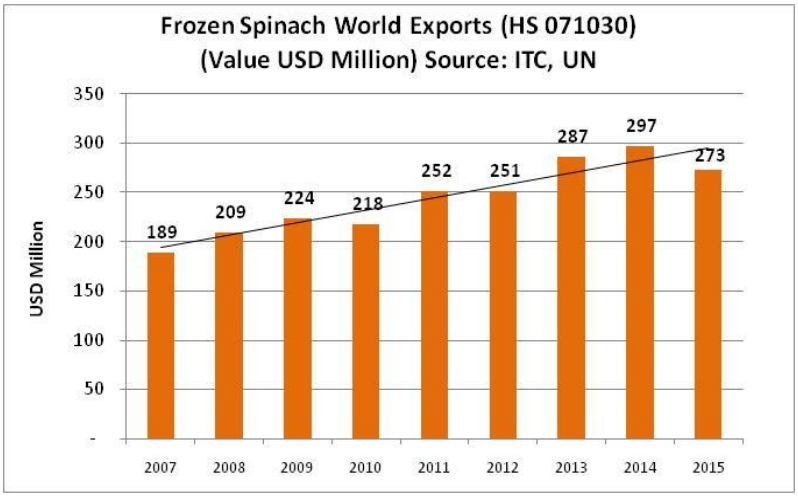


Figure 20 - Frozen Spinach World Exports (Value)

However, the export quantity of frozen spinach remained on a rise during the whole period from 2007 to 2015. Overall growth during this ten year period was 44% in value terms and 57% in quantity terms. This indicates a decrease in average price of frozen spinach in export market.Figure 21 shows the global export quantity trends of frozen spinach.

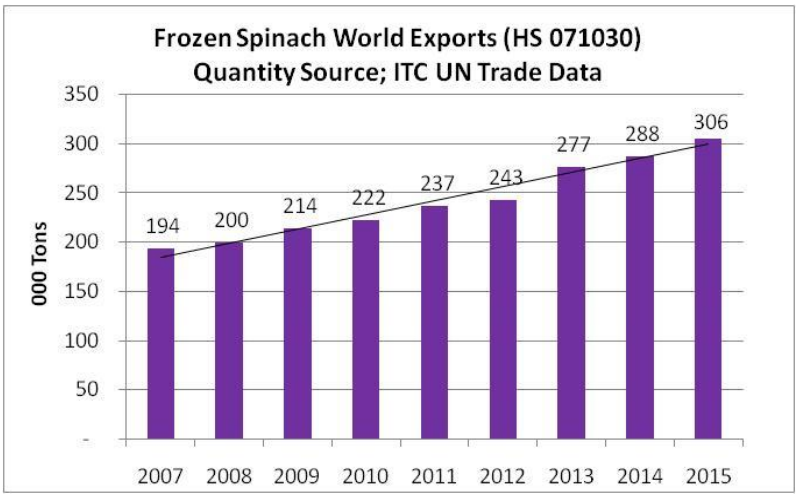


Figure 21 - Frozen Spinach World Exports (Quantity)

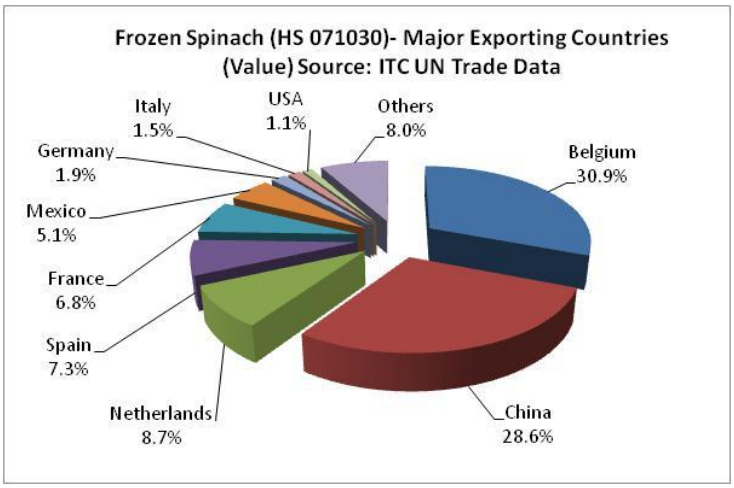


Figure 22 - Frozen Spinach- Major Exporting Countries

Belgium was the largest exporter of frozen spinach in 2015 with exports of USD 84 million; claiming 31% market share. China was the second largest exporter with USD 78 million exports and 28.6% share. All other exporters of frozen spinach included developed countries from Europe and North American regions. Netherlands, Spain and France, respectively, were the third, fourth and fifth largest exporting countries. **Error! Reference source not found.**shows the export market shares of major xporting countries of frozen spinach.

4.2.4 Frozen Mango

'Frozen fruits' is an important export product. Edible fruit is reported under HS 08. There are fourteen sub categories of which one category HS 0811 represents the trade of frozen fruits. In 2015, total exports of edible fruits was USD 102.7 billion which increased from USD 61 billion in 2007; representing a growth of 68%. The exports of frozen fruits in 2015 were USD 4.32 billion which was 4% of the total international fruit trade. During the period from 2007 to 2015, the frozen fruit export market grew by 46%; lower than the total fruit exports which means a declining relative share of this category. Total quantity of frozen fruit in 2015 was 2.2 million tons which grew by 35% from 1.6 million tons in 2007; a growth of 35%. Poland was the largest exporting country of frozen fruit with exports of USD 481 million and 11% market share. Other major exporters were Serbia, Canada, Mexico and USA. China was the sixth largest exporter of frozen fruit with exports of USD 237 million and market share of 5.6%.

There are three sub categories at of HS 0811 at 6-digitcode level. Two of those represent the exports of fruits like frozen strawberries, raspberries, etc. All other fruits are represented by HS 081190 which also includes frozen mango. Total exports under this category in 2015 were USD 2.31 billion and it had 55% share of the total frozen fruits exports. Exports in this category grew by 51% during the ten year period from 2007 to 2015; an average growth rate of 5.1% per annum. Total quantity of frozen fruits exported under this category was2.2 million tons.

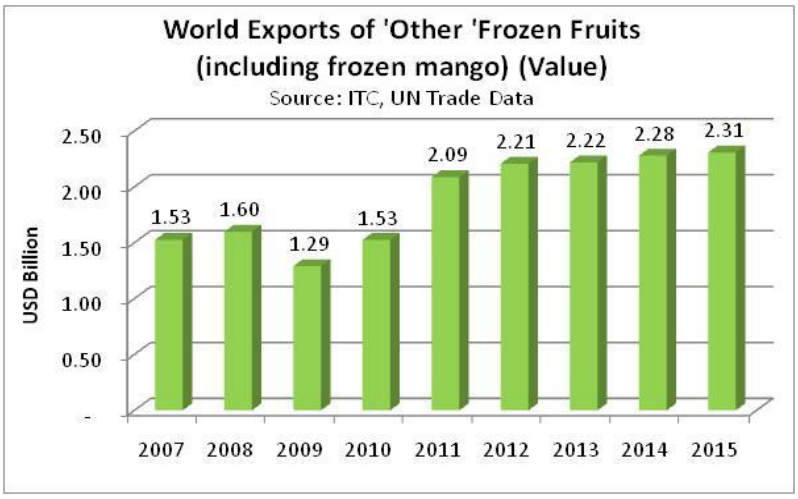


Figure 23 - World Exports Trend of 'Other' Frozen Fruits

4.3 Pakistan's Trade of Frozen Vegetables and Fruits

4.3.1 Pakistan's Exports of Frozen Vegetables

Pakistan's exports of frozen vegetables have not followed a consistent trend over the past years. The export base is small, due to which the increase or decrease in total exports strongly depend on getting or losing individual export orders from different importing countries.In 2015, Pakistan's total exports of frozen vegetables were 10,248 tons worth PKR 626 million; growing from PKR 343 Million in 2011. The export value grew from PKR 2.3 billion to PKR 3.4 billion in 2014; following which there was a sharp decline to PKR 0.6 billionin 2015. Figure 24shows the five-year export trend. The export trend is not in line with the international export market trends which have been following an overall increasing trend over the last ten years.

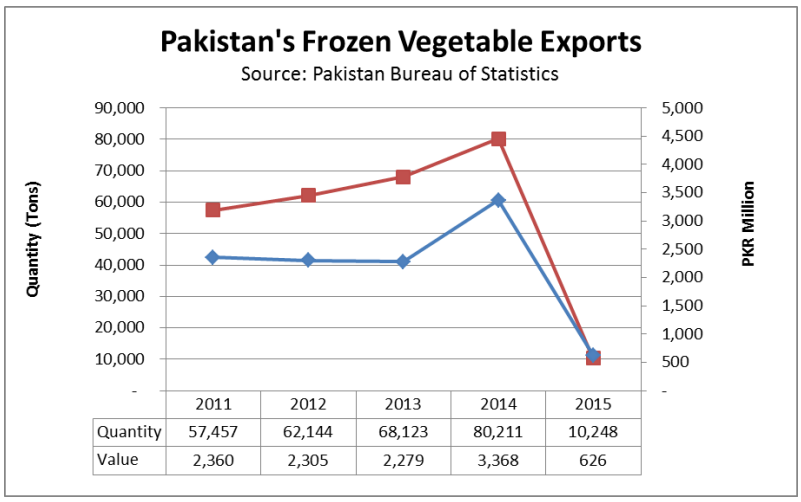


Figure 24 – Pakistan's Frozen Vegetables Exports

In 2015, there were seven product categories (at 8-digit HS code) in which Pakistan exported frozen vegetables. Export quantities and values in those categories are shown in Table 3.

HS Code	Description	Quantity (kg)	Value (000 PKR)	Share in Value
07101000	Potato Frozen	591,474	31,874	5.1%
07102100	Peas Frozen	11,289	959	0.2%
07102900	Other Leguminous Veg. Frozen	129,101	12,711	2.0%
07103000	Spinach Frozen	49,264	5,259	0.8%
07104000	Corn Frozen	123,840	6,255	1.0%
07108000	Other Vegetables Frozen	6,428,579	309,800	49.5%
07109000	Mixture of Vegetables Frozen	2,914,934	259,472	41.4%
	Total Frozen Vegetables Exports	**10,248,481**	**626,330**	100%
Source: Pakistan Bureau of Statistics				

Table 3 – Pakistan's Exports of Frozen Vegetables - 2015

Around half of the total exports were in the category of 'Other' frozen vegetables of which 6,428 tons worth PKR 310 million were exported. 41% of the total exports were

contributed by 'Mixture' of frozen vegetables. Frozen potatoes constituted the third largest category accounting for 5% share. Frozen Leguminous vegetables (including peas)accounted for 2.2% and spinach and corn each accounted for around 1% of the total exports of frozen vegetables.

4.3.1.1 Pakistan's Exports of Frozen Potatoes, Peas and Other Leguminous Vegetables

Pakistan's exports of frozen potatoes (HS 07101000) increased from PKR 1.5 million in 2011 to PKR 330 million in 2013 and declined to PKR 32 million by 2015. Exports of frozen peas and other leguminous vegetables also followed an inconsistent trend during these five years. The trend indicate that the exports rise and fall by getting or losing individual orders. Figure 25shows the export value and quantity trends of potatoes and leguminous vegetables.

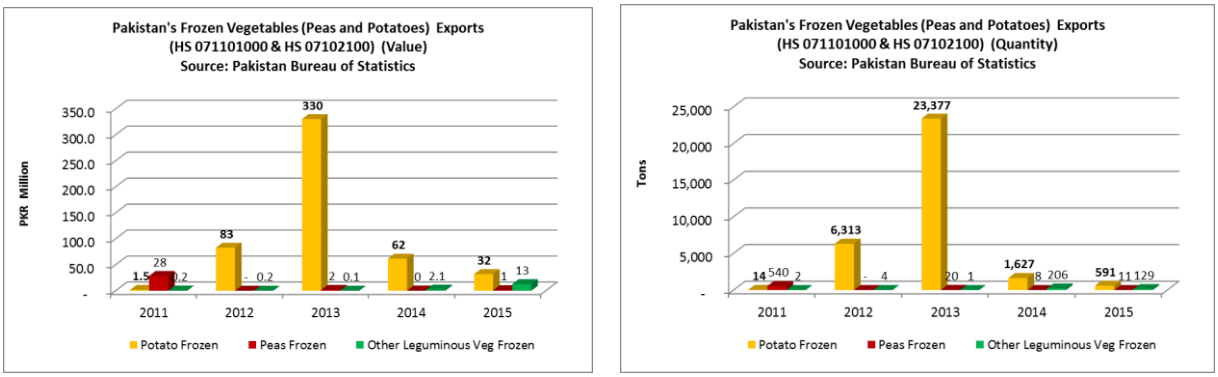


Figure 25 – Pakistan Exports of Frozen Peas and Potatoes (Value and Quantity)

In 2015, Sri Lanka was the biggest buyer of frozen potato from Pakistan. It imported 280 tons worth PKR 10 million; accounting for 47% of the total exports of this product. Other important importing country was Afghanistan that accounted for 44% share. Five-year trend shows that there was an increase of four times when the exports rose from 6,313 tons in 2012 to 23,377 tons in 2013. The largest contributor in this increasewas Malaysia which imported 9,077 tons of frozen potato during that year. Other important contributors were Russian Federation, Sri Lanka and UAE whichrespectively imported 2,722, 6,382 and 2,791 tons during that year.

In 2015, Pakistani frozen peas were imported by UAE and Qatar; whereas in other frozen leguminous vegetables, Afghanistan and Australia were the two importing countries. Major importers of frozen spinach included Canada (33%), Saudi Arabia (32%) and Spain (34%). Frozen sweet corn was exported to Afghanistan (96%), USA and UAE.

4.3.1.2 Pakistan's Exports of 'Other' Frozen Vegetables and 'Mixture' of Vegetables

Pakistan's exports in 'Other Vegetable Frozen' category (HS 07108000) witnessed continuous increase from 2011 to 2014 when the exports increased from PKR 311 million to PKR 3.1 billion. However, in the following year, the exports suffered a huge decline and fell to only PKR 310 million. Export quantities also followed the similar trend and decreased from 75,600 tons in 2014 to only 6,429 tons in 2015. The

export base is not very diversified in terms of markets andthe number of importers and any small change can strongly affect the total exports. Figure 26 shows Pakistan's exports of frozen vegetables in 'Other' and 'Mixture' categories.

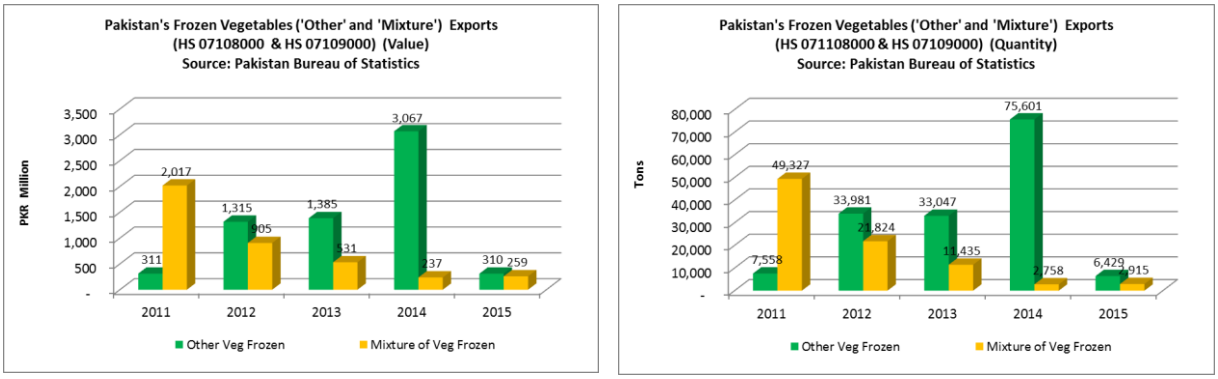


Figure 26 – Pakistan's Exports of Frozen Vegetables ('Other' and 'Mixture')

The country mainly contributing towards the sharp increase in exports of 'Other' frozen vegetables was Afghanistan. In 2011, Afghanistan's share in Pakistan's total exports of this product was only 1% which increased to 95% in 2014. There was a sharp decline in exports to Afghanistan in the following year; decreasing from PKR 2.9 billion to PKR 198 million (93% drop). That led to decline in Pakistan's total exports of this category. An important reason for this decline is the withdrawal of NATO forces from Afghanistan which led to reduced local demand of frozen vegetable products. The situation once again points to the fact that the exports are heavily dependent on individual countries and customers.

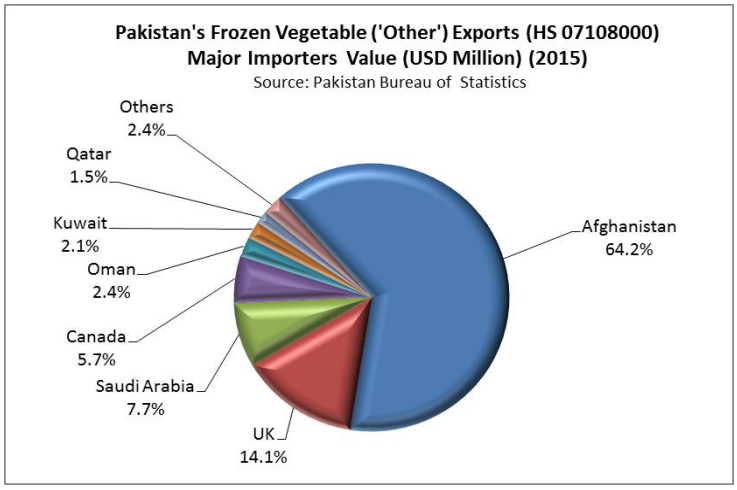


Figure 27 – Pakistan's Frozen Vegetables ('Other' Category) Major Importers

Figure 27 shows that even after decline in exports in 2015, Afghanistan still held 64% share of the total exports of 'Other' frozen vegetables. UK and Saudi Arabia were respectively the second and third largest importers with 14% and 8% shares. Other important trading partners were Canada, Oman, Kuwait and Qatar. It is interesting to note that seven countries accounted for around 98% of the total exports which shows lack of market diversification. The importers include only those countries where a sizeable number of overseas Pakistanis reside.

The export trend of 'Mixture' of frozen vegetables (HS 07109000) shows a declining trend from 2011 to 2015; decreasing from PKR 2 billion to PKR 259 million.It appears that the exports of 'Mixture' of frozen vegetables were being substituted by the exports of 'Other' frozen vegetables during this period. Unlike the 'Other' category, decrease in exports from 2014 to 2015 was not large in 'Mixture' category.

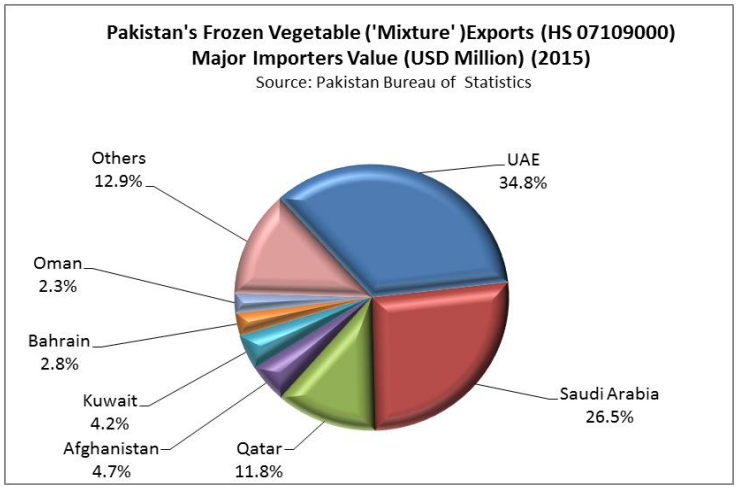


Figure 28 – Pakistan's Frozen Vegetables ('Mixture' Category) Major Importers

Figure 28 shows the shares of major importing countries of 'Mixture' of frozen vegetables from Pakistan. Afghanistan was the major importer of Pakistani frozen 'Mixture' of frozen vegetables. Its share in in total exports, in 2011, was 87% which declined to only 4.7% in 2015. The main reason behind this trend was decrease in demand due to withdrawal of NATO forces from Afghanistan. UAE, Saudi Arabia and Qatar were the first, second and third largest importers of 'Mixture' of frozen vegetables with 35%, 27% and 12% shares respectively. Kuwait, Bahrain and Oman were the other important importing countries. All the major markets are in Middle Eastern countries where significant number of overseas Pakistanis lives.

4.3.2 Pakistan's Exports of Frozen Fruits

Pakistan has a small base of exports of frozen fruits. In 2015, 36 tons of frozen fruits, worth PKR 11 million were exported. 99% of these exports were in the category of frozen raspberry, mulberry, etc. under the HS code 08112000. Table 4shows the details of exports of frozen fruits.

HS Code	Description	Quantity (kg)	Value (000 PKR)	Share in Value
08111000	Strawberries Frozen	619	141	1.3%
08112000	Raspberry, Mulberry, etc. Frozen	35,681	10,966	98.7%
	Total Frozen Fruits	**36,300**	**11,107**	100.0%
Source: Pakistan Bureau of Statistics				

Table 4 – Pakistan's Exports of Frozen Fruits in 2015

85% of the frozen Raspberry/Mulberry exports from Pakistan in 2015 were sent to USA. UK and Malaysia were the other two countries importing frozen fruits from

Pakistan. In frozen strawberry category, UAE was the only buying country. In 2014, there were exports of frozen fruits in the 'Other' category (HS08119000). Afghanistan, USA and Greece were the three buying countries.

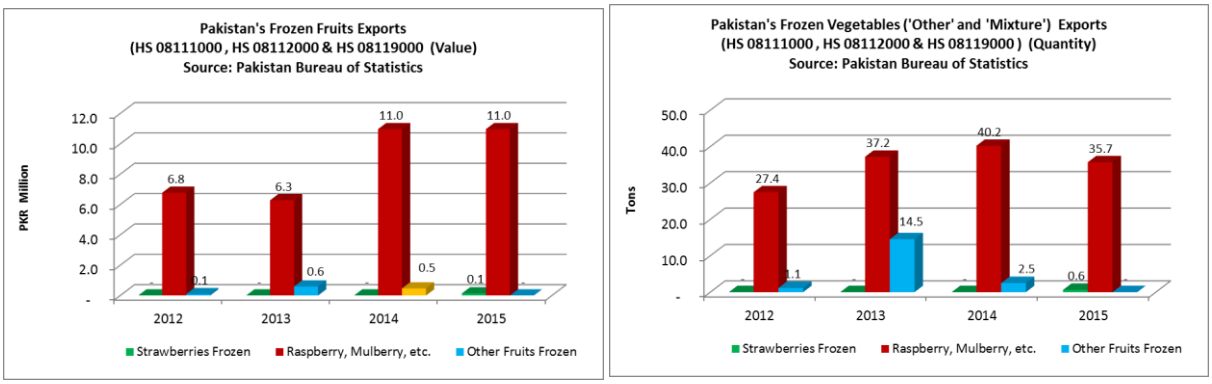


Figure 29 – Pakistan's Frozen Fruits Exports Trends (Value & Quantity)

Pakistan's exports of frozen fruits have not followed a consistent trend due to small base and insufficient market and customer diversification. Four-year trends are shown in Figure 29.

4.3.3 Pakistan's Imports of Frozen Vegetables

In 2015, Pakistan imported 102 tons of frozen vegetables worth PKR 13.8 million. During the same year, exports of this product were 10,249 tons amounting to PKR 626 million; which means that Pakistan is a net exporter of frozen vegetables. Pakistan's imports during 2015 are shown in Table 5.

HS Code	Description	Quantity (kg)	Value (PKR 000)
07101000	Potato Frozen	2,442	1,887
07102900	Other Leguminous Veg Frozen	1,872	227
07104000	Corn Frozen	53,777	8,161
07108000	Other Veg Frozen	9,707	788
07109000	Mixture of Veg Frozen	34,288	2,721
Total		**102,086**	**13,784**

Table 5 – Pakistan's Imports of Frozen Vegetables in 2015

Frozen corn was the biggest import accounting for 59% share of the total. Frozen vegetables mixture was the second largest and Frozen potato the third largest category of imports; respectively accounting for 20% and 14% shares. Shares of different frozen vegetables products imported by Pakistan in 2015 are shown in Figure 30.

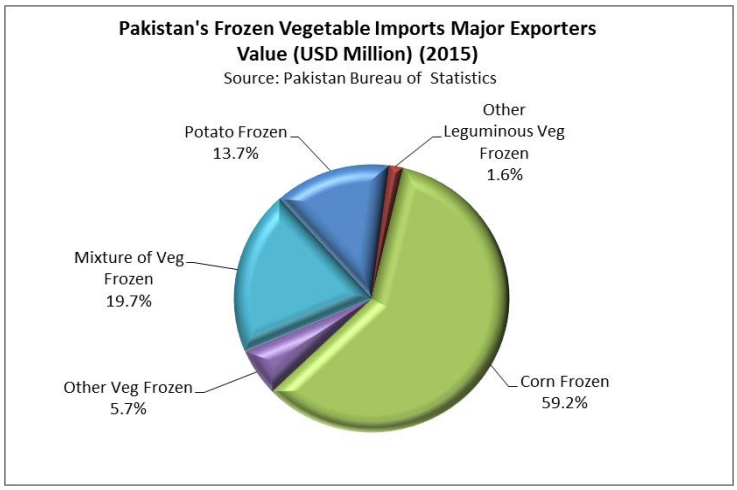


Figure 30 –Pakistan's Frozen Vegetables Imports – Major Exporting Countries

The supplying countries are different for different products. In case of frozen sweet corn, 50% imports were contributed by USA and 28% by India. Other exporting countries included Malaysia, China, UAE and Philippines. In the 'Other' frozen vegetable category, UK was the largest and Jordan the second largest supplier respectively accounting for 43% and 36% share of imports. China, Singapore and USA were the other exporting countries. China accounted for 98% of the supplies of 'Mixture' of frozen vegetables, the rest being contributed by UAE. Pakistan bought frozen potatoes from Afghanistan and Bangladesh.

4.3.4 Pakistan's Imports of Frozen Fruits

In 2015, Pakistan imported 142 tons of frozen fruits worth PKR 13.7 million. During the same year, exports of this product were 36 tons amounting to PKR 11 million; which means that Pakistan is a net importer of frozen fruits. Pakistan's imports during 2015 are shown in Table 6.

HS Code	Description	Quantity (kg)	Value (PKR 000)
08111000	Strawberries Frozen	8,540	1,766
08112000	Raspberry, Mulberry, etc.	116,828	10,084
08119000	Other Fruits Frozen	16,898	1,881
Total		**142,266**	**13,731**

Table 6 – Pakistan's Imports of Frozen Fruits - 2015

Frozen Raspberry/Mulberry had the highest import value and accounted for 73% of the total imports of frozen fruits. 'Other' frozen fruits and frozen strawberries respective accounted for 14% and 13% shares respectively.

Frozen Raspberry/Mulberry (HS 08112000) was mainly imported from Afghanistan accounting for 91% share. Other exporting countries included Mexico, USA and China. Frozen strawberries (HS 08112000) were imported from USA and Mexico.
China was the largest supplier of 'Other' frozen fruits (HS 08119000) accounting for 49% of the total imports under this category. India and Thailand were the second and

third largest suppliers with 33% and 14% shares respectively. USA and UAE were smaller suppliers of 'Other' frozen fruits.

4.4 China's Trade of Frozen Vegetables/Fruits

4.4.1 China's Trade of Frozen Vegetables

After Belgium, China is the second largest exporter of frozen vegetables in the world. In 2015, China exported 869,457 tons of frozen vegetables, worth USD 957 million. This translates into a global market share of 16.5%. China's exports have followed a stable trend during the five year period from 2011 to 2015. China is a small importer of frozen vegetables with total imports of USD 27.7 million in 2015.Table 7 shows China's trade of frozen vegetables.

HS Code	Description	China Trade (USD 000)	
		Exports	Imports
071040	Sweet corn, uncooked or cooked by steaming or by boiling in water, frozen	653,142	16,964
071021	Shelled or unshelled peas "PisumSativum", uncooked or cooked by steaming or by boiling in water, frozen	95,556	8,986
071029	Leguminous vegetables, shelled or unshelled, uncooked or cooked by steaming or by boiling, frozen	78,101	788
071080	Vegetables, uncooked or cooked by steaming or by boiling in water, frozen (excluding potatoes)	47,992	509
071022	Shelled or unshelled beans "Vigna spp., Phaseolus spp.", uncooked or cooked by steaming, frozen	30,912	296
071010	Potatoes, uncooked or cooked by steaming or by boiling in water, frozen	21,951	105
071090	Mixtures of vegetables, uncooked or cooked by steaming or by boiling in water, frozen	16,824	59
071030	Spinach, New Zealand spinach and orache spinach, uncooked or cooked by steaming or by boiling, frozen	12,528	37
	Total	**957,006**	**27,744**

Table 7 – China's Trade of Frozen Vegetables

China's largest traded product was sweet corn which accounted for 68% of the total imports of frozen vegetables. This is not aligned with the global trend where sweet corn is only 7% of the total frozen vegetables export market. Frozen peas product was the second largest export of China accounting for 10% share. In imports as well, sweet corn was the largest category, followed by frozen peas.

4.4.1.1 Pak-China Trade of Frozen Vegetables

Pakistan does not export any frozen product to China since Chins itself is a major exporter of these products. Pakistan is not a major importer of frozen vegetables; however small quantities of two types of frozen products are imported from China; including 'Mixture' of frozen vegetables (HS 071090) (USD 44,000 in 2015) and Cooked or uncooked frozen vegetables (HS 071080) (USD 2,000 in 2015).

4.4.1.2 Frozen Vegetables Trade Potentialbetween Pakistan and China

International Trade Center's Trade Map website assesses trade potential between any two countries for different products. Potential of trade of frozen vegetables between Pakistan and China is shown in Table 8. This has been calculated for the year 2015 and shows that Pakistan can export frozen products worth USD 0.85 million to China and the potential of China exporting these products to Pakistan was USD 0.17 million.

HS Code	Description	Trade Potential in 2015 (USD 000)	
		Export to China	Imports from China
071010	Potatoes, uncooked or cooked by steaming or by boiling in water, frozen	105	2
071040	Sweet corn, uncooked or cooked by steaming or by boiling in water, frozen	2	106
071029	Leguminous vegetables, shelled or unshelled, uncooked or cooked by steaming or by boiling, frozen	125	1
071030	Spinach, New Zealand spinach and orache spinach, uncooked or cooked by steaming or by boiling, frozen	37	6
071021	Shelled or unshelled peas "PisumSativum", uncooked or cooked by steaming or by boiling in water, frozen	9	7
071022	Shelled or unshelled beans "Vigna spp., Phaseolus spp.", uncooked or cooked by steaming, frozen	0	5
071080	Vegetables, uncooked or cooked by steaming or by boiling in water, frozen (excluding potatoes)	509	36
071090	Mixtures of vegetables, uncooked or cooked by steaming or by boiling in water, frozen	59	4
	Total	**846**	**167**
Source: International Trade Center Trade Map			

Table 8 – Trade Potential between China and Pakistan

4.4.2 China's Trade of Frozen Fruits

Unlike frozen vegetables, China is not a large exporter of frozen fruits. In 2015, China exported 159,446 tons of frozen fruit worth USD 237 million. China is the seventh largest exporter in terms of value and fourth largest in terms of quantity. The exports have followed an increasing trend since 2012 when the value of exports was USD 209 million. Chinese imports in 2015 were USD 140 million; which shows that China is a net exporter of frozen fruits. Table 9shows Chinese trade of frozen fruits.

HS Code	Description	China Trade (USD 000)	
		Exports	Imports
081190	Frozen fruit and nuts, uncooked or cooked by steaming or boiling in water, whether or not sweetened	101,735	120,541
081110	Frozen strawberries, uncooked or cooked by steaming or boiling in water, whether or not sweetened	92,788	14,706

081120	Frozen raspberries, blackberries, mulberries, loganberries, black-, white- or red currants	42,155	5,408
	Total	**236,678**	**140,655**

Table 9 – China's Trade of Frozen Fruits

4.4.2.1 Pak-China Trade of Frozen Fruits

Pakistan does not export any frozen fruits to China; however, it does have some small imports from China. In 2015, frozen fruits (HS 081190) worth USD 9,000 were imported from China. There were no imports in the other two product categories.

5.0 VEGETABLES/FRUITS AVAILABILITY

The products considered for individual quick freezingas part of this study include peas, potatoes, carrot, spinach, bitter gourd,okra and mango. There is abundant availability of thesevegetables and fruit for producing the value added frozen products. Major share of the fresh produce of vegetables and fruitsis consumed in the local market. A small share of production is also sold in export market. A significant share of vegetables is lost due to lack of proper post-harvest practices. Use of inappropriate harvesting techniques, inadequate storage, lack of proper transportation and marketing inefficiencies are the key reasons for high post-harvest losses of the horticultural produce of Pakistan. As per the estimates, these losses may be as high as 20-25%. Even using an optimistic figure of 10%, the total loss of fruits and vegetables in Pakistan comes out to be 1.58 million tons. Even if we use a low average price of PKR 10,000 per ton, the total monetary loss due to post harvest losses comes out to be more than PKR 15 billion per annum. Punjab has a major share in production of most of the targeted fruits and vegetables. With the same calculation, estimate of the fruits and vegetables lost in Punjab will be about 1.0 million tons that will translate into about PKR 10 billion per annum.

Establishment of value addition facilities like IQFunits will help reduce these post-harvest losses. A portion of this potentially lost horticultural production will be saved by being processed in such facilities.

5.1 Vegetables/Fruits Availability

5.1.1 Peas Availability

Peas is an abundantly produced vegetable in Pakistan. In 2014-15, total national production of peas was 139,233 tons. Punjab was the largest producer of peas producing 107,005 tons and accounting for 77% of the total national production. Peas production in Punjab has followed an increasing trend over the past five years; increasing from 69,277 tons in 2010-11 to 139,233 tons in 2014-15; exhibiting an overall growth of 54% and a compounded annual growth rate of 9.1%.

District	Production 2013-14 (tons)	Production Share
Sahiwal	3,461	31.3%
Chiniot	2,647	24.0%
Okara	1,165	10.5%
Gujranwala	776	7.0%
Sheikhupura	688	6.2%
Toba Tek Singh	584	5.3%
Other Districts	1,724	15.6%

Table 10 - Peas Producing Districts in Punjab

Peas are produced in almost all districts of Punjab. However, the major production hubs areSahiwal, Chiniot and Okara districts which together account for about two third of the total production of peas in Punjab.Table 10 shows shares of the top peas producing district in Punjab.

5.1.2 Potatoes Availability

Potato is an abundantly produced vegetable in Pakistan. Punjab has a share of 96% in national potato production. In 2014-15, total national production of potatoes was 3.99 million tons of which 3.83 million was contributed by Punjab. Potato production in Punjab has followed an increasing trend over the past five years; increasing from 3.34 million tons in 2010-11 to 3.99 million tons in 2014-15; exhibiting an overall growth of 19% and a compounded annual growth rate of 3.6%.

District	Production 2013-14 (tons)	Production Share
Okara	914,968	33.4%
Sahiwal	426,573	15.5%
Kasur	346,854	12.6%
Pakpattan	311,018	11.3%
Chinniot	122,697	4.5%
Khanewal	103,055	3.8%
Other Districts	518,106	18.9%

Table 11 - Potato Producing Districts in Punjab

Potato production is spread all across Punjab. Table 11 shows the production and shares of the major potato producing districts of Punjab. The main production clusters are near central Punjab. Okara is the biggest potato producing district accounting for one third of the total provincial production. Sahiwal and Kasur are the second and third largest with respective shares of 15.5% and 12.6%.

5.1.3 Carrot, Bitter Gourd, Okra, Spinach Availability

These four vegetables are produced in all districts of Punjab. Larger production centers of these vegetables exist mostly in and around central Punjab with Sheikhupura, Gujranwala, Faisalabad, Kasur, Okara and Lahore being the key districts. Together, these five districts account for around 35% of the total vegetable production (excluding potato) in Punjab.

5.1.4 Mango Availability

Mango is a major fruit produced in Punjab. In 2014-15, Pakistan's total mango production was 1.72 million tons. Of that, 1.31 million tons were produced in Punjab which represented 76% of the total national production. The bulk production of mango is consumed in the local market; however, it is also an important export product. Mango's production is concentrated in the districts of South Punjab. Multan is the biggest mango producing district of Punjab accounting for one third of the total

provincial production. Muzaffargarh and Rahimyar Khan respectively are the second and third largest mango producing districts. Together, the top three districts account for about 70% of the total mango production in Punjab.Table 12 shows the production shares of major mango producing districts of Punjab.

District	Production 2013-14 (tons)	Production Share
Multan	425,303	34.0%
Muzaffargarh	232,704	18.6%
Rahimyar Khan	226,560	18.1%
Khanewal	175,127	14.0%
Bahawalpur	44,999	3.6%
Vehari	30,084	2.4%
Bahawalnagar	18,341	1.5%
Other Districts	98,850	7.9%

Table 12 - Mango Producing Districts in Punjab

5.2 Vegetables/Fruits Prices

The viability of vegetables/fruits processing business greatly depends on the price of the fresh produce since it constitutes the major cost of the final product. It is therefore very important that the fruits/vegetables are procured during the months when there is maximum supply available at the lowest prices of the year. For that, the monthly wholesale price data of the target commodities during the last three years was analyzed. The data of Agriculture Department, Government of Punjab has been used for this purpose. The processing months for each of the target products have been decided on the basis of this analysis and afreezing calendar of the whole year has been developed.Price analysis of the target products are discussed in the following paragraphs:

5.2.1 Potato Prices

The harvesting of potato starts in January and continues till the end of May. The price trend of potato was seen to be almost consistent during the three years with some variations during some months. Figure 31shows the potato price trend.

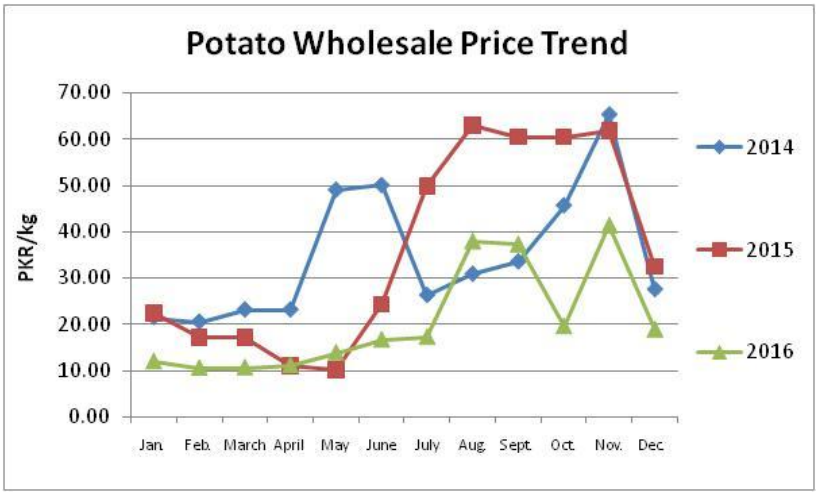


Figure 31 - Potato Monthly Wholesale Price Trend of Three Years

The price of potato was seen to be lowest in the months of February, March, April and May during the three recent years. In line with that, it has been proposed to carry out the processing of potatoes during the months of February, April and May.

5.2.2 Peas Prices

In Punjab, the harvesting of peas crop starts in December and continues till the end of April. The wholesale price trend of peas was seen to be very consistent during the three years. Figure 32shows the trend.

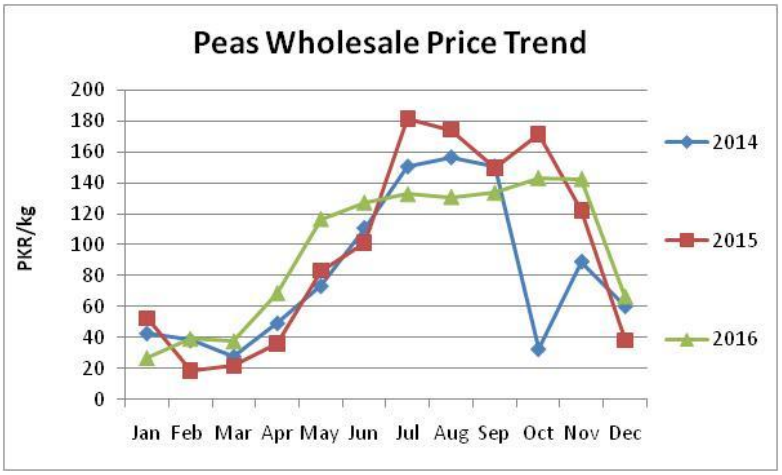


Figure 32 - Peas Monthly Wholesale Price Trend of Three Years

It was seen that the price of peas was the lowest in the months of February and March during different years. Therefore, the processing of peas to produce Individual Quick Frozen peas will be done during the months of February and March.

5.2.3 Spinach Prices

Looking at the monthly price trend spinach during three years, the months of October and November have been selected for processing spinach. Figure 33shows the three year price trend of spinach.

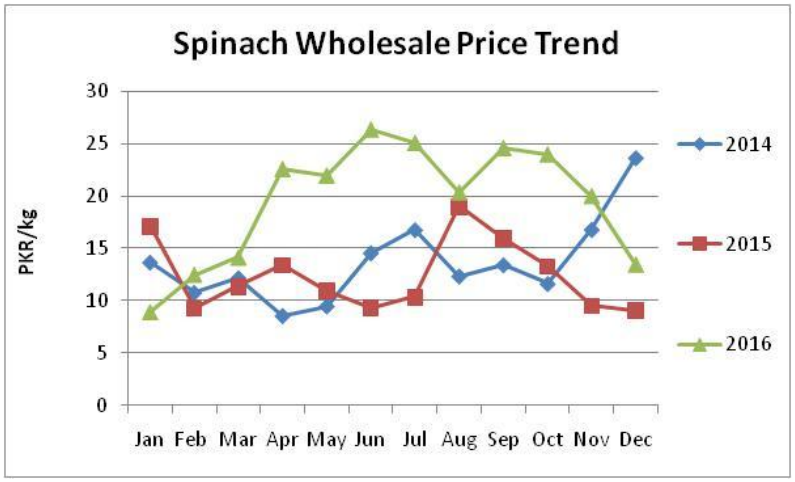


Figure 33 - Spinach Monthly Wholesale Price Trend of Three Years

5.2.4 Okra Prices

Monthly price trend of Okra during three years is presented in Figure 34.

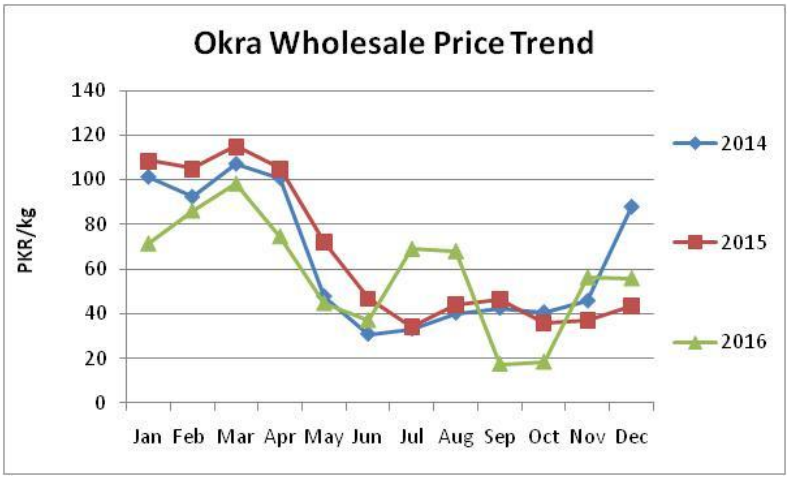


Figure 34 - Okra Monthly Wholesale Price Trend of Three Years

High volumes of okra are available in the market starting from May and continuing till July. Consequently, the prices are lowest during the months of June and July. Therefore, the processing calendar includes these two months for freezing okra through IQF method.

5.2.5 Carrot Prices

Monthly price trend of carrot are seen to be very consistent during three years from 2014 to 2016. Prices have been lower during winter and higher during summer months. Figure 35shows the price trends.

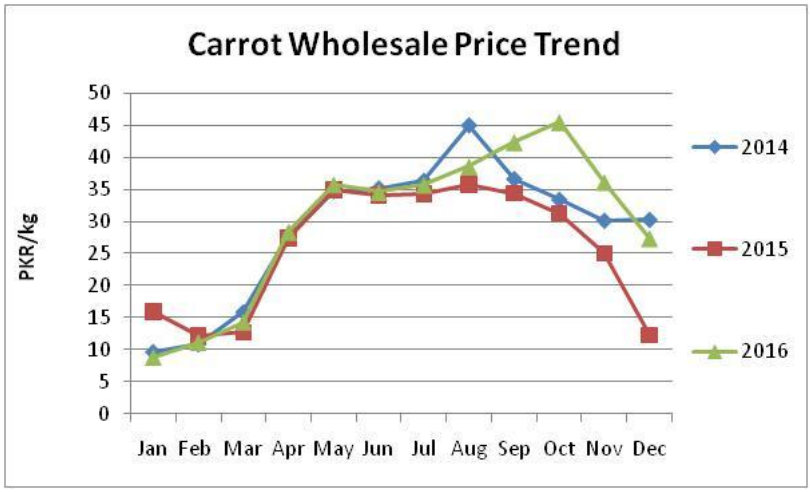


Figure 35 - Carrot Monthly Wholesale Price Trend of Three Years

December, January, February and March are the months during which carrot is available at lower prices. Consequently, December and January have been selected for processing carrot.

5.2.6 Bitter Gourd Prices

Bitter gourd is a vegetable of summer months, with production peaks occurring in May, June and July. A very consistent monthly price trends were observed during three years from 2014 to 2016; shown in Figure 36.

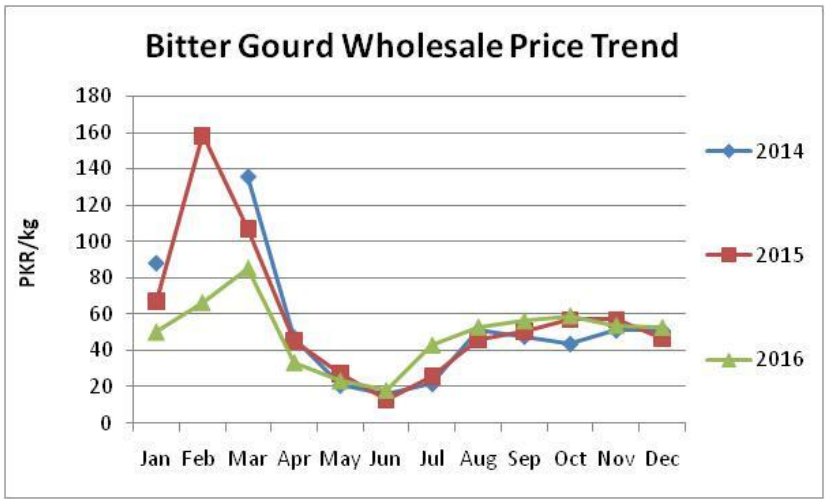


Figure 36 - Bitter Gourd Monthly Wholesale Price Trend of Three Years

The project will carry out individual quick freezing of bitter gourd during the latter half of May and first half of June.

5.2.7 Mango Prices

Mango production in Punjab comprises of different varieties. Chaunsa is the main mango variety produced in Punjab and thus it has been considered as the target variety for making frozen mango product. Chaunsa starts selling in the market during June and continues till the middle of October. Prices in July, August and

September are lower than other months. The months of August and September have been allocated for processing mango.

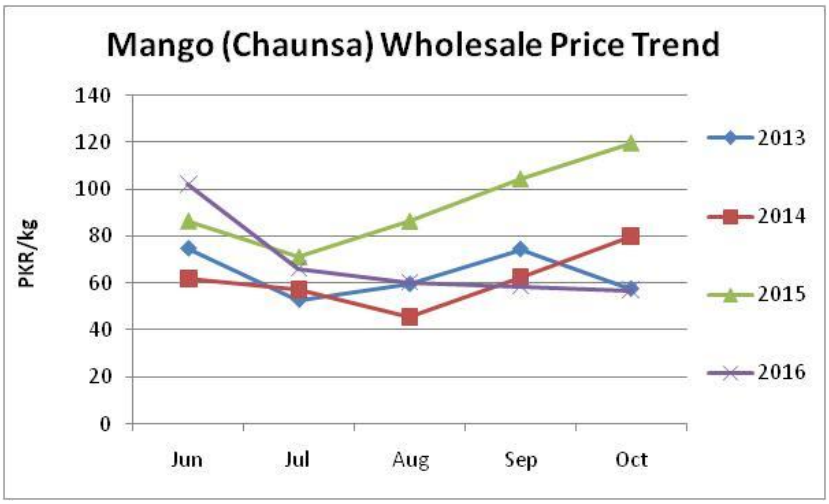


Figure 37 - Mango Monthly Wholesale Price Trend for Three Years

5.3 Freezing Calendar

Based on the above discussion, the freezing calendar for the proposed facility has been developed and is shown in Figure 38.

Freezing Calendar																							
Jan	Jan	Feb	Feb	Mar	Mar	Apr	Apr	May	May	Jun	Jun	Jul	Jul	Aug	Aug	Sep	Sep	Oct	Oct	Nov	Nov	Dec	Dec
Carrot		Potato		Peas			Potato		Bitter Gourd		Okra			Mango				Spinach				Carrot	
29 days		26 days		42 days			28 days		28 days		43 days			45 days				60 days				29 days	

Figure 38 - Freezing Calendar for the Proposed IQF Facility

It is based on a total production days of 330 operational days during a year. During fifteen days in September, there will be no processing activity and annual maintenance will be carried out.Table 13 shows the share of the target frozen products in capacity of the proposed facility.

Frozen Product	Processing Days	Share in Capacity
Peas	42	12.7%
Potato	54	16.4%
Carrot	58	17.6%
Spinach	60	18.2%
Bitter Gourd	28	8.5%
Okra	43	13.0%
Mango	45	13.6%
Total	**330**	**100.0%**

Table 13 - Share of Target Products in Plant Capacity

6.0 THE PROPOSED BUSINESS

6.1 Purpose of the Business

The proposed business focuses on processing the locally produced vegetables and fruits to produce Individually Quick Frozen products. The final frozenproducts will be sold in the export markets. The project will directly contribute towards adding value to the agriculture sector of Punjab by reducing post-harvest losses and converting the surplus farm produce into high value added products. Local farmers will also benefit by finding the opportunity to sell part of their surplus production of vegetables and fruits which otherwise is lost due to low demand in peak production seasons.

6.2 Product Line

The product line of frozen vegetables has been kept broad. Seven products have been included to be processed in the proposed facility. These include:

1. Individual Quick Frozen Peas
2. Individual Quick Frozen Potatoes
3. Individual Quick Frozen Spinach
4. Individual Quick Frozen Carrot
5. Individual Quick Frozen Bitter Gourd
6. Individual Quick Frozen Okra
7. Individual Quick Frozen Mango Slices

Selection of the above-mentioned products is based on the following rationale:

- Horticultural products are seasonal and not available round the year. Therefore, it is not possible to run the plant on single product and multiple products have to be selected. Selection of vegetables was made with the approach to keep the plant running for the whole year. The peak season of the selected commodities do not have much overlap with each other.

- Export market demand in terms of its overall size and growth rate has been considered as a key factor. Frozen peas and frozen potatoes have defined, large international markets.Pakistan's performance in those markets is way below its potential. Similarly, products like frozen spinach, carrot, okra and bitter gourd are exported by number of countries; however, Pakistan, in spite of being a large producer of horticultural products, is not a major player in those markets.

- The product line had to include higher value added products since IQF entails high production costs. That necessitates selling the product at higher price to keep the proposition viable.

- Abundant availability of local raw material is the other important factor for selection of the above-mentioned products. All the selected products are produced in large quantities in Punjab.

- It was also considered that the selected product line should include most of those horticultural products which are produced in Punjab so that the farmers of Punjab and the local agriculture get the main benefit. For all the selected commodities, the intention of the proposed project is to use the local production as raw material.

6.3 Proposed Location

The proposed dehydration project should ideally be located at a place closer to production centers of the target vegetables. The target products in this study arepeas, potato and other vegetables. Share of fruits in the project is contributed only by mango which accounts for around 10% of the total production. In that context, the preferred location should be closer to vegetable production clusters in Punjab which are located in and around Lahore. Table 14 lists the major vegetable producing districts in Punjab.

No.	District	Vegetables Production (tons)	Production Share
1	Gujranwala	169,452	8.9%
2	Faisalabad	146,842	7.7%
3	Sheikhupura	146,835	7.7%
4	Okara	99,671	5.2%
5	Lahore	97,451	5.1%
6	Khanewal	96,895	5.1%
7	Kasur	71,811	3.8%
	Other Districts	1,076,066	56.5%
	Total	**1,905,023**	**100.0%**

Table 14 - Major Vegetable Producing Districts in Punjab

District Lahore itself is an important producer of vegetables. Other large production clusters of vegetables are in Faisalabad, Sheikhupura, Gujranwala which are located close to Lahore and can act as supply sources of the required raw material for the project. Lahore, together with five other adjoining districts, accounts for 38% of the total vegetable production in Punjab. In the south of Lahore, Okara is the main potato producing district which is also not far off from Lahore. This facilitates the project to source potato for the proposed project. In this context, Lahore appears as the most suitable location for establishing the proposed IQF facility.

The other factor that should be considered for selecting location is being close to the main highways. It is important in the context that major share of the production has been assumed to be destined for export markets. Similarly, proximity to CPEC route is also important to open the possibility of ridingthe upcoming economic development wave in the country. Lahore is a good location with respect to this criterion as well.

In the light of above discussion, it is proposed to establish the proposed IQF facility in Lahore.

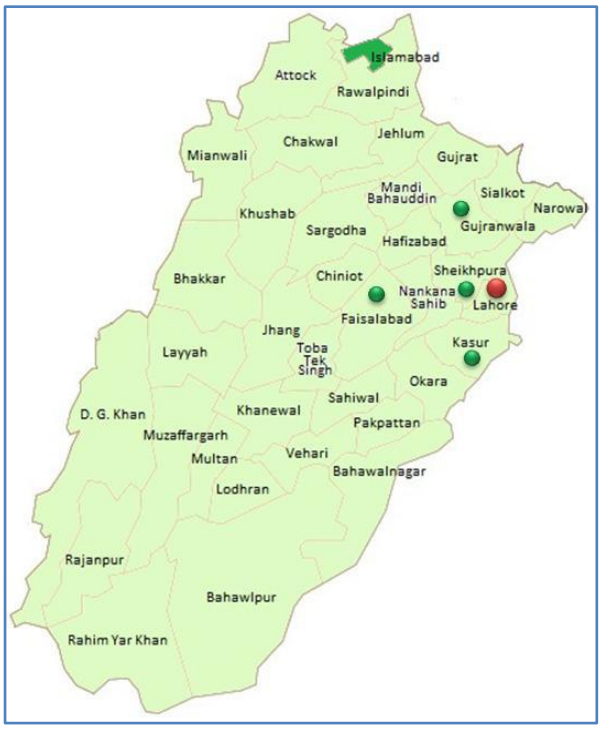


Figure 39 - Project Location on the map of Punjab

6.4 Plant Capacity

Individual Quick Freezing plants are available in range of capacities. The investor can select a plant on the basis of market demand and the technical considerations of the target products for dehydration. Capacities generally quoted by the machinery suppliers fall in the range of one to two tonsof IQF product per hour. Increasing capacity of such units is not complicated since most of the components of the plant come asstandalone units with defined capacities. Overall plant capacity can thus be increased just by addition of individual machines at the required process stages. However, for some machinery and equipment, suchasIQF unit,which operate on continuous process, capacity enhancement decisions are relatively more challenging.

For the purpose of this pre-feasibility study, the plant capacity has been proposed as production of two ton frozen product per hour. The plant will work in single shift to produce 16 tons of frozen product per day. Justification of having a larger capacity has been based on the following factors:

- The pre-feasibility study has been developed in the context of attracting foreign investors to invest in projects that will be developed along the CPEC route. Higher capacity IQF projects are expected to be more profitable than the smaller ones. This will make the project more attractive for the foreign investors.

- The frozen products produced in the proposed unit will be sold in the growing export market. Pakistan's current performance in those markets is below its true potential. A large project will be able to tap that opportunity with a more aggressive approach.

- Some IQF units are already functional in Punjab. The study will provide information and help evaluate and demonstrate the commercial viability of IQF units of higher capacity. The information will be useful for the existing units for a possible up-gradation of their existing capacities.

Using average yields, obtaining 16 tons per day of frozen product will require processing about 23tons of fresh vegetables and fruits per day.

6.5 Project Cost

The project has a total cost of PKR 293.4 millionDetails of different cost components are shown in Table 15and discussed in the following pages:

Cost Item	Cost (PKR)
Land	30,000,000
Building & Civil Works	51,068,494
Preparation Machinery	5,347,250
IQF Tunnel	23,625,000
Freezing rooms	50,883,401
Allied Machinery and Equipment	5,500,000
Office Equipment & Furniture	1,430,000
Vehicles	800,000
Pre-operating expenses	12,208,425
Capital Investment	**180,862,570**
Working Capital	**112,595,233**
Total Project Cost	**293,457,802**

Table 15 - Project Cost Details

6.5.1 Land and Building

Total land requirement for the project has been estimated to be 27,000 square feet which is equal to 10Kanals.[5]Space requirement and the associated civil construction cost ispresented in Table 16.

Table 16 - Land and Building Cost Details

	Space Requirement (Sq. ft)	Construction Cost (PKR/sq.ft.)	Building & Civil Works Cost (PKR)
Processing hall	6,000	1,500	9,000,000
Fruit Storage	5,000	1,500	7,500,000
Freezing Store	23,048	1,200	27,657,504
Generator room	400	1,200	480,000

[5]Kanal is the commonly used unit for land measurement in Punjab. One Kanal is equal to 4500 square feet. Eight Kanals (36000 square feet) constitute one acre of land.

Office space	1,000	2,000	2,000,000
Open spaces	8,862	500	4,430,990
Total Land requirement	**44,310**		**51,068,494**

Land cost has been considered on the assumption that the project will be established in special economic zones established by the government where land will be available at lower-than-market cost. In line with that, the land cost has been assumed to be PKR 3.0 million per Kanal; around half of the market price of industrial land available in and around Lahore. Total cost for 10 Kanals of the required land for the proposed IQF project was calculated to be PKR 30.0 million.

	Length (m)	Width (m)	Area (sq m)	No.	Total Area (Sq m)	Total Area Sqft
Freezing Rooms	23	21	483	4	1,932	20,788
Corridor	23	5	115	1	115	1,237
Loading/Docking	19	5	95	1	95	1,022
Total					2,142	23,048

Table 17 – Freezing Store Space Calculation

6.5.2 Machinery and Equipment

The cost of the proposed IQF project has been obtained through the local and foreign suppliers. The machinery package consists oflocal and imported machinery. The plant has three main sections, raw material preparation, IQF and freeze storage. Allied machinery will also be required along with that. Machinery cost under these heads is provided in Table 18.

Machinery Item	Cost (PKR)
Product Preparation Machinery	5,347,250
IQF Tunnel	23,625,000
Freezing Rooms	50,883,401
Allied Machinery & Equipment	5,500,000
Total IQF Machinery (PKR)	**85,355,651**

Table 18 - Machinery & Equipment Cost

6.5.2.1 Details of Machinery and Equipment

6.5.2.1.1 Vegetables/Fruits Preparation Machinery

Machine	Origin	No.	Cost (PKR)	Total Cost
Sorting conveyor	Local	1	250,000	250,000
Rotary Washer	Local	1	650,000	650,000
Potato & Carrot Peeler	Local	1	250,000	250,000
Slicer	Local	1	150,000	150,000
Okra Cutter	Chinese	1	834,750	834,750
Pea Sheller	Chinese	2	551,250	1,102,500

Spinach Cutter	Local	1	20,000	20,000
Mango Peeling/Slicing Machine	Local	4	400,000	1,600,000
SS Tubs and Hand Peelers	Local	1	10,000	10,000
Blancher	Local	1	400,000	400,000
Working Tables	Local	4	20,000	80,000
Total				**5,347,250**

Table 19 – Machinery Cost Details – Preparation Machinery

6.5.2.1.2 IQF Tunnel

Machine	Origin	No.	Cost (PKR)	Total Cost
IQF Tunnel	Chinese	1	23,625,000	23,625,000
Total				**23,625,000**

Table 20 – Machinery Cost Details – IQF Tunnel

6.5.2.1.3 Freezing Rooms

Equipment	Origin	No.	Cost (PKR)	Total Cost
Total	**European**	**1**	**50,883,401**	**50,883,401**

Table 21 – Machinery Cost Details – Freezing Rooms

Key specifications of freezing rooms are provided in Annex I.

6.5.2.1.4 Allied Machinery & Equipment

Machine	Origin	No.	Cost (PKR)	Total Cost
Weighing and Packing Machine	Local	1	1,400,000	1,400,000
Laboratory Equipment	Local	1	500,000	500,000
Steam generator	Local	1	1,000,000	1,000,000
Tube well	Local	1	600,000	600,000
Generator (50 KVA)	Chinese	1	2,000,000	2,000,000
Total				**5,500,000**

Table 22 – Machinery Cost Details – Allied Machinery & Equipment

6.5.3 Office Equipment and Furniture

Office equipment and furniture is required for administrative and production staff. It includes furniture, interior decoration and IT equipment. Details are presented in Table 23.

Item	No.	Unit Cost (PKR)	Total Cost (Rs)
Office Furniture	1	600,000	600,000
Office Interior	1	500,000	500,000
Laptop Computers	2	70,000	140,000
Desktop Computers	4	35,000	140,000
Printers	2	20,000	40,000
Telephone sets	10	1,000	10,000
Total (PKR)			**1,430,000**

Table 23 - Office Equipment and Furniture Cost

6.5.4 Pre-Operating Expenses

Pre-operating expenses include the cost of utility connections, installation, registration and licenses, salaries of the personnel that will be hired before the plant operations start and the operational expenses, such as travelling, office expenses, etc. Summary of pre-operating expenses is provided in Table 24.

Pre-Operating Costs	Cost (PKR)
Registration, licenses, etc.	500,000
Consultancies for civil works, etc.	3,053,425
Utility Connections/Installations	7,500,000
Salaries	930,000
Admin. Expenses	225,000
Total (PKR)	**12,208,425**

Table 24 - Pre-Operating Costs

6.5.5 Working Capital

Initial working capital requirement has been worked out with the approach that marketing efforts will be required to penetrate the export markets following which sales will start flowing. Thus, the funds requirement for vegetables/fruits (which constitute the biggest cost component) has been calculated for six months. Similar approach has been taken for packing material. For utility costs and salaries as well, a safer time period of six months has been followed. An allocation of 2% of the machinery cost has been made for spare parts. Initial working capital requirements have been calculated for 60% capacity utilization as per the assumed capacity utilization schedule. Table 25shows the working capital requirement.

Cost Head	Amount (Rs) (at 50% capacity)	Basis
Vegetables/Fruits	69,604,378	6 months
Packing Material	12,672,000	6 months
Electricity bills	7,738,992	6 months
Gas charges	222,750	6 months
Salaries	10,650,000	6 months
Spares	1,707,113	2% of Machinery
Starting Cash Balance	10,000,000	
Total Working Capital	**112,595,233**	

Table 25 - Working Capital Details

6.6 Operating Assumptions

6.6.1 Revenue Assumptions

The project's revenue is obtained by selling the seven IQF horticultural products (peas, potato, spinach, bitter gourd, okra,mango) in export markets. Processing of these products will be carried out in months as per the dehydration calendar. At

100% capacity, operating 365 days a year, the plant will produce 5,280 tons of frozen products. Detail is provided in Table 26.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Production (t
Frozen Peas	-	-	448,000	224,000	-	-	-	-	-	-	-	-	**672,000**
Frozen Potatoes	-	416,000	-	224,000	224,000	-	-	-	-	-	-	-	**864,000**
Frozen Carrot	464,000	-	-	-	-	-	-	-	-	-	-	464,000	**928,000**
Frozen Spinach	-	-	-	-	-	-	-	-	-	480,000	480,000	-	**960,000**
Frozen Bitter Gourd	-	-	-	-	224,000	224,000	-	-	-	-	-	-	**448,000**
Frozen Okra	-	-	-	-	-	240,000	448,000	-	-	-	-	-	**688,000**
Frozen Mango	-	-	-	-	-	-	-	480,000	240,000	-	-	-	**720,000**
Total	**464,000**	**416,000**	**448,000**	**448,000**	**448,000**	**464,000**	**448,000**	**480,000**	**240,000**	**480,000**	**480,000**	**464,000**	**5,280,000**
Total No. of days	29	26	28	28	28	29	28	30	15	30	30	29	**330**

Table 26 - Operating Revenue Details

6.6.1.1 Export Sale Prices of Dehydrated Products

The study has been conducted with the assumption that the final frozen products will be sold in export markets. Consequently, export market prices have been used as the selling prices of the final products. Information for that has been obtained mainly from Trade Map data of ITC (International Trade Center).[6] Average export price has been obtained from the export value and quantities. For some products where specific information was not available, information from known international trading websites has also been used. Average values of the selling prices have been considered. Reference of the prices of different IQF products obtained from alibaba.com have been provided in Annex II. Based on this approach, the export selling prices of seven IQF products used in this document are presented inTable 27.

Product	Exports (000 USD)	Value (tons	Price (USD/ton)	Price (PKR/kg)
Frozen Peas	445,000	442,000	1,007	106
Frozen Potatoes	129,000	179,000	721	76
Frozen Carrot	(price data from alibaba.com used)			74
Frozen Spinach	272,000	305,000	892	94
Frozen Bitter Gourd	(price data from alibaba.com used)			110
Frozen Okra	(price data from alibaba.com used)			90
Frozen Mango	(price data from alibaba.com used)			180

Table 27 - IQF Products' Selling Prices

Based on the above productions and sale prices, revenues during the first year of the project were calculated to be PKR324.1 million (at 60% capacity utilization). Detailed revenue calculations are presented in Annex III-A.Annual growth in export market selling prices has been assumed to be 10%.

6.6.1.2 Capacity Utilization Schedule

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
60%	80%	100%	100%	100%	100%	100%	100%	100%	100%

[6]http://www.trademap.org/Country_SelProduct_TS.aspx

Table 28 - Capacity Utilization Schedule

6.6.2 Costs Assumptions

6.6.2.1 Fruits/Vegetables Cost

The cost of fruits and vegetables is calculated on the basis of yields of frozen products from fresh raw materials.

Frozen Product	Yield	Fruit Required (kg/kg frozen product)
Frozen Peas	50%	2.00
Frozen Potatoes	80%	1.25
Frozen Carrot	80%	1.25
Frozen Spinach	70%	1.43
Frozen Bitter Gourd	90%	1.11
Frozen Okra	85%	1.18
Frozen Mango	55%	1.82

Table 29 - Frozen Products Yields from Fresh Produce

6.6.2.1.1 Raw Material Prices

The vegetables/fruits costs were calculated on the basis of wholesale prices of the seven commodities. The raw material prices used in this pre-feasibility study have been decided on the basis on the following approach:

- For each commodity, an average of the prices of the proposed processing months was calculated.
- The price was discounted by a factor since the available wholesale price data is based on auction prices in fruit and vegetable markets. It is assumed that the procurement of fruit and vegetables for processing will be done directly from the farmer to avoid middleman's commission and other associated marketing costs and fees. In fact it is a regular practice of the processing units to procure directly from the farmers. Thus the raw material price was obtained by discounting the wholesale prices by a factor of 30% for all the products.

With the above approach, the raw material prices calculated for different commodities are listed in Table 30.

Commodity	Months	Average Wholesale Price (Rs/kg)	Discounted price (70%)
Peas	March, April	53	37.4
Potato	February, April	15	10.6
Spinach	October, November	18	12.6
Carrot	December, January	22	15.4
Bitter Gourd	May, June	21	14.5
Okra	June, July	47	28.1

Mango	August, September	59	41.6

Table 30 - Fruits/Vegetables (Raw Material) Prices

Annual growth in raw material prices was assumed to be 10%. Based on the above-mentioned data, the total fruits and vegetables cost during the first year of operations was PKR 139.2 million (50% capacity utilization). Detailed cost calculations are shown in Annex III-B.

6.6.2.2 Packaging Cost

Packaging cost has been assumed to be Rs 8 per kg of frozen product. On that basis, total packaging cost during first year of production (60% capacity utilization) comes out to be PKR 25.3 million. Packaging cost has been assumed to grow at 10% per year.

6.6.2.3 Electricity Cost

Electricity cost has been calculated on the basis of overall plant load of 1000 KVA as per the capacity utilization assumptions during each year. B2 Industrial supply tariff has been applied to calculate the monthly bill. An annual increase of 10% in electricity cost has been assumed. Latest electricity tariff is attached as Annex III-C.

6.6.3 Depreciation/Amortization

Straight line depreciation method has been applied to calculate the associated cost. Different rates applied to different types of assets are shown inTable 31.

Asset	Depreciation Rate
Land	0%
Machinery and Equipment	10%
Building & Civil Works	5%
Office Equipment	20%
Vehicles	20%

Table 31 - Depreciation Rates

6.6.4 Human Resource Plan

The project will require human resource in all important functions. Overall management will be carried out by CEO/Plant Manager who will be assisted by procurement, production, quality assurance, marketing, administration, accounts and maintenance teams. Qualified operators will be engaged to manage the IQF operations whereas semiskilled labor will be engaged in vegetables/fruits preparation and packaging activities. Total HR needs of the enterprise has been calculated to be70 persons; including staff of 46 as production staff and 24 for administration and support. Consolidated human resource cost for production and non-production staff is presented in Table 32.

HR Cost	Cost -Year 1 (PKR)
Production Staff Cost	13,740,000
Administration Staff Cost	7,560,000
Total	**21,300,000**

Table 32 - Human Resource Cost (consolidated)

6.6.4.1 Administrative Staff Cost Details

Designation	No.	Salary (PKR/month)	Total (PKR /month)	Salary per annum (PKR)
CEO/Plant Manager	1	125,000	125,000	1,500,000
Admin Officer	1	50,000	50,000	600,000
Accounts Officer	1	50,000	50,000	600,000
Accounts Assistant	1	30,000	30,000	360,000
Marketing Officer	1	50,000	50,000	600,000
Marketing Assistants	1	30,000	30,000	360,000
Storekeeper	1	40,000	40,000	480,000
Store Assistant	1	25,000	25,000	300,000
Security Guards	10	15,000	150,000	1,800,000
Driver	1	20,000	20,000	240,000
Office Boys	2	15,000	30,000	360,000
Sweepers	2	15,000	30,000	360,000
Gardener	1	15,000	15,000	180,000
Total Administrative Staff	**24**		**630,000**	**7,560,000**

Table 33 – Administrative Staff Details

6.6.4.2 Production Staff Cost Details

Designation	No.	Salary (Rs/month)	Total (Rs/month)	Salary per annum
Production Manager	1	80,000	80,000	960,000
Refrigeration Engineer	1	70,000	70,000	840,000
Procurement Officer	1	50,000	50,000	600,000
Procurement Assistant	1	30,000	30,000	360,000
Quality Assurance Officers	2	50,000	100,000	1,200,000
Shift Supervisors	2	40,000	80,000	960,000
Operators	6	25,000	150,000	1,800,000
Plant Helpers	3	15,000	45,000	540,000
Freezing Room Operators	3	25,000	75,000	900,000
Freezing Room Helpers	2	15,000	30,000	360,000
Maintenance Engineer	1	70,000	70,000	840,000
Maintenance Technicians	2	25,000	50,000	600,000
Maintenance Helpers	1	15,000	15,000	180,000
Loading/Unloading Labor	8	15,000	120,000	1,440,000
Product preparation labor	10	15,000	150,000	1,800,000

Packing labor	2	15,000	30,000	360,000
Total Production Staff	**46**		**1,145,000**	**13,740,000**

Table 34 – Production Staff Details

6.7 Financial Feasibility Analysis

6.7.1 Key Financial Assumptions

No. of Projection Years 10
Discount Rate used for NPV 20%

6.7.2 Financial Feasibility

The project of Individual Quick Freezing of vegetables and fruits is found to befinancially feasible. Financial feasibility results are summarized in Table 35.

IRR	39.00%
NPV (PKR)	238,709,976
Payback Period (years)	3.62

Table 35 - Financial Feasibility Results

6.7.3 Profitability Ratios

	Amount (PKR)	Percent
Sales	321.5	100.0%
Cost of Sales	189.9	59.1%
Gross Profit	**131.6**	**40.9%**
Operating Costs	32.9	10.2%
Earnings Before Interest and Taxes	**98.7**	**30.7%**
Net Profit	**64.1**	**20.0%**

Table 36 – Profitability Ratios

6.7.4 Ratio Analysis

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Gross Profit Margin	40.9%	42.1%	42.8%	42.8%	42.9%	42.9%	43.0%	43.0%	43.1%	43.1%
Net Profit Margin	20.0%	22.6%	24.4%	24.7%	24.9%	25.4%	25.5%	25.6%	25.7%	25.9%
Current Ratio	4.1	4.5	5.3	5.9	6.4	6.7	6.9	7.1	7.2	
Return on Equity (ROI)	17.9%	23.8%	29.2%	27.8%	27.0%	27.0%	26.9%	26.9%	27.1%	27.4%

6.7.5 Projected Income Statement

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Operating Revenues	**321,470,341**	**471,489,834**	**648,298,522**	**713,128,374**	**784,441,211**	**862,885,333**	**949,173,866**	**1,044,091,253**	**1,148,500,378**	**1,263,350,416**
Direct Costs										
Vegetables/Fruits	139,208,755	204,172,841	280,737,657	308,811,422	339,692,565	373,661,821	411,028,003	452,130,804	497,343,884	547,078,272
Packing material	25,344,000	37,171,200	51,110,400	56,221,440	61,843,584	68,027,942	74,830,737	82,313,810	90,545,191	99,599,710
Direct Electricity Cost	10,653,984	15,625,843	21,485,534	23,634,088	25,997,497	28,597,246	31,456,971	34,602,668	38,062,935	41,869,228
LPG cost	445,500	490,050	539,055	592,961	652,257	717,482	789,230	868,153	954,969	1,050,466
Payroll Production	13,740,000	14,839,200	16,026,336	17,308,443	18,693,118	20,188,568	21,803,653	23,547,945	25,431,781	27,466,324
Maintenance cost	512,134	751,130	1,024,268	1,109,623	1,194,979	1,280,335	1,365,690	1,451,046	1,536,402	1,621,757
Total Direct Cost	**189,904,373**	**273,050,264**	**370,923,250**	**407,677,977**	**448,073,999**	**492,473,395**	**541,274,285**	**594,914,427**	**653,875,162**	**718,685,758**
Gross Profit	**131,565,968**	**198,439,570**	**277,375,272**	**305,450,397**	**336,367,212**	**370,411,938**	**407,899,581**	**449,176,826**	**494,625,216**	**544,664,658**
Operating Costs										
Payroll Admin	7,560,000	8,164,800	8,817,984	9,523,423	10,285,297	11,108,120	11,996,770	12,956,511	13,993,032	15,112,475
Fixed Electricity Cost	4,824,000	5,209,920	5,626,714	6,076,851	6,562,999	7,088,039	7,655,082	8,267,488	8,928,887	9,643,198
Depreciation	11,534,990	11,534,990	11,534,990	11,534,990	11,534,990	11,088,990	11,088,990	11,088,990	11,088,990	11,088,990
Amortization	2,441,685	2,441,685	2,441,685	2,441,685	2,441,685	-	-	-	-	-
Marketing Cost	4,740,000	5,403,000	3,135,300	2,754,825	2,972,426	1,932,612	2,125,873	2,338,461	2,572,307	2,829,537
Office maintenance Cost	708,300	826,650	880,965	939,294	1,001,968	1,069,346	1,141,821	1,219,820	1,303,810	1,394,300
Licensing/Regulatory Fee	300,000	315,000	330,750	347,288	364,652	382,884	402,029	422,130	443,237	465,398
Audit fee	250,000	262,500	275,625	289,406	303,877	319,070	335,024	351,775	369,364	387,832
Legal/Professional Fee	300,000	315,000	330,750	347,288	364,652	382,884	402,029	422,130	443,237	465,398
Vehicle fuel & maintenance	240,000	264,000	290,400	319,440	351,384	386,522	425,175	467,692	514,461	565,907
Total Operating Costs	**32,898,975**	**34,737,545**	**33,665,162**	**34,574,488**	**36,183,928**	**33,758,468**	**35,572,791**	**37,534,998**	**39,657,325**	**41,953,037**
Earnings before interest and taxes	**98,666,993**	**163,702,025**	**243,710,110**	**270,875,909**	**300,183,284**	**336,653,470**	**372,326,790**	**411,641,828**	**454,967,891**	**502,711,621**
Interest	-	-	-	-	-	-	-	-	-	-
Earnings before taxes	**98,666,993**	**163,702,025**	**243,710,110**	**270,875,909**	**300,183,284**	**336,653,470**	**372,326,790**	**411,641,828**	**454,967,891**	**502,711,621**
Tax	34,533,448	57,295,709	85,298,538	94,806,568	105,064,149	117,828,715	130,314,377	144,074,640	159,238,762	175,949,067
Net Operating Income	**64,133,546**	**106,406,316**	**158,411,571**	**176,069,341**	**195,119,135**	**218,824,756**	**242,012,414**	**267,567,188**	**295,729,129**	**326,762,554**
Net Income	**64,133,546**	**106,406,316**	**158,411,571**	**176,069,341**	**195,119,135**	**218,824,756**	**242,012,414**	**267,567,188**	**295,729,129**	**326,762,554**
Balance brought forward	-	64,133,546	153,485,876	249,517,958	340,469,839	428,471,179	517,836,747	607,879,329	700,357,214	796,869,074
Total profit available for appropriation	64,133,546	170,539,862	311,897,447	425,587,298	535,588,973	647,295,934	759,849,161	875,446,517	996,086,343	1,123,631,628
Dividend	-	17,053,986	62,379,489	85,117,460	107,117,795	129,459,187	151,969,832	175,089,303	199,217,269	224,726,326
Balance carried forward	**64,133,546**	**153,485,876**	**249,517,958**	**340,469,839**	**428,471,179**	**517,836,747**	**607,879,329**	**700,357,214**	**796,869,074**	**898,905,302**

6.7.6 Projected Balance Sheet

ASSETS											
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Current Assets											
Cash	10,000,000	89,803,656	141,105,777	171,435,327	253,192,525	329,686,238	402,112,441	472,417,394	542,079,762	612,390,639	506,665,645
Raw material	82,276,378										
Advance Processing Charges	18,611,742										
Accounts Receivables		160,735,171	235,744,917	324,149,261	356,564,187	392,220,606	431,442,666	474,586,933	522,045,626	574,250,189	631,675,208
Spare Parts inventory	1,707,113	1,792,469	1,882,092	1,976,197	2,075,007	2,178,757	2,287,695	2,402,079	2,522,183	2,648,293	2,780,707
Total Current Assets	**112,595,233**	**252,331,295**	**378,732,786**	**497,560,784**	**611,831,719**	**724,085,601**	**835,842,802**	**949,406,406**	**1,066,647,571**	**1,189,289,121**	**1,141,121,560**
Fixed Assets											
Land	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000
Building & Civil Works	51,068,494	48,515,069	45,961,645	43,408,220	40,854,795	38,301,371	35,747,946	33,194,521	30,641,096	28,087,672	25,534,247
IQF Tunnel	23,625,000	21,262,500	18,900,000	16,537,500	14,175,000	11,812,500	9,450,000	7,087,500	4,725,000	2,362,500	-
Freezing Rooms & Other Machinery	61,730,651	55,557,586	49,384,521	43,211,456	37,038,391	30,865,326	24,692,260	18,519,195	12,346,130	6,173,065	- 0
Office Equipment & Furniture	1,430,000	1,144,000	858,000	572,000	286,000	-	-	-	-	-	-
Vehicles	800,000	640,000	480,000	320,000	160,000	-	-	-	-	-	-
Net Fixed Assets	**168,654,145**	**157,119,155**	**145,584,165**	**134,049,176**	**122,514,186**	**110,979,196**	**99,890,206**	**88,801,216**	**77,712,227**	**66,623,237**	**55,534,247**
Other Assets											
Pre-operating Expenses	12,208,425	9,766,740	7,325,055	4,883,370	2,441,685	-	-	-	-	-	-
Total Other Assets	**12,208,425**	**9,766,740**	**7,325,055**	**4,883,370**	**2,441,685**	**-**	**-**	**-**	**-**	**-**	**-**
TOTAL ASSETS	**293,457,802**	**419,217,190**	**531,642,006**	**636,493,330**	**736,787,590**	**835,064,797**	**935,733,009**	**1,038,207,622**	**1,144,359,798**	**1,255,912,358**	**1,196,655,807**

LIABILITIES											
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Current Liabilities											
Accounts Payables		61,625,842	84,698,328	93,517,570	102,859,949	113,135,815	124,438,459	136,870,491	150,544,782	165,585,481	4,292,702
Short term loan											
Total Current Liabilities	**-**	**61,625,842**	**84,698,328**	**93,517,570**	**102,859,949**	**113,135,815**	**124,438,459**	**136,870,491**	**150,544,782**	**165,585,481**	**4,292,702**
Long Term Liabilities											
Long term debt	-	-	-	-	-	-	-	-	-	-	-
Long term debt	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Equity											
Paid up Capital	293,457,802	293,457,802	293,457,802	293,457,802	293,457,802	293,457,802	293,457,802	293,457,802	293,457,802	293,457,802	293,457,802
Retained Earnings		64,133,546	153,485,876	249,517,958	340,469,839	428,471,179	517,836,747	607,879,329	700,357,214	796,869,074	898,905,302
Total Equity	**293,457,802**	**357,591,348**	**446,943,678**	**542,975,760**	**633,927,641**	**721,928,981**	**811,294,550**	**901,337,131**	**993,815,016**	**1,090,326,877**	**1,192,363,105**
TOTAL LIABILITIES	**293,457,802**	**419,217,190**	**531,642,006**	**636,493,330**	**736,787,590**	**835,064,797**	**935,733,009**	**1,038,207,622**	**1,144,359,798**	**1,255,912,358**	**1,196,655,807**

6.7.7 Projected Cash Flow Statement

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Operating Activities											
Net Income		**64,133,546**	**106,406,316**	**158,411,571**	**176,069,341**	**195,119,135**	**218,824,756**	**242,012,414**	**267,567,188**	**295,729,129**	**326,762,554**
Depreciation		11,534,990	11,534,990	11,534,990	11,534,990	11,534,990	11,088,990	11,088,990	11,088,990	11,088,990	11,088,990
Amortization		2,441,685	2,441,685	2,441,685	2,441,685	2,441,685	-	-	-	-	-
Change in raw material inventories	(82,276,378)	82,276,378	-	-	-	-	-	-	-	-	-
Change in advance processing charges	(18,611,742)	18,611,742									
Change in spares inventory	(1,707,113)	(85,356)	(89,623)	(94,105)	(98,810)	(103,750)	(108,938)	(114,385)	(120,104)	(126,109)	(132,415)
Change in Accounts Receivables		(160,735,171)	(75,009,746)	(88,404,344)	(32,414,926)	(35,656,419)	(39,222,061)	(43,144,267)	(47,458,693)	(52,204,563)	(57,425,019)
Change in Accounts Payables		61,625,842	23,072,485	8,819,242	9,342,379	10,275,867	11,302,643	12,432,032	13,674,291	15,040,699	(161,292,779)
Cash from operations	**(102,595,233)**	**79,803,656**	**68,356,107**	**92,709,039**	**166,874,659**	**183,611,507**	**201,885,390**	**222,274,784**	**244,751,671**	**269,528,146**	**119,001,331**
Financing Activities											
Short term debt principle repayment											
Long term debt principle repayment		-	-	-	-	-	-	-	-	-	-
Addition to short term debt											
Additions to long term debt	-										
Issuance of shares	293,457,802										
Net cash from financing activities	**293,457,802**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Investing Activities											
Capital Expenditure	(180,862,570)										
Cash from investing activities	**(180,862,570)**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Net Cash	10,000,000	79,803,656	68,356,107	92,709,039	166,874,659	183,611,507	201,885,390	222,274,784	244,751,671	269,528,146	119,001,331
Cash balance brought forward	-	10,000,000	89,803,656	141,105,777	171,435,327	253,192,525	329,686,238	402,112,441	472,417,394	542,079,762	612,390,639
Cash investment in securities		-	-	-	-	-	-	-	-	-	-
Cash available for appropriation	10,000,000	89,803,656	158,159,763	233,814,816	338,309,985	436,804,033	531,571,628	624,387,226	717,169,065	811,607,908	731,391,971
Dividend	-	-	17,053,986	62,379,489	85,117,460	107,117,795	129,459,187	151,969,832	175,089,303	199,217,269	224,726,326
Cash carried forward	**10,000,000**	**89,803,656**	**141,105,777**	**171,435,327**	**253,192,525**	**329,686,238**	**402,112,441**	**472,417,394**	**542,079,762**	**612,390,639**	**506,665,645**

6.7.8 NPV and IRR Calculations

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Net Cash Flow (Rs)	10,000,000	79,803,656	68,356,107	92,709,039	166,874,659	183,611,507	201,885,390	222,274,784	244,751,671	269,528,146	119,001,331
Total Investor Cash outflow (Rs)	(293,457,802)										
Net Cash flows (Rs)	(293,457,802)	79,803,656	68,356,107	92,709,039	166,874,659	183,611,507	201,885,390	222,274,784	244,751,671	269,528,146	119,001,331
Accumulated Cash flows (Rs)		(213,654,146)	(145,298,040)	(52,589,000)	114,285,658	297,897,166	499,782,556	722,057,340	966,809,012	1,236,337,158	1,355,338,489
Payback period (years)		1.00	1.00	1.00	0.62	-	-	-	-	-	-
IRR	**39.00%**										
NPV (Rs)	**238,709,976**										
Payback (years)	**3.62**										

6.8 Sensitivity Analysis

Sensitivity of project's viability in terms of NPV was analyzed with respect to changes in different revenue and cost components. In addition, project's capacity to absorb debt cost was also analyzed. While studying the effect of one variable, all other variables have been assumed to be constant.

6.8.1 Project's Sensitivity to Sales Price Growth Rate

Sales prices of the final products have been assumed to grow at 10% per annum. The export market sale prices are driven by global demand-supply dynamics and the project does not have any control on those. Therefore a sensitivity analysis was carried out to know the fluctuations beyond which the project becomes infeasible. Drop in NPV with a drop in sales price growth rate are is shown in Figure 40.

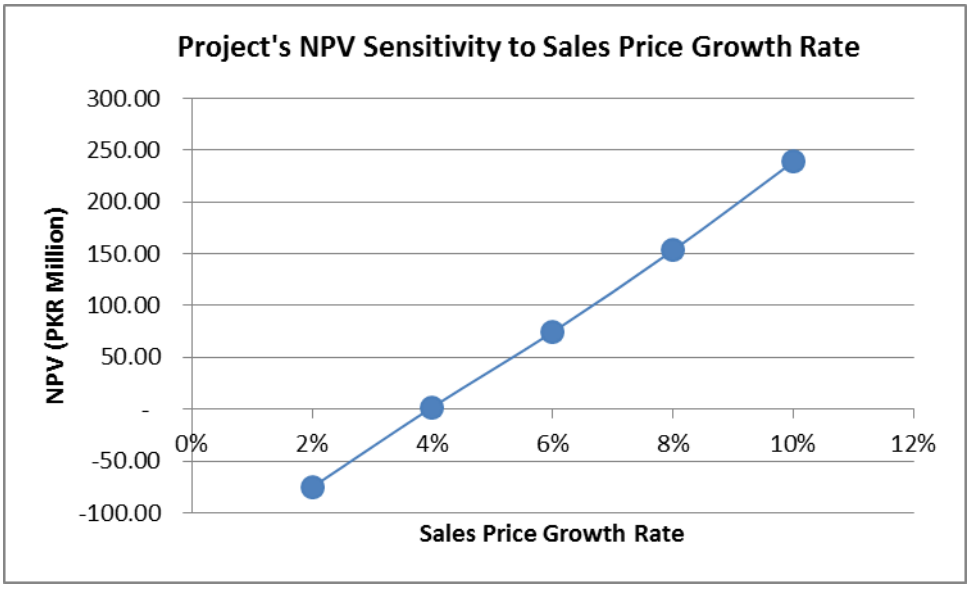


Figure 40 – Project's Sensitivity to Sales Price Growth Rate

The project remains in the feasible range as long as the sales prices of the final products grow above 4% per annum. Below this value, the project becomes financially unviable.

6.8.2 Project's Sensitivity to Raw Material Growth Rate

Raw material prices have been assumed to grow at 10% per annum. Just like market sale prices, the raw material (fresh vegetables) prices are also driven by demand-supply dynamics and the project does not have any control on those. Therefore a sensitivity analysis was carried out to know the fluctuations beyond which the project becomes infeasible. Project's profitability direct decreases with increase in raw material prices Drop in NPV with increase in annual growth rate of fresh vegetables prices is shown in Figure 41.

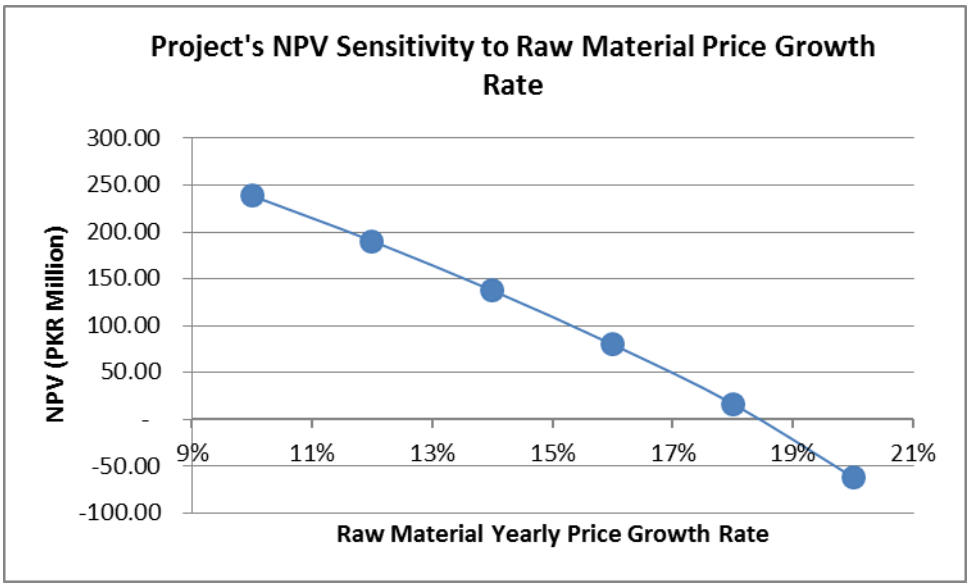


Figure 41 – Project's Sensitivity to Raw Material Price Growth Rate

Project was found to be financially viable up to annual increase of about 18.5% in the prices of fresh vegetables/fruits. The threshold is quite above the average inflation rate and thus the risk to project's viability due to increase in raw material prices should not be considered high.

6.8.3 Project's Sensitivity to Land Price

The project assumes that land will be available in special economic zones at rates lower than the market rates. Impact on project's viability was analyzed in case the assumption could not materialize and the project has to be established on land available on market rates. Figure 42 shows the results.

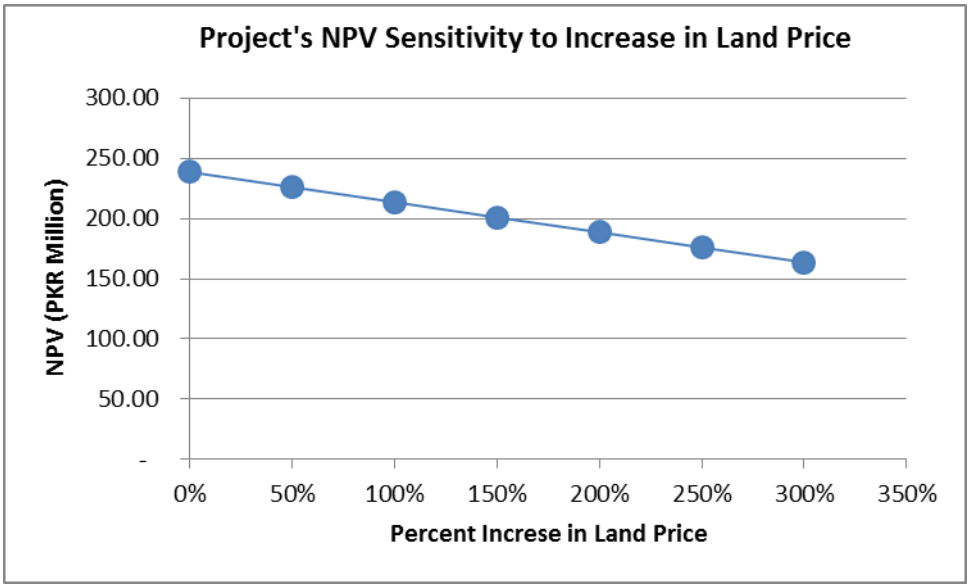


Figure 42 – Project's Sensitivity to Increase in Land Price

The project is seen to be fairly safe with increase in land prices. NPV remains positive even if land is acquired at four times of the cost that has been used in project's calculations.

6.8.4 Project's Capacity to Absorb Debt

The project has been assumed to be financed solely with equity. Addition of debt in the project's capital structure directly affects the NPV due to added cost of interest payments and additional cash outflows for principle repayments. Figure 43shows that the project has a significant capacity to absorb debt. NPV remains positive even for an 80% share of debt (15% p.a. for 10 years).

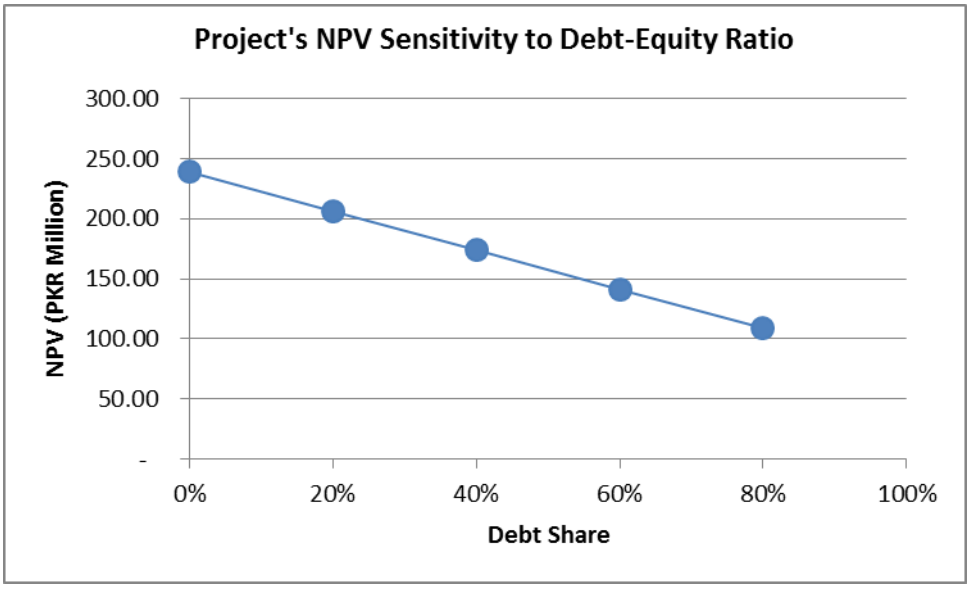


Figure 43 – Project's NPV Capacity to Absorb Debt

Impact of debt on profitability ratio was also analyzed. Net profit margin was found to be falling by about 0.6% with every 10% increase of debt in capital structure. Thus the project has a good capacity to absorb debt cost. Figure 44 shows the results.

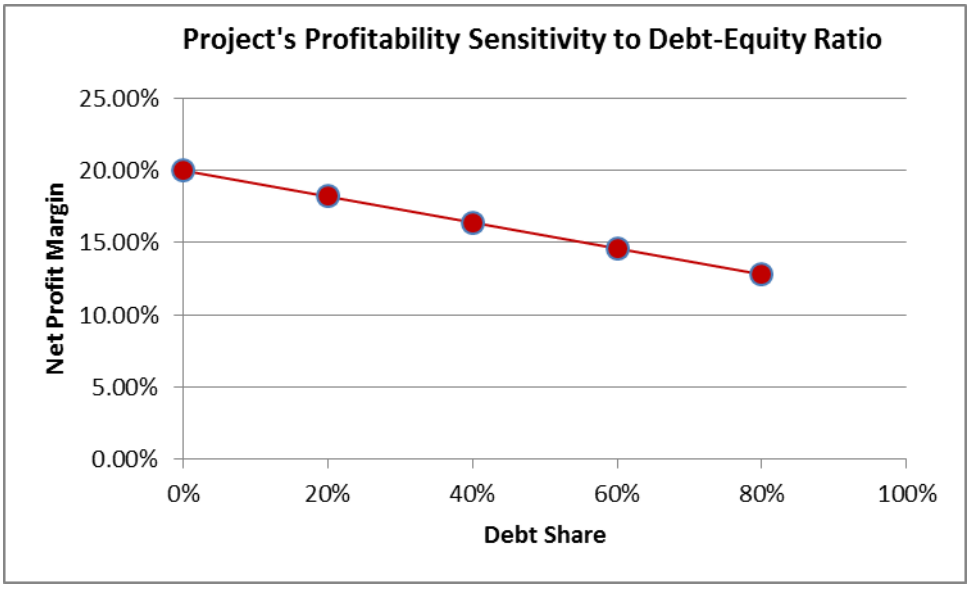
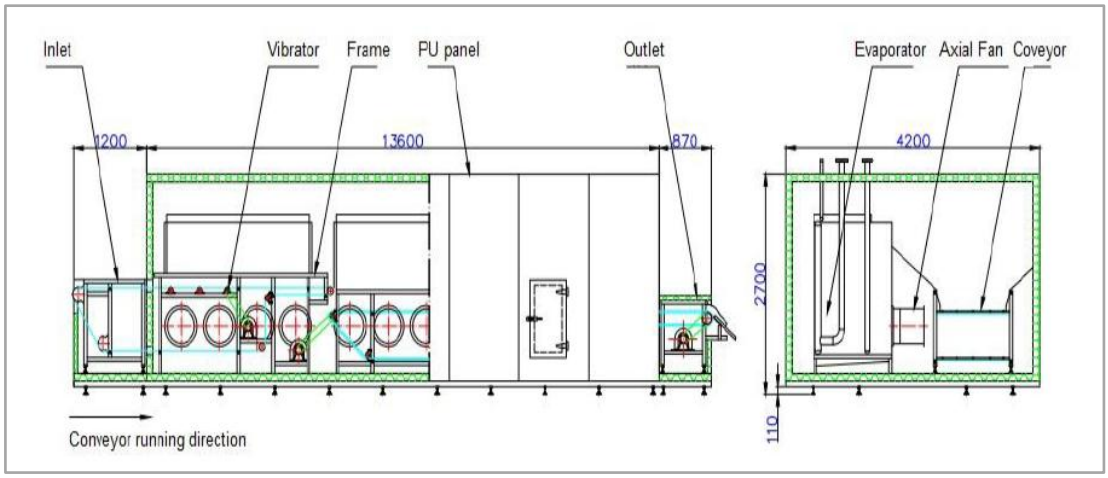


Figure 44 – Project's Profit Margin's Sensitivity to Debt Share

7.0 ANNEXES

7.1 Annex I – Technical Specifications

7.1.1 Annex I-A –IQF Tunnel Layout



7.1.2 Annex I-B - Freezing Store Details

Description

Main product	Green Bean;Mango dice and other fruits
Capacity	2000kg/h
Freezing time	Adjustable\Continuously

Working condition

Inlet T.	+15℃
Outlet T.	-18℃
Evaporating T.	-40℃
Inside T.	-33℃
Power data	380V,3ph,50hz

Technical parameters

Dimension(L*W*H)	13600mm×4200mm×2700mm
Effective width of net belt	1200mm
Height of input channel	100mm
Length of inlet	1200mm
Length of outlet	870mm
Cold consumption	320KW
Installation power	66.9KW
Conveyor motor	1.1KW*2
Conveyor dry pump	3.0kw
Vibrator motor	2.2kw*2
Fan Type\blade\power\Qty	Centrifuge fan\Aluminum\5.5KW\\10sets
Coil management	Multiple supplement
Evaporator type\Case material	SS pipe and Aluminum fin\SS
Liquid supply	4— Φ 38
Gas back	4— Φ 108
Defrosting Type	Water defrosting
Defrosting pipe	4— Φ 60
Defrosting interval time	16—20hrs
Refrigerant	R717

COLD ROOM DETAILS

Dimensions	:	Please refer to attached drawing
Freezer 1 & 2	:	22,900 mm x 21,100 mm x 8,500 mm high (External) divided into two rooms with the help of 21000 mm partition wall
Freezer 3 & 4	:	22,900 mm x 21,100 mm x 8,500 mm high (External) divided into two rooms with the help of 21000 mm partition wall
Corridor	:	5,000 mm x 22,900 mm x 5,000 mm (H) Two walls of 22,900 mm are common walls of cold rooms
Loading/Docking Area	:	5000 mm x 18900 mm x 5000 mm (H) External
Product	:	Frozen Veg
Room required Temp	:	-20°C ~ -25°C
Product incoming Temp	:	-18°C
Pull Down Time	:	25,000 kg in 24 hrs.
Ambient Temp	:	43°C (Max)

FREEZER ROOMS:

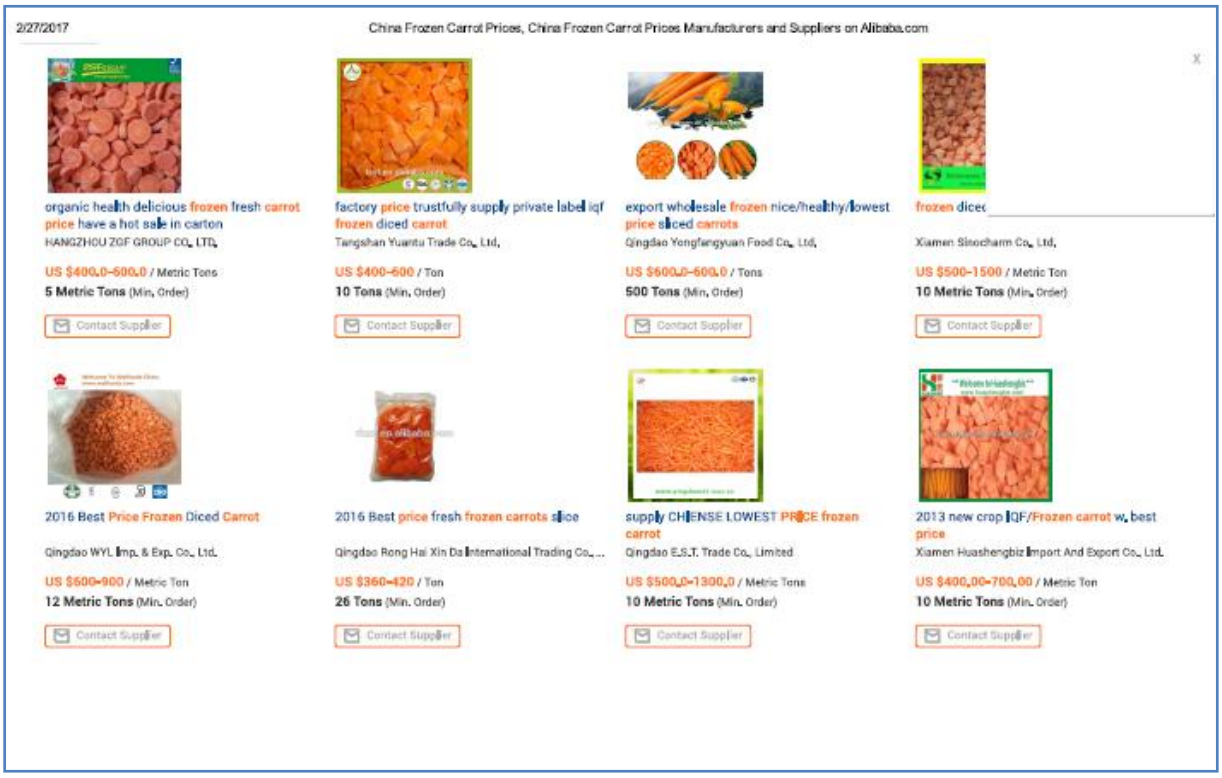
Condensing Unit	:	Bock – Germany, Single Stage Air-Cooled Condensing Unit Model: SHGX6/1240-4L (35HP)
Evaporator	:	Eco –LUVATA, Italy matching Ceiling Mounted Evaporator Model: CTE 502B6ED (DT 6)
Refrigeration	:	R404A
Quantity	:	8 nos. (Two units in each Freezer Room)

CORRIDOR & LOADING/DOCKING AREA:

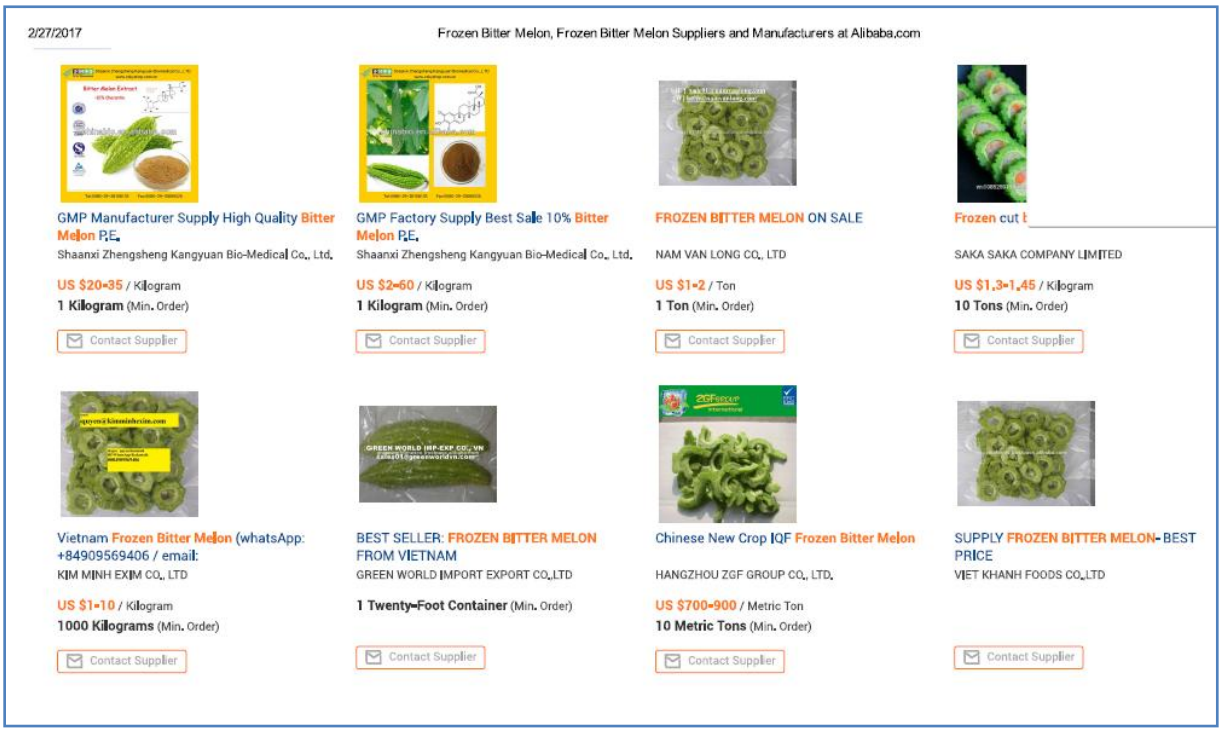
Condensing Unit	:	Bock – Germany, Single Stage Air-Cooled Condensing Unit Model: SHGX22e/125-4SL (R22)
Evaporator	:	Eco –LUVATA, Italy matching Ceiling Mounted Evaporator Model: CTE 96M6 ED (DT 9.5) **15m air throw**
Quantity	:	4 nos. (Two units in Corridor and Two in Docking Area)

7.2 Annex II – Online Prices of Dried Vegetables/Fruits

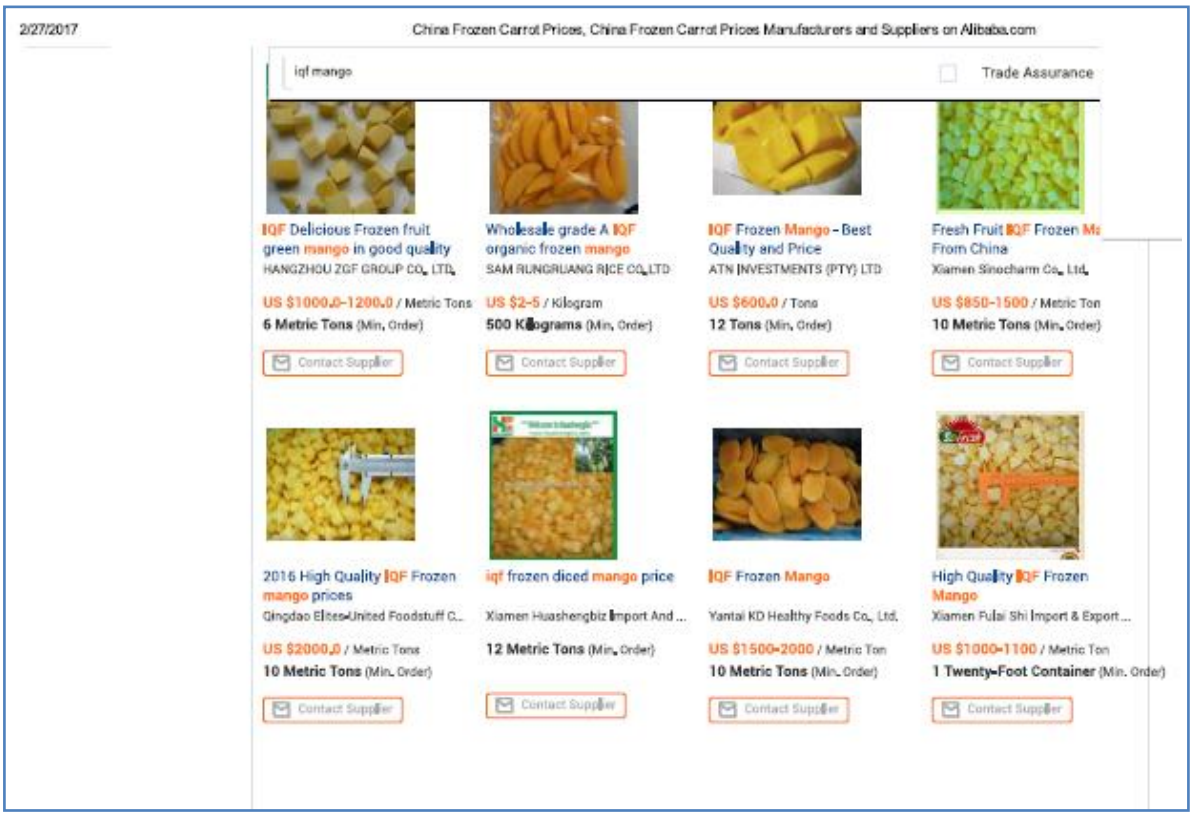
7.2.1 Annex II-A - Online Frozen Carrot Prices



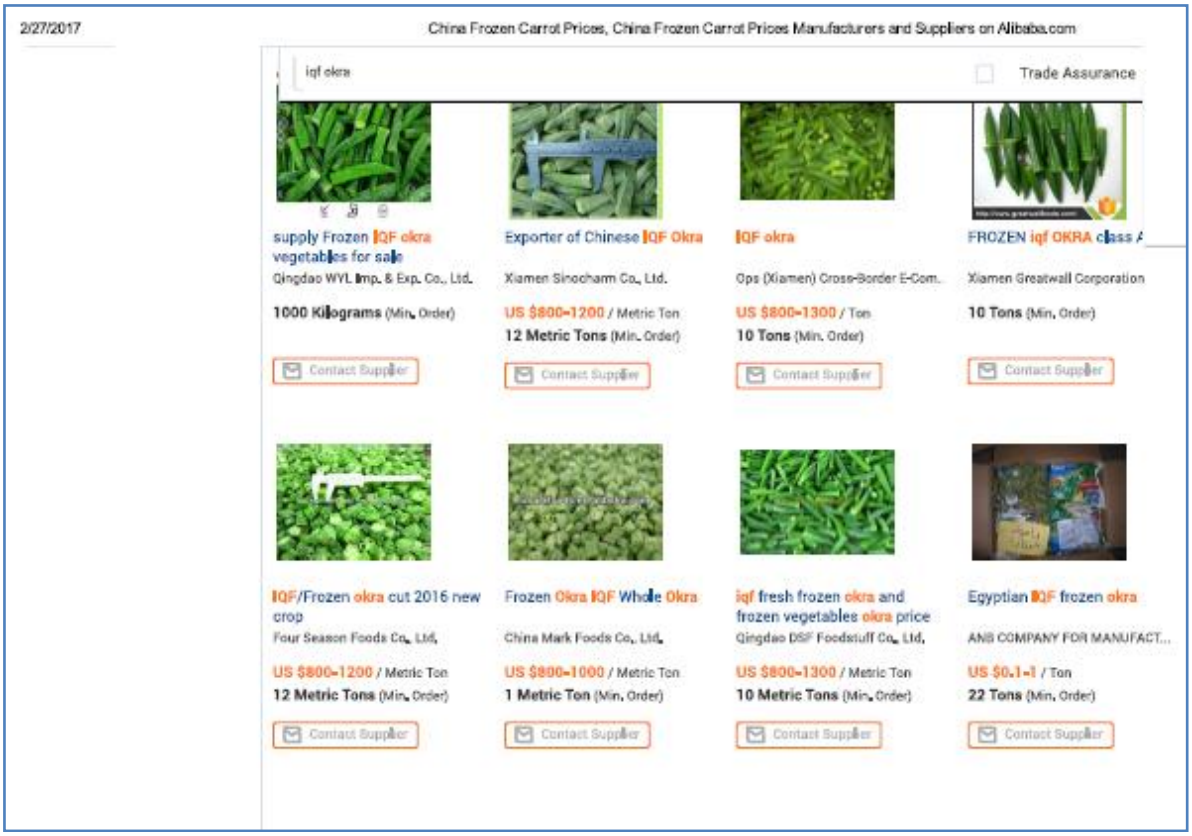
7.2.2 Annex II-B - Online Frozen Bitter Gourd Prices



7.2.3 Annex II-C Online Frozen Mango Prices



7.2.4 Annex II-D - Online Okra Prices



7.3 Annex III – Details of Feasibility Calculations

7.3.1 Annex III-A - Revenue Calculations

Frozen Peas	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Volume produced (kg)	403,200	537,600	672,000	672,000	672,000	672,000	672,000	672,000	672,000	672,000
Selling price (Rs/kg)	106	116	128	141	155	170	187	206	227	249
Revenues from Frozen Peas (PKR)	**42,623,348**	**62,514,244**	**85,957,086**	**94,552,795**	**104,008,074**	**114,408,881**	**125,849,770**	**138,434,747**	**152,278,221**	**167,506,043**

Frozen Potatoes	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Volume produced (kg)	518,400	691,200	864,000	864,000	864,000	864,000	864,000	864,000	864,000	864,000
Selling price (Rs/kg)	76	83	92	101	111	122	134	147	162	178
Revenues from Frozen Potatoes (PKR)	**39,227,531**	**57,533,712**	**79,108,854**	**87,019,739**	**95,721,713**	**105,293,884**	**115,823,273**	**127,405,600**	**140,146,160**	**154,160,776**

Frozen Carrot	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Volume produced (kg)	556,800	742,400	928,000	928,000	928,000	928,000	928,000	928,000	928,000	928,000
Selling price (Rs/kg)	74	81	90	98	108	119	131	144	159	174
Revenues from Frozen Carrot (PKR)	**41,203,200**	**60,431,360**	**83,093,120**	**91,402,432**	**100,542,675**	**110,596,943**	**121,656,637**	**133,822,301**	**147,204,531**	**161,924,984**

Frozen Spinach	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Volume produced (kg)	576,000	768,000	960,000	960,000	960,000	960,000	960,000	960,000	960,000	960,000
Selling price (Rs/kg)	94	103	113	125	137	151	166	182	201	221
Revenues from Frozen Spinach (PKR)	**53,936,262**	**79,106,518**	**108,771,462**	**119,648,609**	**131,613,469**	**144,774,816**	**159,252,298**	**175,177,528**	**192,695,281**	**211,964,809**

Frozen Bitter Gourd	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Volume produced (kg)	268,800	358,400	448,000	448,000	448,000	448,000	448,000	448,000	448,000	448,000
Selling price (Rs/kg)	110	121	133	146	161	177	195	214	236	259
Revenues from Frozen Bitter Gourd (PKR)	**29,568,000**	**43,366,400**	**59,628,800**	**65,591,680**	**72,150,848**	**79,365,933**	**87,302,526**	**96,032,779**	**105,636,057**	**116,199,662**

Frozen Okra	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Volume produced (kg)	412,800	550,400	688,000	688,000	688,000	688,000	688,000	688,000	688,000	688,000
Selling price (Rs/kg)	90	99	109	120	132	145	159	175	193	212
Revenues from Frozen Okra (PKR)	**37,152,000**	**54,489,600**	**74,923,200**	**82,415,520**	**90,657,072**	**99,722,779**	**109,695,057**	**120,664,563**	**132,731,019**	**146,004,121**

Frozen Mango	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Volume produced (kg)	432,000	576,000	720,000	720,000	720,000	720,000	720,000	720,000	720,000	720,000
Selling price (Rs/kg)	180	198	218	240	264	290	319	351	386	424
Revenues from Frozen Mango Slices (PKR)	**77,760,000**	**114,048,000**	**156,816,000**	**172,497,600**	**189,747,360**	**208,722,096**	**229,594,306**	**252,553,736**	**277,809,110**	**305,590,021**

TOTAL	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Total Product Volume produced (kg)	3,168,000	4,224,000	5,280,000	5,280,000	5,280,000	5,280,000	5,280,000	5,280,000	5,280,000	5,280,000
Total Revenues (PKR)	**321,470,341**	**471,489,834**	**648,298,522**	**713,128,374**	**784,441,211**	**862,885,333**	**949,173,866**	**1,044,091,253**	**1,148,500,378**	**1,263,350,416**

7.3.2 Annex III-B – Vegetables/Fruits Cost Calculations

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Frozen Peas										
Volume produced (kg)	403,200	537,600	672,000	672,000	672,000	672,000	672,000	672,000	672,000	672,000
Fruit/Vegetable Required for processing	806,400	1,075,200	1,344,000	1,344,000	1,344,000	1,344,000	1,344,000	1,344,000	1,344,000	1,344,000
Fruit Cost (Rs/kg)	37.4	41	45	50	55	60	66	73	80	88
Peas cost (Rs)	**30,174,278**	**44,255,608**	**60,851,461**	**66,936,608**	**73,630,268**	**80,993,295**	**89,092,625**	**98,001,887**	**107,802,076**	**118,582,283**
Frozen Potatoes										
Volume produced (kg)	518,400	691,200	864,000	864,000	864,000	864,000	864,000	864,000	864,000	864,000
Fruit/Vegetable Required for processing	648,000	864,000	1,080,000	1,080,000	1,080,000	1,080,000	1,080,000	1,080,000	1,080,000	1,080,000
Fruit Cost (Rs/kg)	10.6	12	13	14	16	17	19	21	23	25
Potatoes cost (Rs)	**6,860,700**	**10,062,360**	**13,835,745**	**15,219,320**	**16,741,251**	**18,415,377**	**20,256,914**	**22,282,606**	**24,510,866**	**26,961,953**
Frozen Carrot										
Volume produced (kg)	556,800	742,400	928,000	928,000	928,000	928,000	928,000	928,000	928,000	928,000
Fruit/Vegetable Required for processing	696,000	928,000	1,160,000	1,160,000	1,160,000	1,160,000	1,160,000	1,160,000	1,160,000	1,160,000
Fruit Cost (Rs/kg)	12.6	14	15	17	18	20	22	25	27	30
Carrot cost (Rs)	**8,786,652**	**12,887,090**	**17,719,748**	**19,491,723**	**21,440,895**	**23,584,985**	**25,943,483**	**28,537,832**	**31,391,615**	**34,530,776**
Frozen Spinach										
Volume produced (kg)	576,000	768,000	960,000	960,000	960,000	960,000	960,000	960,000	960,000	960,000
Fruit/Vegetable Required for processing	822,857	1,097,143	1,371,429	1,371,429	1,371,429	1,371,429	1,371,429	1,371,429	1,371,429	1,371,429
Fruit Cost (Rs/kg)	15.4	17	19	20	22	25	27	30	33	36
Spinach cost (Rs)	**12,640,320**	**18,539,136**	**25,491,312**	**28,040,443**	**30,844,488**	**33,928,936**	**37,321,830**	**41,054,013**	**45,159,414**	**49,675,356**
Frozen Bitter Gourd										
Volume produced (kg)	268,800	358,400	448,000	448,000	448,000	448,000	448,000	448,000	448,000	448,000
Fruit/Vegetable Required for processing	298,667	398,222	497,778	497,778	497,778	497,778	497,778	497,778	497,778	497,778
Fruit Cost (Rs/kg)	14.5	16	18	19	21	23	26	28	31	34
Bitter Gourd cost (Rs)	**4,338,133**	**6,362,596**	**8,748,569**	**9,623,426**	**10,585,768**	**11,644,345**	**12,808,780**	**14,089,658**	**15,498,623**	**17,048,486**
Frozen Okra										
Volume produced (kg)	412,800	550,400	688,000	688,000	688,000	688,000	688,000	688,000	688,000	688,000
Fruit/Vegetable Required for processing	485,647	647,529	809,412	809,412	809,412	809,412	809,412	809,412	809,412	809,412
Fruit Cost (Rs/kg)	90.0	99	109	120	132	145	159	175	193	212
Okra Cost (Rs)	**43,708,235**	**64,105,412**	**88,144,941**	**96,959,435**	**106,655,379**	**117,320,917**	**129,053,008**	**141,958,309**	**156,154,140**	**171,769,554**
Frozen Mango										
Volume produced (kg)	432,000	576,000	720,000	720,000	720,000	720,000	720,000	720,000	720,000	720,000
Fruit/Vegetable Required for processing	785,455	1,047,273	1,309,091	1,309,091	1,309,091	1,309,091	1,309,091	1,309,091	1,309,091	1,309,091
Fruit Cost (Rs/kg)	41.6	46	50	55	61	67	74	81	89	98
Mango Cost (Rs)	**32,700,436**	**47,960,640**	**65,945,880**	**72,540,468**	**79,794,515**	**87,773,966**	**96,551,363**	**106,206,499**	**116,827,149**	**128,509,864**
Total Vegetable/Fruit Required for Proc	**4,543,025**	**6,057,367**	**7,571,709**	**7,571,709**	**7,571,709**	**7,571,709**	**7,571,709**	**7,571,709**	**7,571,709**	**7,571,709**
Total Vegetables/Fruits Cost (Rs)	**139,208,755**	**204,172,841**	**280,737,657**	**308,811,422**	**339,692,565**	**373,661,821**	**411,028,003**	**452,130,804**	**497,343,884**	**547,078,272**

7.3.3 Annex III-C - Electricity Supply Tariff

B Industrial Supply Tariff										
					GOP Tarrif Rtionalization					
					Government Subsidy			Surcharge		
Sr. No.	Tariff Category/Particulars	Fixed Charges Rs/KW/M	Variable Charges (Rs/KWh)		Fixed Charges Rs/Kw/M	Variable Charges Rs/Kw/M		Variable Charges Rs/Kw/M	
B1 (a	Up to 25 kw (at 400/230 volts)	-	12		-	-	-		2.5
B2(a)	exceeding 25-500 Kw (at 400 Volts)	400	11.5		-	-	-		2.5
	Time of Use		Peak	Off-Peak		Peak	Off-Peak	Peak	Off-Peak
B1 (b)	Up to 25 kw	-	15	9.5	-	-	-	3	3
B2 (b)	exceeding 25-500 Kw (at 400 Volts)	400	15	9.5	-	-	-	3	2.99
B3	For All Loads up to 5000 KW(at 11,33 KV)	380	15	9.5	-	-	-	3	3.1
B4	For All Loads (at 66,132 KV & above)	360	15	9.5	-	-	-	3	3.1
For B1 consumers there shall be fixed minimum charge of Rs. 350 per month.									
For B2 consumers there shall be fixed minimum charge of Rs. 2,000 per month.									
For B3 consumers there shall be fixed minimum charge of Rs. 50,000 per month.									
For B4 consumers there shall be fixed minimum charge of Rs. 500,000 per month.									

PEAK / OFF PEAK TIMINGS		
Season	Peak Timing	Off-Peak Timing
Dec to Feb	5 PM to 9 PM	Remaining 20 hours
Mar to May	6 PM to 10 PM	-do-
Jun to Aug	7 PM to 11 PM	-do-
Sep to Nov	6 PM to 10 PM	-do-

7.3.4 Annex III-D - Depreciation/Amortization Schedule

		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
	Rate	Opening Balance	Depreciation	Depreciation	Depreciation	Depreciation	Depreciation	Depreciation	Depreciation	Depreciation	Depreciation	Depreciation
Land	0%	30,000,000	-	-	-	-	-	-	-	-	-	-
IQF Tunnel	10%	23,625,000	2,362,500	2,362,500	2,362,500	2,362,500	2,362,500	2,362,500	2,362,500	2,362,500	2,362,500	2,362,500
Building & Civil Works	5%	51,068,494	2,553,425	2,553,425	2,553,425	2,553,425	2,553,425	2,553,425	2,553,425	2,553,425	2,553,425	2,553,425
Freezing rooms and Other machinery	10%	61,730,651	6,173,065	6,173,065	6,173,065	6,173,065	6,173,065	6,173,065	6,173,065	6,173,065	6,173,065	6,173,065
Office Equipment	20%	1,430,000	286,000	286,000	286,000	286,000	286,000	-	-	-	-	-
Vehicles	20%	800,000	160,000	160,000	160,000	160,000	160,000	-	-	-	-	-
Total		**168,654,145**	**11,534,990**	**11,534,990**	**11,534,990**	**11,534,990**	**11,534,990**	**11,088,990**	**11,088,990**	**11,088,990**	**11,088,990**	**11,088,990**

Year End Value

		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Land		30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000
IQF Tunnel		23,625,000	21,262,500	18,900,000	16,537,500	14,175,000	11,812,500	9,450,000	7,087,500	4,725,000	2,362,500	-
Building & Civil Works		51,068,494	48,515,069	45,961,645	43,408,220	40,854,795	38,301,371	35,747,946	33,194,521	30,641,096	28,087,672	25,534,247
Freezing rooms and Other machinery		61,730,651	55,557,586	49,384,521	43,211,456	37,038,391	30,865,326	24,692,260	18,519,195	12,346,130	6,173,065	- 0
Office Equipment		1,430,000	1,144,000	858,000	572,000	286,000	-	-	-	-	-	-
Vehicles		800,000	640,000	480,000	320,000	160,000	-	-	-	-	-	-
Total		**168,654,145**	**157,119,155**	**145,584,165**	**134,049,176**	**122,514,186**	**110,979,196**	**99,890,206**	**88,801,216**	**77,712,227**	**66,623,237**	**55,534,247**

AMORTIZATION SCHEDULE

	Rate	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Pre-operating Expenses	20%	12,208,425	2,441,685	2,441,685	2,441,685	2,441,685	2,441,685	-	-	-	-	-
Accumulated Amortization cost			2,441,685	4,883,370	7,325,055	9,766,740	12,208,425	12,208,425	12,208,425	12,208,425	12,208,425	12,208,425
Year end value		12,208,425	9,766,740	7,325,055	4,883,370	2,441,685	-	-	-	-	-	-