

# Pre-Feasibility Study

## OFF-SEASON VEGETABLE FARMING (Low Tunnel)



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<b>1</b>	<b>EXECUTIVE SUMMARY .....</b>	<b>5</b>
<b>2</b>	<b>INTRODUCTION TO SMEDA .....</b>	<b>6</b>
<b>3</b>	<b>PURPOSE OF THE DOCUMENT .....</b>	<b>6</b>
<b>4</b>	<b>PROJECT PROFILE .....</b>	<b>7</b>
4.1	OPPORTUNITY RATIONALE.....	7
4.2	PROJECT BRIEF.....	7
4.3	PROPOSED BUSINESS LEGAL STATUS .....	8
4.4	PROPOSED CAPACITY .....	8
4.5	ADVANTAGES .....	8
4.6	VIABLE ECONOMIC FARM SIZE .....	9
4.7	PROCESS FLOW CHART .....	9
4.8	PRODUCTION FLOW OF OFF-SEASON VEGETABLES .....	9
<b>5</b>	<b>CURRENT INDUSTRY STRUCTURE .....</b>	<b>10</b>
5.1	OFF SEASON VEGETABLE GROWERS .....	10
5.2	VEGETABLES SUITABLE FOR TUNNEL FARMING .....	10
5.3	PRESENT PRODUCTION OF VEGETABLES .....	11
5.4	CLUSTERS OF OFF-SEASON VEGETABLE PRODUCTION.....	11
<b>6</b>	<b>TECHNICAL ANALYSIS.....</b>	<b>11</b>
6.1	PLANTATION AND GROWTH ESSENTIALS .....	11
6.2	FERTILIZERS ON PRODUCTION.....	11
6.3	SOWING & PICKING PERIOD OF OFF-SEASON VEGETABLES .....	12
6.4	OFF-SEASON CULTIVATION METHODS .....	12
6.4.1	<i>Natural method by selection of appropriate area .....</i>	<i>12</i>
6.4.2	<i>Artificial Methods.....</i>	<i>12</i>
6.5	STRUCTURES .....	13
6.5.1	<i>Height based structures.....</i>	<i>13</i>
6.5.2	<i>Material based structures.....</i>	<i>13</i>
6.6	RECOMMENDED TUNNEL .....	13
6.6.1	<i>Support Structure .....</i>	<i>14</i>
6.7	SEED AND ITS IMPORTANCE .....	15
6.8	PRACTICAL TIPS FOR OFF-SEASON VEGETABLE FARMING.....	15
<b>7</b>	<b>LAND UTILIZATION.....</b>	<b>16</b>
7.1	SOIL PREPARATION AND SOWING.....	16
7.2	MATERIAL AVAILABILITY.....	16
7.3	EXPECTED PRODUCTION AND SALE PRICE.....	16
<b>8</b>	<b>HUMAN RESOURCE REQUIREMENT .....</b>	<b>17</b>
8.1	NUMBER OF STAFF REQUIRED.....	17
<b>9</b>	<b>MACHINERY AND TOOLS .....</b>	<b>17</b>
<b>10</b>	<b>FURNITURE AND FIXTURE.....</b>	<b>18</b>

<b>11</b>	<b>LAND AND BUILDING</b> .....	<b>18</b>
11.1	LAND AND BUILDING REQUIREMENT .....	18
11.2	UTILITIES REQUIRED .....	18
<b>12</b>	<b>PROJECT ECONOMICS</b> .....	<b>18</b>
<b>13</b>	<b>KEY SUCCESS FACTORS</b> .....	<b>19</b>
13.1	GUIDELINES FOR SUCCESSFUL CULTIVATION .....	19
<b>14</b>	<b>THREATS FOR THE BUSINESS</b> .....	<b>20</b>
<b>15</b>	<b>OPPORTUNITIES FOR THE BUSINESS</b> .....	<b>20</b>
<b>16</b>	<b>F.INANCIAL ANALYSIS</b> .....	<b>21</b>
16.1	PROJECT COST .....	21
16.2	RAW MATERIAL CALCULATIONS .....	22
16.3	PACKING CALCULATIONS.....	22
16.4	REVENUE CALCULATIONS .....	23
16.5	PROJECTED INCOME STATEMENT.....	24
16.6	PROJECTED CASH FLOW STATEMENT .....	25
16.7	PROJECTED BALANCE SHEET .....	26
<b>17</b>	<b>KEY ASSUMPTIONS</b> .....	<b>27</b>
<b>18</b>	<b>ANNEXURE</b> .....	<b>29</b>
18.1	TAX DEDUCTION INCOME SLABS .....	29

## 1 EXECUTIVE SUMMARY

The proposed project is a medium size off-season vegetable farming unit, spreading over a land area of 7.5 acres on the outskirts of Lahore. Off-season vegetables are proposed to be cultivated in this project using low tunnel technology. The three vegetables assumed to be cultivated in this particular project are watermelon, muskmelon and pumpkin. The approximate total time from land preparation to harvesting time is around 8 months.

There is great demand of vegetables all year round and the price is high at the start of the season and at the end of the season. If modern techniques are applied to grow off season vegetable, high prices can be fetched. Vegetables can be cultivated in off-season, with the induction of an artificial technique like tunnel technology, in which temperature and moisture is controlled for specific growth of vegetables. The production of vegetables all around the year enables the growers to fully utilize their resources and supplement income from vegetable growing as compared to other normal agricultural crops. As the landholding power of farmers is decreasing, they need to increase the productivity of their available land, off-season vegetable farming is a measure through which they can attain higher profit margins from the crop.

Tunnel farming is gaining popularity, and being practiced in many areas of Punjab like, Faisalabad, Mamokanjan, Gujranwala, Okara, Sahiwal. But still their cultivation is not at a level to be exported. Farmers are also unaware of their potential. Awareness programmes are helpful as Punjab government is already doing its effort to introduce this technology.

The total initial cost for setting up the low tunnel farm is estimated at Rs. 1.338 million. The project is proposed to be financed through 50% debt and 50% equity. The project NPV is projected around Rs. 2.018 million, with an IRR of 34% and a payback period of 4.20 years. The legal business status of this project is proposed as 'Sole Proprietorship'.

The estimated yield potential of the farm varies according to the selected type of vegetable. The proposed vegetable mix is watermelon, muskmelon and pumpkin each cultivated on 2.5 acres of land. The quantity of seeds sown each year on 7.5 acres of land is 750 grams watermelon seeds, 1,000 grams of muskmelon seeds and 2,000 grams of pumpkin seeds. The estimated produce would be 51 tonnes of watermelon, 53 tonnes muskmelon and 38 tonnes of pumpkin excluding 15% wastage.

## **2 INTRODUCTION TO SMEDA**

The Small and Medium Enterprises Development Authority (SMEDA) was established with an objective to provide fresh impetus to the economy through the launch of an aggressive SME support program.

Since its inception in October 1998, SMEDA had adopted a sectoral SME development approach. A few priority sectors were selected on the criterion of SME presence. In depth research was conducted and comprehensive development plans were formulated after identification of impediments and retardants. The all-encompassing sectoral development strategy involved recommending changes in the regulatory environment by taking into consideration other important aspects including finance, marketing, technology and human resource development.

SMEDA has so far successfully formulated strategies for industries such as horticulture, including export of fruits and vegetables, marble and granite, gems and jewellery, marine fisheries, leather and footwear, textiles, surgical instruments, transport, dairy etc. Whereas the task of SME development at a broader scale still requires more coverage and enhanced reach in terms of SMEDA's areas of operation.

Along with the sectoral focus a broad spectrum of business development services is also offered to the SMEs by SMEDA. These services include identification of viable business opportunities for potential SME investors. In order to facilitate these investors, SMEDA provides business guidance through its help desk services as well as development of project specific documents. These documents consist of information required to make well-researched investment decisions. Pre-feasibility studies and business plan development are some of the services provided to enhance the capacity of individual SMEs to exploit viable business opportunities in a better way.

This document is in continuation of this effort to enable potential investors to make well-informed investment decisions.

## **3 PURPOSE OF THE DOCUMENT**

The objective of this pre-feasibility study is primarily to facilitate potential entrepreneurs in project identification for investment. This pre-feasibility may form the basis of an important investment decision and in order to serve this objective, the document/study covers various aspects of project concept development, start-up, and production, marketing, finance and business management. The document also provides sector information and international scenario, which have some bearing on the project itself.

The purpose of this document is to facilitate potential investors of Low Tunnel Farming by providing them a macro and micro view of the business with the hope that the information provided herein will aid potential investors in crucial investment decisions.

This report is based on the information obtained from industry sources as well as discussions with businessmen. In the financial model, since forecast/projections relate to the future periods, actual results are likely to differ because of events and circumstances that do not occur as expected.

## 4 PROJECT PROFILE

### 4.1 Opportunity Rationale

Importance of vegetables in human diet cannot be ignored as they provide vitamins and minerals and are a major source of roughage that is helpful for digestion process. Vegetables also help to control cholesterol in our body. Many vegetables are famous for their low-caloric value being used by diet conscious people.

With increased health awareness in the general public and changing dietary patterns vegetables are now becoming an integral part of average household's daily meals. Additionally, high population growth rate (1.6%)<sup>1</sup> and availability of packaged vegetables, has generated a year round high demand for vegetables in the country.

In natural season local vegetables flood the markets bringing down the prices substantially. The demand of vegetables is high all year round and the price is high at the start of the season and at the end of the season. If modern techniques are applied to grow off season vegetable, high prices can be fetched. Increasing population of the world and shortage of land for agricultural use coined the idea of producing vegetables in tunnels. Vegetables can be cultivated in off-season, with the induction of this artificial technique, in which temperature and moisture is controlled for specific growth of vegetables. The production of vegetables all around the year enables the growers to fully utilize their resources and supplement income from vegetable growing as compared to other normal agricultural crops. As the landholding power of farmers is decreasing, they need to increase the productivity of their available land, off-season vegetable farming is a measure through which they can attain higher profit margins from the crop as compared to traditional farming.

Lack of developed vegetable processing and storage facility robs farmers from their due share of profit margins. In the absence of storage infrastructure and vegetable processing industry in the country, off-season vegetables farming is one of the most viable options that can add value to the farmer's produce.

### 4.2 Project Brief

The proposed project is designed as a medium sized off-season vegetable farming unit, spreading over a land area of 7.5 acres. Off-season vegetables, such as, tomatoes, chillies, cucumber, brinjal, hot pepper, sweet peppers, watermelon, muskmelon, pumpkin, ridge-gourd (teendi) and bitter-gourd (krela) can be cultivated using low tunnel technology. However for the purpose of this pre-feasibility three crops have been proposed, namely: watermelon, muskmelon and pumpkin.

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<sup>1</sup> [http://en.wikipedia.org/wiki/Demographics\\_of\\_Pakistan](http://en.wikipedia.org/wiki/Demographics_of_Pakistan)

The land can be utilized for green manuring during the idle period to maintain the fertility of soil. Apart from green manuring, the land can also be utilized for growing seasonal vegetables in the idle period.

The estimated yield potential of the farm varies according to the selected type of vegetable. For this project a mix of three proposed vegetables is listed below. For this vegetable mix it is estimated that a 7.5-acre farm unit will yield a total of 142,375 kg per season excluding 15% wastage.

### 4.3 Proposed Business Legal Status

The business legal status of the proposed project can either be sole proprietorship or partnership. Additionally, it can also be registered under the Companies Ordinance, 1984 with the Securities & Exchange Commission of Pakistan. The selection depends upon the choice of the Entrepreneur. This Pre-feasibility assumes the legal status to be Sole Proprietorship.

### 4.4 Proposed Capacity

The estimated yield potential of the farm varies according to the selected type of vegetable. The proposed vegetable mix is watermelon, muskmelon and pumpkin each cultivated on 2.5 acres of land. The quantity of seeds sown each year on 7.5 acres of land is 750 grams watermelon seeds, 1,000 grams of muskmelon seeds and 2,000 grams of pumpkin seeds. The estimated produce would be 51 tonnes of watermelon, 53 tonnes muskmelon and 38 tonnes of pumpkin excluding 15% wastage.

**Table 4-1 Total Production Capacity on the basis of low tunnel technology**

Vegetables	Area (acres)	Seeds sown (grams)	Total Production Quantity (kg)
Watermelon	2.5	750	51,000
Muskmelon	2.5	1000	53,125
Chillies	2.5	2000	38,250

### 4.5 Advantages

Benefits from year-round production include year-round income, retention of old customers, gain in new customers, and higher prices at times of the year when other local growers (who have only unprotected field crops) can not deliver vegetable produce. Other potential benefits of season extension technologies are higher yields and better quality. In winters for off season vegetables cultivation, high quality indeterminate seed is easily available in the markets. This indeterminate seed grows upwards with provided support similar to Pumpkin instead of spreading on ground. Therefore tunnel farming has increased the production of plants in even smaller areas. Farmers with small cultivating area can get benefits from plastic tunnel farming and can increase their income.

In plastic tunnel farming, problems due to less supply of water are alleviated by using drip system irrigation.



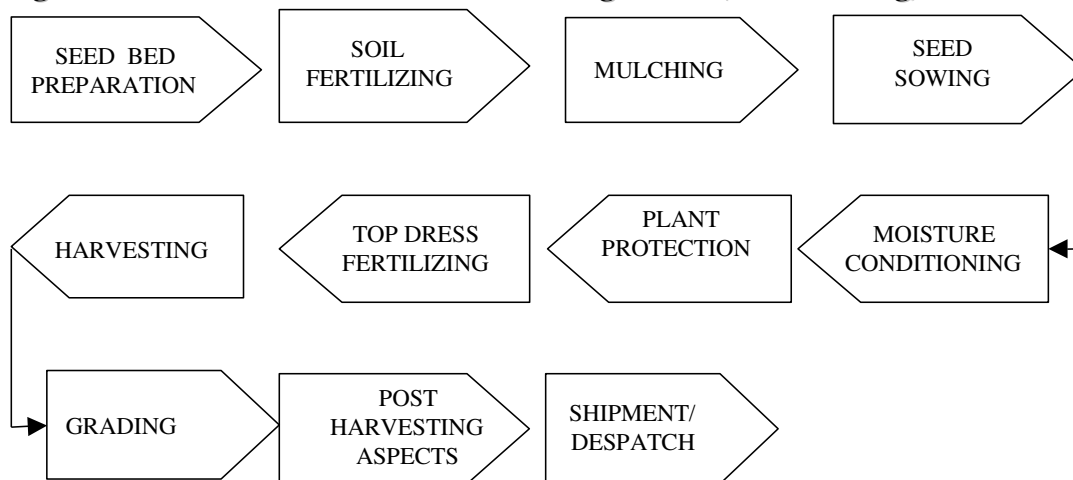
In addition, with year-round production you can provide extended or year-round employment for skilled employees whom you might otherwise lose to other jobs at the end of the outdoor growing season. Disadvantages include no break in the yearly work schedule, increased management demands, higher production costs, and plastic disposal problems.

#### 4.6 Viable Economic Farm Size

The proposed project is based on leased land of 7.5 acres, however the distance of the farm from the market will determine the feasible size of the project. Near large markets like Lahore, projects with smaller land holdings can be a viable option, and large land holdings are recommended for projects that are planned away from large markets.

#### 4.7 Process Flow Chart

**Figure 4-1 Production flow of off- season vegetables (direct sowing)**



#### 4.8 Production Flow of off-season vegetables

The production flow varies slightly for different vegetables. The following production flow is based on the production of watermelons:

- i. Preparation of seed beds in the field for cultivation of vegetables.
- ii. Using fertilizer in the soil to maintain its fertility.
- iii. Covering the furrows with black polyethylene as mulch to protect weeding.
- iv. Sowing of seeds directly in the soil.
- v. Maintaining level of moisture in the soil.
- vi. Protection from the pests, diseases and other wild growths by using pesticides/sprays of chemicals, and trimming.
- vii. Using fertilizer of different varieties for the smooth growth of plantation.
- viii. Picking/harvesting at various times as per nature/requirement of the

- plantation.
- ix. Grading of crop on the basis of quality and other standards.
  - x. Application of post harvesting technology for picking and storing the products.
  - xi. Transportation to the sale points in local or export markets.

## **5 CURRENT INDUSTRY STRUCTURE**

### **5.1 Off season vegetable growers**

At present, the tunnel technology is being used at the following places/farms.

- i. Mian Shadi Agri Farm, Mamonkangan, district Faisalabad
- ii. Haji Sons, Chiniot, Jhang
- iii. Ayub Agricultural Research Center, Faisalabad
- iv. National Agriculture Research Center (NARC) Chak Shahzad, Islamabad
- v. Jalandhar Vegetable Farm, Rahim Yar Khan
- vi. University of the Punjab, Lahore
- vii. Sindhu Farm, Kamalia, district T.T Singh
- viii. Sitara Farm, at Sitara Chemicals, Shah Kot, district Faisalabad

### **5.2 Vegetables Suitable for Tunnel Farming**

Growing under plastic is more competitive in today's vegetable market, it gives superior yields and early spring production. Few high value vegetables, which can be grown in off-season and provide significant increase in earnings, are as follows:

- Muskmelon
- Tomato
- Pepper
- Chillies
- Cucumber
- Bitter Gourds
- Squashes
- Pumpkin
- Watermelon
- Brinjal

### 5.3 Present Production of Vegetables

According to Agriculture Marketing Information Service, Govt. of Punjab 2008-09, the production statistics of various vegetables are shown in table below:

**Table 5-1 Production of various vegetables during the year 2008-09 (tonnes)**

Item	Punjab	Sindh	KPK	Balochistan	Pakistan
Tomato	72,475	100,921	161,828	226,667	561,891
Onion	300,515	660,171	136,442	607,015	1,704,143
Garlic	24,870	14,309	22,030	5,995	67,204
Chillies	8,590	172,171	749	6,182	187,692
Turmeric	33,640	170	2,343	--	36,153
Potato	2,782,683	3,026	121,005	34,606	2,941,320

### 5.4 Clusters of off-season vegetable production

As per the information gathered from Agriculture Department, Government of Punjab, and National Agricultural Research Center, Islamabad, following are the areas which could be identified as major existing clusters of off-season vegetable production:

Mamonkangan, Nankana Sahib, Faisalabad, Kamalia in Toba Tek Singh, Rahim Yar Khan, Chack Shahzad, Islamabad, Swat, Tarnab, Mardan, Khairabad, Mirpur Khas, Chiniot, etc.

## 6 TECHNICAL ANALYSIS

### 6.1 Plantation and Growth Essentials

There are 15 essential requirements for healthy growth of a plant. The requirement and their respective sources are provided in the following table:

**Table 6-1 Plantation growth essentials**

SOURCE	REQUIREMENT
Air & Water	Carbon, Hydrogen, Oxygen, Nitrogen, Phosphorus and Potash
Land	Calcium, Magnesium, Sulphur Iron, Copper, Zinc, Boron, Molybdenum, Manganese and Chlorine

### 6.2 Fertilizers on Production

By using fertilizers containing Nitrogen, Phosphorus and Potash the yield of the crop can be maximized. Good quality and appropriate quantity of fertilizer plays a great role in the production and quality of vegetables ultimately affecting overall cost of production.

### 6.3 Sowing & Picking period of off-season vegetables

Following are sowing and picking periods of selected off-season vegetables in their respective normal growing seasons:

**Table 6-2 Sowing and Picking period for the selected off-season vegetables**

Vegetables	Sowing Period	Picking Period
Muskmelon	<ul style="list-style-type: none"> <li>▪ 10<sup>th</sup>-20<sup>th</sup> December</li> <li>▪ November (transplantation)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Mid March to May</li> </ul>
Watermelon	<ul style="list-style-type: none"> <li>▪ 10<sup>th</sup>-20<sup>th</sup> November</li> </ul>	<ul style="list-style-type: none"> <li>▪ Mid March to May</li> </ul>
Pumpkin	<ul style="list-style-type: none"> <li>▪ 20<sup>th</sup> October - 10<sup>th</sup> November</li> </ul>	<ul style="list-style-type: none"> <li>▪ 2nd week of February to May</li> </ul>
Cucumber	<ul style="list-style-type: none"> <li>▪ End of October to end of December (direct seeding)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Mid January to May</li> </ul>
Sweet pepper/ Hot pepper	<ul style="list-style-type: none"> <li>▪ Mid of September to 1<sup>st</sup> week of October</li> <li>▪ End of October to 1<sup>st</sup> week of November (Transplantation)</li> </ul>	<ul style="list-style-type: none"> <li>▪ End of January to September</li> </ul>

### 6.4 Off-season cultivation methods

There are number of ways and methods to cultivate vegetables during the off-season. Some of the methods are explained as under:

#### 6.4.1 Natural method by selection of appropriate area

Off-season vegetables are grown in areas where climatic conditions are moderate for both normal and off-season vegetables. Winter vegetables are grown in summer on hilly/semi-hilly areas where climatic conditions are favourable for a particular vegetable. In the same way summer vegetables are grown in winter season in the valleys and across the sea areas.

The production cost of vegetables under given conditions is very high due to transportation of crop to the markets. Moreover, the transportation of crop over long distance markets causes post-harvest losses. These drawbacks lead to adoption of artificial methods of cultivation in off-season, nearer to markets to tackle heavy transportation cost and to reduce post-harvest losses.

#### 6.4.2 Artificial Methods

Vegetables can be grown in off-season through artificial methods; the detail of these methods is given below:

- **Growing Beneath the Sarkanda<sup>2</sup>**

This is an old method and is usually adopted near the big cities. The main vegetables grown under this method are tomato, chilli, cucumber, and bottle gourd. The nursery of these vegetables is planted in October/November and a wall of Sarkanda is affixed in the direction of North South, which protects plants from cold winds and mist. This method of cultivation is not beneficial because the growth of the plant tends to be slow, as the plant does not receive required sunshine and desired humidity.

- **Building of Green Houses**

Through building green houses, the sunshine intensity is controlled. The vegetables under this method are grown mostly in the winter season. Here the temperature, humidity, carbon dioxide, ventilation of air and irrigation etc. is controlled. Green houses can be built of plain glass or of fibreglass material. The main drawback in the usage of this method is heavy capital cost.

- **Plastic Tunnel**

Cultivation by this method is gaining popularity because of low cost and easy usage. Plastic tunnels are transparent which provide required sunshine to the plants, and the plastic also acts as a barrier against the cool air in winter.

## **6.5 Structures**

There are different types of tunnel structures which are used to grow off-season vegetables based on the height of tunnel and material used.

### **6.5.1 Height based structures**

- Low tunnel
- Walk-in tunnel
- High tunnel

### **6.5.2 Material based structures**

- Tunnel made by Bamboo
- Tunnel made by Iron material
- Tunnel made by Plastic pipe (PVC material)

## **6.6 Recommended Tunnel**

In this pre-feasibility study, cultivation is recommended with the use of low tunnels on the basis of its low construction cost.

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<sup>2</sup> *Sarkanda (Saccharum spontaneum)* is a tall, straight, grass, growing in clumps, having height up to 6 meters.

It is the cheapest among the available options and quite similar to conventional method. The tunnels are suitable for heavy individual fruit bearing vegetables, i.e. melons, watermelons, pumpkin, bitter gourds, squashes, etc. The crop yield in this type of tunnel is however low compared to other types. All calculations are done on the basis of low tunnel technology. The specifications of low tunnel are given in the following table:

**Table 6-3 Specifications of Low Tunnel**

<b>Material Specification</b>	Material	Plastic pipe (PVC material)
	Plastic pipe (PVC material)	Diameter 3/4 inch Length 9 ft
	Plastic	0.04 mm thick and 10 ft wide
<b>Tunnel Specification</b>	Height	3.5 ft, half moon shaped
	Width	4 ft
	Length	200 ft
	No. of tunnels	25 per acre

The cost of such tunnel amount to Rs.30,000 per acre excluding the cost related to plastic used as a shield (Cover) and mulch.

**Figure 6-1 Low Plastic Tunnels<sup>3</sup>**



### 6.6.1 Support Structure

Each tunnel will be 200 feet long, 3.5 feet high and 4 feet wide. The tunnel is built by 3/4 inch diameter plastic pipe (PVC material) of 9 feet length, in half moon shape. The plastic pipes are put at regular intervals of approximately 10-15 feet.

<sup>3</sup> Curtsey: Polo Aabyari, Tunnel Farming with Water Conservation Technologies, Shahdra, Lahore.

Each tunnel structure will then be covered by 0.04-mm thick and 10 feet wide plastic sheet. Approximately 25 tunnels can be constructed on an acre of land depending on the type of vegetable, i.e. watermelon, muskmelon or pumpkin.

**Figure 6-2 Support structure in low tunnels**



### **6.7 Seed and its Importance**

For tunnel cultivation, F1 hybrid seed is used, because they have the ability to resist multiple diseases. These hybrid seeds cost more than the ordinary seeds. The productivity and quality of the crop is ensured from quality of these seeds. Hybrid seeds have above 90% germination capacity as compared to that of ordinary one. The ordinary seed is produced from the crop itself whereas hybrid seed is produced through a special process. For every crop, new hybrid seed needs to be purchased / sown.

The crop yield achieved from hybrid seeds is 3 to 4 times higher than the ordinary seeds and is also less prone to diseases.

### **6.8 Practical Tips for off-season vegetable farming**

- Any person who is planning to adopt this technology should have some practical knowledge about agriculture and farming.
- Land that is being utilized for off-season vegetable farming should be tested which will help in determining the quality of soil for vegetable production.
- Farmer should ensure that the plants they are planning to grow must have the ability to self-pollinate under the plastic sheet.
- Selection of the seed is most important factor because the quality of seed determines the productivity of the crop.
- Vegetables, which are in demand should be cultivated, this will help in earning higher profit margins.

- Timing of cultivation of vegetables has to be done accurately. The farmer should have knowledge about the benefits of an early crop and he should gather data about the prices of these early crops.

## 7 LAND UTILIZATION

### 7.1 Soil Preparation and Sowing

- Laser levelling or with any precise method soil should be properly levelled
- Deep ploughing and harrowing.
- Apply well decomposed FYM 10 tonne per acre or green manuring is recommended at least 60 days before sowing.
- Apply basal dose chemical fertilizer one month before sowing followed by irrigation.
- Prepare soil, complete bed preparation and mulching one week before sowing.
- Make holes on mulch (plastic sheet) before seeding.
- Irrigate the field after seeding in such a way that moisture should reach the seed place.
- The next day, light irrigation should be repeated to assure proper moisture at seed place.

### 7.2 Material Availability

- Tunnel material i.e. iron rod, Plastic Sheet, Iron Wire, Bamboo, is available locally from different suppliers.
- Mian Shadi Agricultural Material Company, Syngenta Pakistan Ltd. and Haji Sons are the major suppliers of hybrid seeds.
- Fertilizers of all kinds are available locally.
- Pesticides of different kinds are also available locally.
- Water is available from canal or can be used from tube wells.

### 7.3 Expected Production and Sale price

Expected production and sale prices of some vegetables are given in table below:

**Table 7-1 Expected Production and Land Utilization**

Vegetable	Land Utilization (Acres)	Production Quantity (Kg/ Acre)	Production Quantity excl. Wastage (Kg)	Sale Price (Rs./ Kg )
Watermelon	2.5	24,000	51,000	15
Muskmelon	2.5	25,000	53,125	25



Pumpkin	2.5	18,000	38,250	15
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The prices of vegetables in normal season are around one-third of the prices of vegetables grown in off-seasons.

## 8 HUMAN RESOURCE REQUIREMENT

### 8.1 Number of Staff Required

Permanent staff required for the project is given in the table below.

**Table 8-1 Permanent staff requirement**

Description	Number	Monthly Salary per person (Rs.)	Annual Salary (Rs)
Farm Owner	1	20,000	160,000
Permanent Labour	3	8,000	192,000
<b>Total Salary</b>			<b>352,000</b>

Part time workers would be required during the picking season of three months. Five pickings per month are assumed with an average rate of Rs. 220 per picking. Following table shows the criteria for temporary labour salary:

**Table 8-2 Part-time staff requirement**

Description	Number	Salary (Rs. per hour)	Annual Salary (Rs)
Temporary Labour	11	Male: 220 Female: 220	272,250

## 9 MACHINERY AND TOOLS

Plant and machinery required for an off-season vegetable farm can be purchased or leased by paying on hourly basis. In this particular pre-feasibility we have assumed machinery for hoeing and land preparation would be leased and spray machine and some tools would be purchased.

**Table 9-1 Machinery and Tools purchased**

Description	Number	Cost per Unit (in Rs.)	Total Cost (in Rs.)
Farm Tools	1	5,000	5,000
Spray Machines	2	5,000	10,000
<b>Total cost of tools &amp; equipment</b>			<b>15,000</b>

## 10 FURNITURE AND FIXTURE

Table 10-1 shows the furniture requirement of the project and table 10-2 below represents the Tunnel equipment required for construction of tunnels:

**Table 10-1 Office Furniture and Fixtures**

Description	Unit	Unit Cost (Rs.)	Total Amount (Rs.)
Chairs	12	1,500	6,000

**Table 10-2 Requirement for low tunnel**

Description	Unit /Acre	Units for 7.5 acres	Unit Cost (Rs.)	Total Amount (Rs.)
PVC pipe material (No. / Acre)	500	3750	60	225,000
Plastic String (Kg / Acre)	10	75	120	9,000
Plastic (white) Cost (Kg / Acre)	100	750	192	144,000
Plastic Mulch (black)	25	188	207	38,813
<b>Total Cost</b>				<b>416,813</b>

## 11 LAND AND BUILDING

### 11.1 Land and Building requirement

Keeping in mind the weather conditions and population base, “off-season” vegetable farming project can be located near the big cities on fertile land. Big cities have adequate consumption of various vegetables. The project may be located on the outskirts of Lahore, Faisalabad, Sahiwal, Mardan, and Quetta.

For setting up a tunnel farm, land can either be purchased or rented out. In this pre-feasibility 7.5 acres of land is assumed to be rented for a season of 8 months.

### 11.2 Utilities Required

- Water
- Telephone (mobile)

## 12 PROJECT ECONOMICS

The total project cost is estimated around Rs. 1.338 million. The capital cost is estimated around Rs. 0.437 million and working capital of Rs. 0.900 million. The total cost, project returns and financial plan are given in the tables below:

**Table 12-1 Total Project Cost**

Account Head	Total Cost (Rs.)
Capital Cost	437,813
Working Capital Cost	900,483
<b>Total Project Cost</b>	<b>1,338,296</b>

**Table 12-2 Project Returns**

NPV (Rs.)	2,018,065
IRR	34%
Payback Period (Years)	4.20

**Table 12-3 Financing Plan**

Financing	Ratio	Rs.
Equity	50%	669,148
Debt	50%	669,148

## 13 KEY SUCCESS FACTORS

The commercial viability of the project depends upon the regular and consistent supply of good quality hybrid seeds and fertilizers. The other important aspect is the need for strong linkages with the local markets.

### 13.1 Guidelines for successful cultivation

Following principles need to be pursued for the best productivity of vegetables:

- Proper soil analysis for determining soil nutritional level.
- Use of high quality hybrid seeds.
- Fertile land and its maintenance within the tunnel during the period of cultivation.
- Selection of profitable vegetables on the basis of best analysis of cost and revenues for a given season. Cost efficiency through better management.
- Timely control of pests, diseases and exercise of preventive measures.
- Maintenance and control of internal temperature and humidity of the tunnel.
- Timely irrigation and fertilization.
- Timely training and grading of plantation.
- Fertilization should be done at the soil bed preparation stage. The second fertilization, after 3 weeks interval, the third after 6 weeks and finally during the harvesting period.
- Post harvest includes protection from direct sunlight and speedy transport to the market.

## **14 THREATS FOR THE BUSINESS**

- Crop failure in any year.
- Effect of change in the government regulations.
- Absence of crop insurance.

## **15 OPPORTUNITIES FOR THE BUSINESS**

- Hybrid seeds that provide higher yield can lead to lower unit cost.
- Off-season cultivation of high value vegetables will fetch better price and provide continuous supply to the processing industries.
- Higher prices can be obtained by producing the right crops, at the right times and of better quality. They may also depend on negotiating skills and targeting high price buyers.

## 16 FINANCIAL ANALYSIS

### 16.1 Project Cost

<b>Initial Investment</b>		
<b>Capital Investment</b>	<b>Rs. in actuals</b>	
Machinery & equipment		15,000
Furniture & fixtures		231,000
Tunnel equipment		191,813
<b>Total Capital Costs</b>		<b>437,813</b>
<b>Working Capital</b>	<b>Rs. in actuals</b>	
Raw material inventory		403,950
Upfront land rent		250,000
Cash		246,533
<b>Total Working Capital</b>		<b>900,483</b>
<b>Total Investment</b>		<b>1,338,296</b>
<b>Initial Financing</b>	<b>Rs. in actuals</b>	
Debt		669,148
Equity		669,148
<b>Project Returns</b>		
	EQUITY	PROJECT
Net Present Value (Rs.)	1,353,117	2,018,065
Internal Rate of Return	49%	34%
Payback Period (Yrs)	3.19	4.20



## 16.2 Raw material calculations

Raw material costs										
Total cost of seeds	Year-1	Year-2	Year-3	Year-4	Year-5	Year-6	Year-7	Year-8	Year-9	Year-10
Watermelon Seed	15,000	16,500	18,150	19,965	21,962	24,158	26,573	29,231	32,154	35,369
Muskmelon Seed	33,700	37,070	40,777	44,855	49,340	54,274	59,702	65,672	72,239	79,463
Pumpkin	20,000	22,000	24,200	26,620	29,282	32,210	35,431	38,974	42,872	47,159
<b>Total</b>	<b>68,700</b>	<b>75,570</b>	<b>83,127</b>	<b>91,440</b>	<b>100,584</b>	<b>110,642</b>	<b>121,706</b>	<b>133,877</b>	<b>147,265</b>	<b>161,991</b>
Total cost of fertilizer	Year-1	Year-2	Year-3	Year-4	Year-5	Year-6	Year-7	Year-8	Year-9	Year-10
Calcium Amonium Nitrate	21,000	23,100	25,410	27,951	30,746	33,821	37,203	40,923	45,015	49,517
Nitrophos	78,000	85,800	94,380	103,818	114,200	125,620	138,182	152,000	167,200	183,920
DAP	63,000	69,300	76,230	83,853	92,238	101,462	111,608	122,769	135,046	148,551
SOP	60,750	66,825	73,508	80,858	88,944	97,838	107,622	118,385	130,223	143,245
<b>Total</b>	<b>222,750</b>	<b>245,025</b>	<b>269,528</b>	<b>296,480</b>	<b>326,128</b>	<b>358,741</b>	<b>394,615</b>	<b>434,077</b>	<b>477,484</b>	<b>525,233</b>

## 16.3 Packing calculations

Packing Expense										
	Year-1	Year-2	Year-3	Year-4	Year-5	Year-6	Year-7	Year-8	Year-9	Year-10
Watermelon	-	-	-	-	-	-	-	-	-	-
Muskmelon	70,833	74,375	78,094	81,998	86,098	90,403	94,923	99,670	104,653	109,886
Pumpkin	51,000	53,550	56,228	59,039	61,991	65,090	68,345	71,762	75,350	79,118
<b>Total Packing expense</b>	<b>121,833</b>	<b>127,925</b>	<b>134,321</b>	<b>141,037</b>	<b>148,089</b>	<b>155,494</b>	<b>163,268</b>	<b>171,432</b>	<b>180,003</b>	<b>189,003</b>



## 16.4 Revenue calculations

<b>Sales Revenue</b>										
	<b>Year-1</b>	<b>Year-2</b>	<b>Year-3</b>	<b>Year-4</b>	<b>Year-5</b>	<b>Year-6</b>	<b>Year-7</b>	<b>Year-8</b>	<b>Year-9</b>	<b>Year-10</b>
<b>No. of Kgs per acre</b>										
Watermelon	24,000	24,000	24,000	24,000	24,000	24,000	24,000	24,000	24,000	24,000
Muskmelon	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
Pumpkin	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000
<b>Total Production in Kgs (excl. wastage)</b>										
Watermelon	51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000
Muskmelon	53,125	53,125	53,125	53,125	53,125	53,125	53,125	53,125	53,125	53,125
Pumpkin	38,250	38,250	38,250	38,250	38,250	38,250	38,250	38,250	38,250	38,250
	<b>142,375</b>	<b>142,375</b>	<b>142,375</b>	<b>142,375</b>	<b>142,375</b>	<b>142,375</b>	<b>142,375</b>	<b>142,375</b>	<b>142,375</b>	<b>142,375</b>
<b>Sales Price per kg</b>										
Watermelon	15	17	18	20	22	24	27	29	32	35
Muskmelon	25	28	30	33	37	40	44	49	54	59
Pumpkin	15	17	18	20	22	24	27	29	32	35
<b>Sales Revenue</b>										
Watermelon	765,000	841,500	925,650	1,018,215	1,120,037	1,232,040	1,355,244	1,490,769	1,639,845	1,803,830
Muskmelon	1,328,125	1,460,938	1,607,031	1,767,734	1,944,508	2,138,959	2,352,854	2,588,140	2,846,954	3,131,649
Pumpkin	573,750	631,125	694,238	763,661	840,027	924,030	1,016,433	1,118,076	1,229,884	1,352,872
Sale of empty bags of fertilizer	750	825	908	998	1,098	1,208	1,329	1,462	1,608	1,768
<b>Total sales Revenue</b>	<b>2,667,625</b>	<b>2,934,388</b>	<b>3,227,826</b>	<b>3,550,609</b>	<b>3,905,670</b>	<b>4,296,237</b>	<b>4,725,860</b>	<b>5,198,446</b>	<b>5,718,291</b>	<b>6,290,120</b>



## 16.5 Projected Income Statement

Income Statement										
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Revenue	2,667,625	2,934,388	3,227,826	3,550,609	3,905,670	4,296,237	4,725,860	5,198,446	5,718,291	6,290,120
<i>Cost of sales</i>										
Seeds expense	68,700	75,570	83,127	91,440	100,584	110,642	121,706	133,877	147,265	161,991
Fertilizer expense	222,750	245,025	269,528	296,480	326,128	358,741	394,615	434,077	477,484	525,233
Pesticide expense	112,500	123,750	136,125	149,738	164,711	181,182	199,301	219,231	241,154	265,269
Green Manuring and Land Preparation	79,500	87,450	96,195	105,815	116,396	128,036	140,839	154,923	170,415	187,457
Mechanical Hoeing	22,500	24,750	27,225	29,948	32,942	36,236	39,860	43,846	48,231	53,054
Irrigation expense	30,000	30,600	31,212	31,836	32,473	33,122	33,785	34,461	35,150	35,853
Direct labor	464,250	456,777	501,249	550,051	603,605	662,373	726,863	797,631	875,290	960,509
Transportation Cost from Farm to Market	106,781	117,459	129,205	142,126	156,338	171,972	189,169	208,086	228,895	251,785
Packing expense	121,833	127,925	134,321	141,037	148,089	155,494	163,268	171,432	180,003	189,003
Total cost of sales	1,228,815	1,289,306	1,408,187	1,538,470	1,681,267	1,837,799	2,009,407	2,197,563	2,403,886	2,630,153
Gross Profit	1,438,810	1,645,081	1,819,639	2,012,139	2,224,403	2,458,438	2,716,454	3,000,883	3,314,405	3,659,967
<i>General administration &amp; selling expenses</i>										
Administration expense	160,000	131,683	144,504	158,573	174,012	190,954	209,546	229,948	252,336	276,903
Land rental expense	250,000	275,000	302,500	332,750	366,025	402,628	442,890	487,179	535,897	589,487
Travelling expense	30,000	31,500	33,075	34,729	36,465	38,288	40,203	42,213	44,324	46,540
Communications expense (phone, fax, mail, internet, etc.)	18,000	18,900	19,845	20,837	21,879	22,973	24,122	25,328	26,594	27,924
Misc. expenses	9,600	7,901	8,670	9,514	10,441	11,457	12,573	13,797	15,140	16,614
Vegetable market expense	186,734	205,407	225,948	248,543	273,397	300,737	330,810	363,891	400,280	440,308
Depreciation expense	216,413	226,003	236,073	246,647	257,749	271,321	283,562	296,414	309,909	324,079
Subtotal	870,746	896,395	970,616	1,051,593	1,139,969	1,238,358	1,343,705	1,458,770	1,584,480	1,721,855
Operating Income	568,064	748,687	849,023	960,545	1,084,434	1,220,079	1,372,748	1,542,113	1,729,924	1,938,111
Other income (interest on cash)	12,327	16,739	51,457	91,139	137,791	197,161	271,713	360,362	465,173	690,026
Earnings Before Interest & Taxes	580,391	765,426	900,481	1,051,684	1,222,225	1,417,240	1,644,461	1,902,476	2,195,098	2,628,138
Interest expense on long term debt (Project Loan)	37,214	31,909	43,677	33,851	22,356	8,906	4,802	-	-	-
Interest expense on long term debt (Working Capital Loan)	39,968	-	-	-	-	-	-	-	-	-
Subtotal	77,182	31,909	43,677	33,851	22,356	8,906	4,802	-	-	-
Earnings Before Tax	503,209	733,517	856,804	1,017,833	1,199,869	1,408,334	1,639,659	1,902,476	2,195,098	2,628,138
Tax	62,901	110,028	149,941	213,745	251,972	352,083	409,915	475,619	548,774	657,034
<b>NET PROFIT/(LOSS) AFTER TAX</b>	<b>440,308</b>	<b>623,489</b>	<b>706,864</b>	<b>804,088</b>	<b>947,896</b>	<b>1,056,250</b>	<b>1,229,744</b>	<b>1,426,857</b>	<b>1,646,323</b>	<b>1,971,103</b>



## 16.6 Projected Cash Flow Statement

<b>Cash Flow Statement</b>											
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
<i>Operating activities</i>											
Net profit		440,308	623,489	706,864	804,088	947,896	1,056,250	1,229,744	1,426,857	1,646,323	1,971,103
Add: depreciation expense		216,413	226,003	236,073	246,647	257,749	271,321	283,562	296,414	309,909	324,079
Deferred income tax		(140,339)	(190,714)	(201,349)	(203,567)	(239,974)	(222,024)	(262,960)	(305,011)	(351,831)	(421,117)
Accounts receivable		(219,257)	(10,963)	(23,022)	(25,324)	(27,857)	(30,642)	(33,706)	(37,077)	(40,785)	(44,863)
Raw material inventory	(403,950)	(40,395)	(44,435)	(48,878)	(53,766)	(59,142)	(65,057)	(71,562)	(78,718)	(86,590)	952,493
Pre-paid building rent	(250,000)	(25,000)	(27,500)	(30,250)	(33,275)	(36,603)	(40,263)	(44,289)	(48,718)	(53,590)	589,487
Cash provided by operations	(653,950)	231,729	575,881	639,438	734,803	842,070	969,586	1,100,788	1,253,746	1,423,437	3,371,181
<i>Financing activities</i>											
Project Loan - principal repayment		(31,208)	(36,514)	(57,795)	(67,620)	(79,116)	(24,143)	(28,247)	-	-	-
Working Capital Loan - principal repayment		(450,242)	-	-	-	-	-	-	-	-	-
Additions to Project Loan	218,906	-	105,737	-	-	-	-	-	-	-	-
Additions to Working Capital Loan	450,242	-	-	-	-	-	-	-	-	-	-
Issuance of shares	669,148	-	105,737	-	-	-	-	-	-	-	-
Cash provided by / (used for) financing activities	1,338,296	(481,450)	(29,631)	(57,795)	(67,620)	(79,116)	(24,143)	(28,247)	-	-	-
<i>Investing activities</i>											
Capital expenditure	(437,813)	(201,403)	(211,473)	(222,047)	(233,149)	(263,951)	(257,047)	(269,899)	(283,394)	(297,564)	-
Cash (used for) / provided by investing activities	(437,813)	(201,403)	(211,473)	(222,047)	(233,149)	(263,951)	(257,047)	(269,899)	(283,394)	(297,564)	-
<b>NET CASH</b>	<b>246,533</b>	<b>(451,124)</b>	<b>334,776</b>	<b>359,596</b>	<b>434,034</b>	<b>499,004</b>	<b>688,396</b>	<b>802,641</b>	<b>970,352</b>	<b>1,125,873</b>	<b>3,371,181</b>



## 16.7 Projected Balance Sheet

<b>Balance Sheet</b>											
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
<b>Assets</b>											
<i>Current assets</i>											
Cash & Bank	246,533	-	334,776	694,372	1,128,406	1,627,410	2,315,806	3,118,447	4,088,798	5,214,671	8,585,852
Accounts receivable		219,257	230,220	253,242	278,566	306,422	337,065	370,771	407,848	448,633	493,496
Raw material inventory	403,950	444,345	488,780	537,657	591,423	650,566	715,622	787,184	865,903	952,493	-
Pre-paid building rent	250,000	275,000	302,500	332,750	366,025	402,628	442,890	487,179	535,897	589,487	-
<b>Total Current Assets</b>	<b>900,483</b>	<b>938,602</b>	<b>1,356,276</b>	<b>1,818,021</b>	<b>2,364,420</b>	<b>2,987,025</b>	<b>3,811,383</b>	<b>4,763,581</b>	<b>5,898,447</b>	<b>7,205,284</b>	<b>9,079,349</b>
<i>Fixed assets</i>											
Machinery & equipment	15,000	13,500	12,000	10,500	9,000	26,644	23,230	19,815	16,401	12,987	9,572
Furniture & fixtures	231,000	207,900	184,800	161,700	138,600	115,500	92,400	69,300	46,200	23,100	-
Office equipment	191,813	201,403	211,473	222,047	233,149	244,807	257,047	269,899	283,394	297,564	-
<b>Total Fixed Assets</b>	<b>437,813</b>	<b>422,803</b>	<b>408,273</b>	<b>394,247</b>	<b>380,749</b>	<b>386,951</b>	<b>372,677</b>	<b>359,015</b>	<b>345,995</b>	<b>333,651</b>	<b>9,572</b>
<i>Intangible assets</i>											
Total Intangible Assets	-	-	-	-	-	-	-	-	-	-	-
<b>TOTAL ASSETS</b>	<b>1,338,296</b>	<b>1,361,405</b>	<b>1,764,549</b>	<b>2,212,268</b>	<b>2,745,169</b>	<b>3,373,976</b>	<b>4,184,060</b>	<b>5,122,596</b>	<b>6,244,442</b>	<b>7,538,935</b>	<b>9,088,921</b>
<b>Liabilities &amp; Shareholders' Equity</b>											
<i>Current liabilities</i>											
Total Current Liabilities	-	204,591	-	-	-	-	-	-	-	-	-
<i>Other liabilities</i>											
Deferred tax		(140,339)	(331,054)	(532,403)	(735,969)	(975,943)	(1,197,967)	(1,460,927)	(1,765,939)	(2,117,769)	(2,538,886)
Long term debt (Project Loan)	218,906	187,698	256,921	199,126	131,506	52,390	28,247	-	-	-	-
Long term debt (Working Capital Loan)	450,242	-	-	-	-	-	-	-	-	-	-
<b>Total Long Term Liabilities</b>	<b>669,148</b>	<b>47,359</b>	<b>(74,133)</b>	<b>(333,277)</b>	<b>(604,463)</b>	<b>(923,553)</b>	<b>(1,169,720)</b>	<b>(1,460,927)</b>	<b>(1,765,939)</b>	<b>(2,117,769)</b>	<b>(2,538,886)</b>
<i>Shareholders' equity</i>											
Paid-up capital	669,148	669,148	774,884	774,884	774,884	774,884	774,884	774,884	774,884	774,884	774,884
Retained earnings		440,308	1,063,797	1,770,661	2,574,748	3,522,645	4,578,895	5,808,639	7,235,496	8,881,820	10,852,923
<b>Total Equity</b>	<b>669,148</b>	<b>1,109,455</b>	<b>1,838,681</b>	<b>2,545,545</b>	<b>3,349,633</b>	<b>4,297,529</b>	<b>5,353,779</b>	<b>6,583,524</b>	<b>8,010,381</b>	<b>9,656,704</b>	<b>11,627,807</b>
<b>TOTAL CAPITAL AND LIABILITIES</b>	<b>1,338,296</b>	<b>1,361,405</b>	<b>1,764,549</b>	<b>2,212,268</b>	<b>2,745,169</b>	<b>3,373,976</b>	<b>4,184,060</b>	<b>5,122,596</b>	<b>6,244,442</b>	<b>7,538,935</b>	<b>9,088,921</b>



## 17 KEY ASSUMPTIONS

**Table 17-1: Revenue Assumptions**

<b>Annual Production per Acre</b>	
Watermelon (kg)	24,000
Muskmelon (kg)	25,000
Pumpkin (kg)	18,000
<b>Sales price per kg</b>	
Watermelon (Rs.)	15
Muskmelon (Rs.)	25
Pumpkin (Rs.)	15
Sales price growth rate	10%
Percentage wastage	15%
Production capacity utilization year 1 - 10	100%

**Table 17-2: COGS Assumptions**

<b>Cost of seed per gram</b>	
Watermelon (Rs.)	20
Muskmelon (Rs.)	33.7
Pumpkin (Rs.)	10
<b>Quantity of seeds per Acre</b>	
Watermelon (gram)	300
Muskmelon (gram)	400
Pumpkin (gram)	800
<b>Cost of Fertilizer per bag</b>	
Calcium Ammonium Nitrate (Rs.)	1,400
Nitrophos (Rs.)	2,600
DAP (Rs.)	4,200
SOP (Rs.)	4,050
<b>Quantity of Fertilizer per Acre</b>	
Calcium Ammonium Nitrate (bags)	2
Nitrophos (bags)	4
DAP (bags)	2
SOP (bags)	2
Pesticides expense per Acre per season (Rs.)	15,000
<b>Water expense</b>	
Number of months for irrigation	5
Total number of irrigations per month	2
Cost per irrigation per acre (Rs.)	400
Total cost of green manuring, land prep and sowing per acre (Rs.)	10,600
Total cost of Mechanical Hoeing – twice per season per acre (Rs.)	1,500

Packing expense per kg (Rs.)	1.33
<b>Commercial Transportation of farm produce</b>	
Cost per kilometre (Rs.)	20
Farm to market distance (km)	75
Per trip cost (Rs.)	1,500
Load per trip (tonnes)	2
No. of trips	71

**Table 17-3 Expense Assumptions**

COGS growth rate	10%	
Operating costs growth rate	5%	
Vegetable market expense	7%	% of revenue
Operating costs growth rate	5.0%	
Travelling expense	Rs. 30,000 per annum	
Communication expense	Rs. 18,000 per annum	
Office expenses	6%	% of admin expense
Promotional expense growth rate	1%	% of revenue
Tools and machinery depreciation rate	10	% of machinery & equip. cost
Tunnel equipment depreciation rate	100%	% of tunnel equipment cost
Furniture & Fixtures depreciation rate	10.0%	% of furniture & fixture cost

**Table 17-4 Economy Related Assumptions**

Inflation rate	10%
Electricity growth rate	10%
Water price growth rate	2%
Gas price growth rate	10%
Wage growth rate	10%

**Table 17-5: Cash Flow Assumptions**

Time period per season (months)	8
Accounts receivable in days	30
Raw material inventory (months)	6

**Table 17-6 Financial Assumptions**

Project life (Years)	10
Debt	50%
Equity	50%
Interest rate on long-term debt (KIBOR + 5%)	17%
Interest rate on short-term debt	16%
Interest on cash in bank	10%
Debt tenure (Years)	5
Debt payments per year	1



## 18 ANNEXURE

### 18.1 Tax deduction income slabs

Income Slabs	Tax Rate
	0.00%
100,000 – 110,000	0.50%
110,000 – 125,000	1.00%
125,000 – 150,000	2.00%
150,000 – 175,000	3.00%
175,000 – 200,000	4.00%
200,000 – 300,000	5.00%
300,000 – 400,000	7.50%
400,000 – 500,000	10.00%
500,000 – 600,000	12.50%
600,000 – 800,000	15.00%
800,000 – 1,000,000	17.50%
1,000,000 – 1,300,000	21.00%
1,300,000 and above	25.00%