

Pre-Feasibility Study

OFF-SEASON VEGETABLES FARMING (Low Tunnel)



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1 INTRODUCTION

1.1 General

Vegetables are rich source of vitamins, carbohydrates, salts and proteins. 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. In addition, high population growth rate has also given rise to high demand in basic dietary vegetables. Increased health awareness, high population growth rate, changing dietary patterns of increasingly affluent middle class and availability of packaged vegetables, has therefore generated a year round high demand for vegetables in the country in general and in major city centers in particular. However, our farmers have yet not been able to encash this opportunity and still follow traditional sowing and picking patterns. This results in highly volatile vegetable supply market wherein the market is flooded with seasonal vegetables irrespective of demand presence on one hand and very high priced vegetables in off-season on the other. Lack of developed vegetable processing and storage facility robs our farmers from their due share of profit margins. In natural season local vegetables flood the markets substantially bringing down the prices.

In the absence of storage infrastructure and vegetable processing industry in the country, off-season vegetables farming is the only viable option that can add value to the farmer produce. The term plasticulture is used to describe the broad and general use of plastics in agriculture. Plasticulture can extend the growing season and improve crop health and growth.

1.2 Project Brief

The proposed project is designed as a medium size off-season vegetable farming unit, spreading over a land area of 7.5 acres. Off-season vegetables, such as, tomatoes, cucumber, brinjal, hot pepper, sweet peppers and watermelon can be cultivated viably using low tunnel technology. However for our convenience we have restricted our study for three crops only Tomato, Capsicum and Cucumber.

The land can be utilized for green farming¹ during the idle period to maintain the fertility of soil. Apart from green farming, the land can also be utilized for growing seasonal vegetables like potato, carrot, onion, garlic and cabbage etc., in the idle period, but this may effect the fertility of the land, resulting in reduction of yield of off-season vegetables. Therefore it is recommended that only off-season vegetables should be grown on the proposed land, with a well chalked out sowing pattern.

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 180,000 Kg per annum.

¹ Green farming is done to maintain the fertility of the land with the help of any legume crop. When the crop is matured it is then incorporated in soil with the help of a Rotavator.

Figure 1-1: Total Production Capacity on the basis of low tunnel technology

| Vegetables | Area (Acres) | Production Quantity in (Kgs)/ Acre | Total Production Quantity |
|------------|--------------|------------------------------------|---------------------------|
| Tomatoes | 2.5 | 25,000 | 62,500 |
| Cucumber | 2.5 | 35,000 | 87,500 |
| Capsicum | 2.5 | 12,000 | 30,000 |

1.3 Opportunity Rationale

There is a huge demand for fresh vegetables in the local as well as international markets, which includes Europe, Middle East, and Far Eastern markets but due to their perishable nature it is difficult to export this commodity. The facility of growing off-season vegetables also allows for growing non-conventional varieties and vegetables, which are in high demand in the international market.

The importance of vegetables cannot be denied due to their nutritional value as these provide proteins, carbohydrates & salts that are essential ingredients for the growth of human body. Vegetables are used in raw form as salad or cooked food according to the taste, which provide a balanced diet and keep human being healthy. A large number of world population now prefer vegetables in their daily diet due to the awareness that vegetables provide better source of energy and nourishment to the body.

The essential nutritional ingredients of some of the vegetables are shown in Table 1-1, below: -

Table 1-1 Nutritional ingredients in a weight of 100 Gram

| Vegetable Name | Calories | Proteins Gram | Fats Gram | Carbohydrates Gram | Ascorbic acid |
|----------------|----------|---------------|-----------|--------------------|---------------|
| Potato | 71.6 | 1.7 | 0.1 | 16.0 | 14.1 |
| Turnip | 30.0 | 0.9 | 0.2 | 6.2 | 24.7 |
| Carrot | 39.6 | 1.1 | 0.3 | 8.2 | 5.3 |
| Cauli Flower | 13.9 | 1.1 | 0.1 | 2.2 | 31.1 |
| Cabbage | 19.8 | 1.0 | 0.2 | 3.9 | 38.1 |
| Peas | 45.4 | 3.0 | 0.2 | 8.0 | 11.9 |
| Tomato | 20.0 | 0.9 | 0.3 | 3.5 | 20.5 |
| Onion | 45.8 | 0.9 | 0.2 | 9.7 | 8.4 |
| Spinach | 23.8 | 1.0 | 0.0 | 60.4 | 5.1 |
| Brinjal | 20.3 | 1.9 | 0.2 | 2.6 | 48.2 |
| Lettuce | 12.6 | 0.8 | 0.1 | 2.0 | 12.6 |

Mostly the vegetables grown in the world are local to their land and countries however other varieties and types have also been introduced from across different

continents/countries, which are now grown and consumed in the local diet. Almost all types and varieties of known vegetables are grown in Pakistan.

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 powers of farmers are 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.

1.4 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) do not have produce. Other potential benefits of season extension technologies are higher yields and better quality. In summers for off season vegetables cultivation high quality indeterminate seed is easily available in 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, which is turned out to be profitable.

Small 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 alleviating 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.

1.5 Viable Economic Farm Size

The proposed project is based on a land holding 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, but large land holdings are recommended for projects that are planned away from large markets.

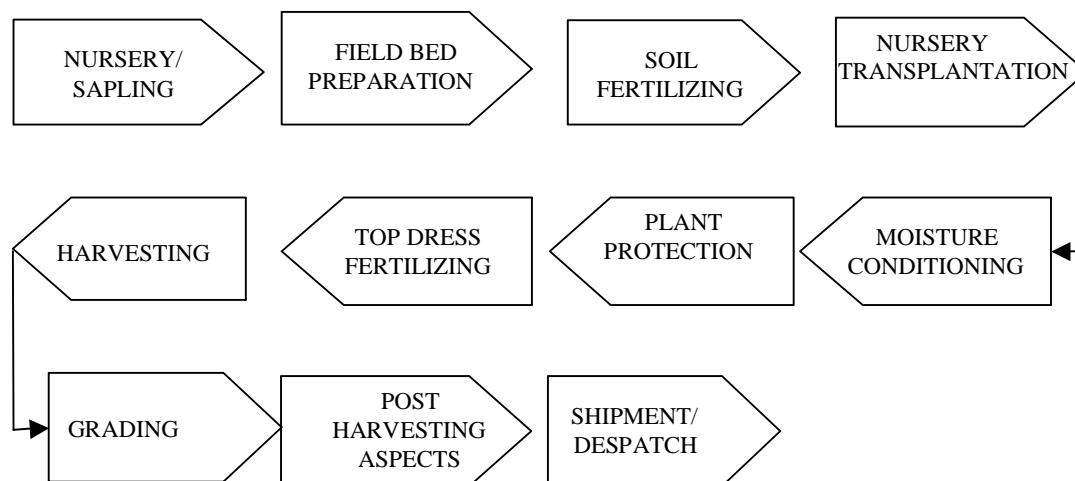
1.6 Project Cost

The proposed project of Off-Season vegetables farming needs capital investment of about Rs. 0.820 million. This includes machinery and equipment. The land utilized for cultivation is recommended to be leased. In addition to this, a sum of Rs. 0.362

million is also required as working capital. The total project cost amounts to Rs. 1.182 million.

1.7 Process Flow Chart

Figure 1-2: Production flow of off- season vegetables



1.8 Production Flow of off-season vegetables

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

- i. Sowing of seeds in a separate plot of land for nursery.
- ii. Preparation of seed beds in the field for cultivation of vegetables.
- iii. Using fertilizer in the soil to maintain its fertility.
- iv. Transplantation of nursery in the soil or 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/plucking, packing and storing the vegetables in order to fetch the maximum price.
- xi. Transportation to the sale points in local or export markets.

2 CURRENT INDUSTRY STRUCTURE

The main commodities in food and beverages which showed an increase in their prices during August 2007 over July, 2007 are as under:-

Table 2-1 Percentage Increase in Prices during 2007²

| Commodities | Percentage Increase | Commodities | Percentage Increase |
|---------------------|---------------------|------------------------|---------------------|
| Tomatoes | 43.74% | Milk products | 2.39% |
| Chicken farm | 29.08% | Spices | 2.00% |
| Onions | 17.94% | Potatoes | 1.92% |
| Pulse masoor | 7.81% | Vegetable ghee | 1.83% |
| Vegetables | 6.53% | Sugar | 1.76% |
| Mustard oil | 3.86% | Cereals | 1.42% |
| Cooking oil | 3.65% | Pulse gram | 1.39% |
| Milk powder | 3.61% | Bakery & confectionery | 1.36% |
| Maid | 2.53% | Rice | 1.07% |
| Betel leaves & nuts | 2.49% | Milk fresh | 1.00% |

2.1 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. Mardan
- vi. University of the Punjab, Lahore
- vii. Sindhu Farm, Kamalia, district T.T Singh
- viii. Sitara Farm, at Sitara Chemicals, Shah Kot, district Faisalabad

2.2 Vegetables Which Can Be Sown

Growing under plastic is more competitive in today's vegetable market, it gives superior yields and early spring production. Following crops are high value vegetables and has shown significant increase in earliness.

- Melons
- Tomato
- Pepper
- Cucumber
- Bitter Gourds

² Government of Pakistan Statistics division, Federal bureau of statistics.

- Squashes
- Eggplant
- Water melon
- Brinjal

2.3 Present Production of Vegetables

According to Pakistan Statistical yearbook 2005-06, the production of various vegetables is shown in Table below: -

Table 2-2: Production of various vegetables during the year 2005-06

| Item | Punjab “000” Tons | Sind “000” Tons | NWFP “000” Tons | Balochistan “000” Tons | Pakistan “000” Tons |
|----------|----------------------|--------------------|--------------------|------------------------------|------------------------|
| Tomato | 64,588 | 48,326 | 161,599 | 193,633 | 468,146 |
| Onion | 306,450 | 833,508 | 216,624 | 699,209 | 2,055,791 |
| Garlic | 2,293 | 10,415 | 21,579 | 2,365 | 57,292 |
| Chili | 9,342 | 108,772 | 979 | 3,797 | 122,890 |
| Turmeric | 31,780 | 86 | 3,701 | -- | 35,567 |
| Potato | 1,389,591 | 2,576 | 134,237 | 41,478 | 1,567,882 |

2.4 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, Shah Kot, Faisalabad, Ayub Agricultural Research Institute, Faisalabad and Kamalia in Toba Tek Singh and, NARC Chack Shahzad, Islamabad, Swat, Tarnab, Mardan, Khairabad, Mirpur Khas and Chiniot in district Jhang.

3 TECHNICAL ANALYSIS

3.1 Plantation & 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:

Figure 3-1: Plantation growth essentials

| SOURCE | REQUIREMENT |
|-------------|---|
| Air & Water | Carbon, Hydrogen, Oxygen, Nitrogen, Phosphorus and Potash |
| Land | Calcium, Magnesium, Sulphur Iron, Copper, Zinc, Boran, Molybdenium, Maganese and Chlorine |

3.2 Fertilizers on Production

Using fertilizers containing Nitrogen, Phosphorus and Potash the yield of the crop can be maximized.

Appropriate quality and quantity of fertilizer plays a great role in the production and quality of vegetables.

3.3 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 3-1 Sowing and Picking period for the selected off-season vegetables

| Vegetables | Sowing Period | Picking Period |
|--------------------------|---|---|
| Tomato | <ul style="list-style-type: none"> ▪ October (Nursery) ▪ November (transplantation) | <ul style="list-style-type: none"> ▪ February-May |
| Brinjal | <ul style="list-style-type: none"> ▪ October (Nursery) ▪ November (transplantation) | <ul style="list-style-type: none"> ▪ February-May |
| Squashes | <ul style="list-style-type: none"> ▪ End of October to 1st week of November (direct seeding) | <ul style="list-style-type: none"> ▪ End of December to April |
| Cucumber | <ul style="list-style-type: none"> ▪ End of October to end of December (direct seeding) | <ul style="list-style-type: none"> ▪ Mid January to May |
| Sweet pepper/ Hot pepper | <ul style="list-style-type: none"> ▪ Mid of September to 1st week of October ▪ End of October to 1st week of November (Transplantation) | <ul style="list-style-type: none"> ▪ End of January to September |

3.4 Off-season cultivation methods

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

3.4.1 *Natural method by selection of appropriate area*

The off-season vegetables are grown in the areas where the climatic conditions are moderate for both normal as well as for off-seasons. Winter vegetables are grown in summer on hilly/semi hilly areas where climatic conditions are favorable for a particular vegetable. Like wise summer vegetables are grown in winter season in the valleys and across the sea areas.

The production cost of vegetables under above 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 the adoption of artificial methods of cultivation in off-season, nearer to markets to tackle heavy transportation cost and to reduce post-harvest losses.

3.4.2 *Artificial Methods*

Vegetables can be grown in off-season through artificial methods, the details of these methods are given below:

- **Growing Beneath the Sarkanda³**

This is an old method and is usually adopted near the big cities. The main vegetables grown under this method are tomato, chili, 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 protect plant 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 fiberglass 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 provides required sunshine to the plants, and the plastic also plays a barrier against the cool air in winter.

³ Sarkanda (*Saccharum spontaneum*) is a tall, straight, grass, growing in clumps, having height upto 6 meters.

3.5 Structures

Various types of structures are available to lengthen the growing season for the crop and improve overall crop health and quality. The following are just a few of the structures available, such as high tunnels, low tunnels, walk-in tunnels, and greenhouses. Structures that are used for winter production must be able to withstand heavy rainfall, snow, and wind. Structures that are used for summer production must have good ventilation. Many structures may not be suitable for year-round production.

In the construction of tunnel the major materials involved are mild steel bars and plastic sheets. Plastic sheets are used for roof covering of the tunnel shaped construction, which is built with steel bars. Bamboo lengths can also be used in some proportion with the mild steel bars. Plastic sheet is to be spread in such a manner that it enables the stoppage of cold air from outside.

The tunnel construction offers maximum crop yield, better maintenance of the fertility of land, controlled temperature and humidity, protection from wild animals and insects and better water conservation.

There are three types of tunnels, known as high, low and walk-in tunnels.

1. Low Tunnel

It is cheaper than high tunnel but creates difficulty for soil preparation, spraying and picking.

The tunnels are suitable for cucumber sown flat bed, melons, watermelons, bitter gourds, squashes, and snake gourds etc. The crop yield in this type of tunnel is however low compared to high tunnels.

Figure 3-2: Low Plastic Tunnels⁴



⁴ Curtsey: Mian Shadi Agriculture Farms Mamoorkangan, Faisalabad

2. Walk-in Tunnels

Walk-in tunnels are lower than the high tunnels but they are gaining popularity as they provide high yield compared to low tunnels. The tunnel is suitable for growing tomatoes, cucumbers, sweet pepper and hot pepper.

Figure 3-3: Walk-in Tunnel⁵



3. High Tunnel

High tunnel facilitates easy access for soil preparation, picking and spraying due to its width and height. The crop yield is maximum in this type of tunnel. The tunnel is suitable for growing tomatoes, cucumbers and sweet peppers.

Figure 3-4: Picture of High Tunnel⁶



⁵Curtsey: Mian Shadi Agriculture Farms Mamoonkangan, Faisalabad

⁶Curtsey: Mian Shadi Agriculture Farms Mamoonkangan, Faisalabad

3.6 Recommended Tunnel

In this pre-feasibility study, cultivation is recommended with the use of low tunnels on the basis of its low construction cost. All the calculations are done on the basis of low tunnel technology.

The specification of low tunnel are given in the following table:

Table 3-2: Specifications of Low Tunnel⁷

| | | |
|-------------------------------|----------------|--|
| Material Specification | Pipe material | Mild steel, painted with red oxide paint |
| | Steel | Diameter 6 mm Length 10 ft |
| | Plastic | 0.05 mm thick and 10 ft wide |
| Tunnel Specification | Height | 2.5 ft, half moon shaped |
| | Width | 5 ft |
| | Length | 190 ft |
| | No. of tunnels | 30 per acre |

The cost of such tunnel amount to Rs. 26,500 excluding the cost related to plastic used as a shield (Cover) and mulch.

3.6.1 Support Structure

Each tunnel will be 190 feet long, 2.5 feet high and 5 feet wide. The tunnel is built by 6-mm diameter steel bar of 10 feet length, in half moon shape. The steel bars are put at regular intervals of approximately 10 feet. Each tunnel structure will then be covered by 0.05-mm thick and 10 feet wide plastic sheet. Approximately 30 tunnels can be constructed on an acre of land.

Figure 3-5: Support structure in low tunnels



⁷ Mian Shadi Agricultural Material Company importers of all kind of vegetable hybrid seeds, drip and sprinkler irrigation materials, foliar and water soluble fertilisers, consultant in green house fabrication, drip and sprinkler irrigation assisting farmers community in all kind of helps required phones 0092 4610 431431, 431400, 431500 fax 431600 e-mail shadi@brain.net.pk

3.7 Seed and its Importance

For tunnel cultivation, F1 hybrid seed bred for tunnel use 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 more than to the ordinary seeds and is also less prone to diseases.

3.8 Practical Tips for off-season vegetable farming

- Any person who is planning to adopt this technology should have some practical knowledge about farming.
- Land that is being utilized for off-season vegetable farming should be tested which will help in determining the quality of land for agriculture purposes.
- Farmer should ensure that the plant 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 this 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 benefit that the early crop will offer and should gather data about the prices of these early crops.

4 LAND UTILIZATION

Table 4-1: Total Land utilization per Vegetable

| Vegetables | (Acres) |
|-----------------------|---------|
| Tomato (Determinate) | 2.5 |
| Capsicum | 2.5 |
| Cucumber (Parth.) | 2.5 |

4.1 A Soil Preparation and Sowing

- Laser leveling or with any precise method soil should be properly leveled
- Deep ploughing and harrowing.
- Apply well decomposed FYM 10 ton 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 beds & mulching one week before sowing.
- Make holes 2 days before seeding.
- Irrigation field after seeding in such a way that moisture should reach the seed place.
- Next day light irrigation should be repeated to assure the proper moistures at seed place.

4.2 Mode of Land Acquisition

Agricultural land can be taken on lease or purchased for the implementation of the proposed project.

4.3 Material Availability

- Tunnel material i.e. mild steel bar, 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 natures are also available locally.
- Water is available from canal or can be used from peter engine.

4.4 Expected Production and Sale price

Expected production and sale price of some vegetable is given in Table below: -

Table 4-2: Expected Production and Land Utilization

| Vegetable | Land Utilization (Acres) | Production Quantity (Kgs)/ Acre | Production Quantity (Kgs) | Sale Price Rs ⁸ / Kg |
|-----------|--------------------------|---------------------------------|---------------------------|---------------------------------|
| Tomatoes | 2.5 | 25,000 | 62,500 | 30 |
| Cucumber | 2.5 | 35,000 | 87,500 | 13 |
| Capsicum | 2.5 | 12,000 | 30,000 | 25 |

The prices of vegetables in normal season are around one-third of the prices of vegetables grown in off-seasons.

5 PLANT & MACHINERY

Following plant and machinery is required for an off-season vegetable farm of 7.5 Acres:

Table 5-1: Tools, Equipment and Vehicles

| Description | Number | Cost per Unit (in Rs) | Total Cost (in Rs) |
|-------------|--------|-----------------------|--------------------|
| Rotavator | 1 | 30,000 | 30,000 |

⁸ Prices are set by targeting the proposed Off-season expensive vegetables

| | | | |
|---|---|---------|----------------|
| Ridger | 1 | 12,000 | 12,000 |
| Soil Leveler/ Scraper | 1 | 12,000 | 12,000 |
| Spray Machines & Farm Tools | 1 | 50,000 | 50,000 |
| Peter Engine | 1 | 20,000 | 20,000 |
| Total cost of tools & equipment cost | | | 124,000 |
| Tractor & Cultivator | 1 | 350,000 | 350,000 |
| Total cost of vehicle | | | 350,000 |
| Total cost of tools, equipment & vehicle | | | 474,000 |

6 HUMAN RESOURCE REQUIREMENT

6.1 Number of Staff Required

Table 6-1: Number of Staff & Officers required

| Description | Number | Monthly Salary per person (Rs.) | Annual Salary (Rs) |
|--------------|--------|---------------------------------|--------------------|
| Farm Manager | 1 | 6,000 | 72,000 |
| Labor | 8 | 4,600 | 441,600 |
| Guard | 1 | 5500 | 66,000 |

Apart from the above mentioned staff requirement part time workers for four month will be required during the picking season. Following table shows the part time staff requirement:

Table 6-2: Part-time staff requirement

| Description | Number | Salary (Month) (Rs) | Annual Salary (Rs) |
|-------------|--------|---------------------|--------------------|
| Labor | 120 | 4,600 | 552,000 |

7 INFRASTRUCTURE REQUIREMENT

7.1 Total Land and Building Covered Area

Table 7-1: Land & Building Covered Area

| Description | Area |
|-------------------------|------|
| Agriculture Land (Acre) | 7.5 |

Table 7-2: Construction Cost for low tunnel per Acer

| Description | No. of Units | Price per Unit | Total Cost in Rs. |
|--|--------------|----------------|-------------------|
| Mild Steel, Red Oxide painted (Kg/ Acer) | 600 | 40 | 24,000 |
| Plastic String (Kg/ Acre) | 25 | 100 | 2,500 |
| Paint, Labour (Acer) | - | 1,600 | - |

| | | | |
|---|-----|-----|---------------|
| Total Cost in Rs. per Acre | | | 26,500 |
| Plastic Cost Kg/ Acre) | 135 | 140 | 18,900 |
| Plastic Mulch | 40 | 150 | 6,000 |
| Plastic Cost Kg/ Acre)⁹ | | | 24,900 |
| Total Cost Per Acre | | | 51,400 |

7.2 Suitable Location for the proposed project

On the basis of 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. As such, the project can be located near Lahore, Faisalabad, Sahiwal, Mardan, and Quetta.

7.3 Utilities Required

- Electricity
- Diesel (for tube well operations)
- Water
- Telephone/Fax

⁹ Salvage value after a year 25%

8 PROJECT ECONOMICS

Table 8-1: Project Cost

| DESCRIPTION | Cost (in Rs) |
|--------------------------------|------------------|
| Building and Civil Works | 198,750 |
| Plant and Machinery | 124,000 |
| Furniture/ Fixture & Equipment | 50,000 |
| Pre-operational Expenses | 97,300 |
| Vehicles | 350,000 |
| Total Fixed Cost | 820,050 |
| Working Capital | 362,720 |
| Total | 1,182,770 |

Table 8-2: Financing Plan

| Financing | | Rs. |
|-----------|-----|---------|
| Equity | 50% | 590,535 |
| Debt | 50% | 590,535 |

Table 8-3: Project's Return

| | |
|---------------------------------------|---------|
| Project Internal Rate of Return (IRR) | 32.49% |
| Net Present Value (NPV) (in Rs) | 636,750 |
| Payback Period (Years) | 3.357 |

9 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 market and progressive vegetable exporter.

9.1 Guidelines for successful cultivation

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

1. Use of high quality hybrid seeds.
2. Having and maintaining fertility of land within the tunnel during the period of cultivation.
3. Selection of profitable vegetables on the basis of best analysis of cost and revenues for a given season. Cost efficiency through better management.
4. Timely control of pests, diseases and exercise of preventive measures.
5. Maintenance & control of internal temperature & humidity in the tunnel.
6. Timely irrigation and fertilization.
7. Timely training and grading of plantation.
8. Expansion in customer's market.
9. 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.
10. Post harvest includes protection from direct sunlight and speedy transport to the market.
11. Proper soil analysis for determining soil nutritional level.

10 THREATS FOR THE BUSINESS

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

11 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.

12 FINANCIAL ANALYSIS

12.1 Projected Income Statement

| | Const Year | Year-1 | Year-2 | Year-3 | Year-4 | Year-5 | Year-6 | Year-7 | Year-8 | Year-9 | Year-10 |
|---|------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Sales | | 3,198,125 | 3,358,031 | 3,525,933 | 3,702,229 | 3,887,341 | 4,081,708 | 4,285,793 | 4,500,083 | 4,725,087 | 4,961,342 |
| COST OF GOODS SOLD | | | | | | | | | | | |
| Raw Material | | 431,760 | 453,348 | 476,015 | 499,816 | 524,807 | 551,047 | 578,600 | 607,530 | 637,906 | 669,801 |
| Payroll (Production Staff) | | 1,065,600 | 945,000 | 992,250 | 1,041,863 | 1,093,956 | 1,148,653 | 1,206,086 | 1,266,390 | 1,329,710 | 1,396,195 |
| Machine Maintenance | | 150,000 | 157,500 | 165,375 | 173,644 | 182,326 | 191,442 | 201,014 | 211,065 | 221,618 | 232,699 |
| Direct Electricity | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diesel Oil | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Direct Water | | 15,000 | 16,500 | 18,150 | 19,965 | 21,962 | 24,158 | 26,573 | 29,231 | 32,154 | 35,369 |
| Plastic Cost | | 186,750 | 149,400 | 168,542 | 174,051 | 183,483 | 192,475 | 202,144 | 212,240 | 222,855 | 233,997 |
| Total | | 1,849,110 | 1,721,748 | 1,820,332 | 1,909,338 | 2,006,533 | 2,107,775 | 2,214,418 | 2,326,456 | 2,444,243 | 2,568,062 |
| Gross Profit | | 1,349,015 | 1,636,283 | 1,705,601 | 1,792,891 | 1,880,808 | 1,973,933 | 2,071,376 | 2,173,627 | 2,280,844 | 2,393,279 |
| OPERATING EXPENSE | | | | | | | | | | | |
| Payroll (Admin) | | 66,000 | 69,300 | 72,765 | 76,403 | 80,223 | 84,235 | 88,446 | 92,869 | 97,512 | 102,388 |
| Payroll (Marketing and Sale) | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fixed electricity | | 42,000 | 46,200 | 50,820 | 55,902 | 61,492 | 67,641 | 74,406 | 81,846 | 90,031 | 99,034 |
| Insurance Expense | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Administrative Overheads | | 31,981 | 33,580 | 35,259 | 37,022 | 38,873 | 40,817 | 42,858 | 45,001 | 47,251 | 49,613 |
| Amortization (Pre-operational Expenses) | | 9,730 | 9,730 | 9,730 | 9,730 | 9,730 | 9,730 | 9,730 | 9,730 | 9,730 | 9,730 |
| Transport Cost | | 450,000 | 472,500 | 496,125 | 520,931 | 546,978 | 574,327 | 603,043 | 633,195 | 664,855 | 698,098 |
| Packing Cost | | 270,000 | 283,500 | 297,675 | 312,559 | 328,187 | 344,596 | 361,826 | 379,917 | 398,913 | 418,859 |
| Depreciation | | 62,338 | 62,338 | 62,338 | 62,338 | 62,338 | 62,338 | 62,338 | 62,338 | 62,338 | 62,338 |
| Total | | 932,049 | 977,148 | 1,024,712 | 1,074,885 | 1,127,821 | 1,183,683 | 1,242,646 | 1,304,895 | 1,370,629 | 1,440,059 |
| Operating Profit | | 416,966 | 659,135 | 680,889 | 718,006 | 752,987 | 790,249 | 828,730 | 868,732 | 910,215 | 953,221 |
| NON-OPERATING EXPENSE | | | | | | | | | | | |
| Financial Charges on Long-term Loan | | 32,013 | 27,170 | 21,649 | 15,355 | 8,180 | 0 | 0 | 0 | 0 | 0 |
| Financial Charges on Running Finance | | 50,781 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Land Lease | | 112,500 | 112,500 | 112,500 | 112,500 | 112,500 | 112,500 | 112,500 | 112,500 | 112,500 | 112,500 |
| Building Rental | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | | 195,294 | 139,670 | 134,149 | 127,855 | 120,680 | 112,500 | 112,500 | 112,500 | 112,500 | 112,500 |
| PROFIT BEFORE TAX | | 221,672 | 519,465 | 546,740 | 590,151 | 632,307 | 677,749 | 716,230 | 756,232 | 797,715 | 840,721 |
| Tax | | 15,709 | 75,366 | 82,185 | 93,038 | 103,577 | 114,937 | 125,680 | 139,681 | 154,200 | 169,252 |
| PROFIT AFTER TAX | | 205,963 | 444,099 | 464,555 | 497,113 | 528,730 | 562,812 | 590,549 | 616,551 | 643,515 | 671,468 |
| Retained Earnings beginning of year | | 0 | 205,963 | 650,062 | 1,114,617 | 1,611,730 | 2,140,461 | 2,703,273 | 3,293,822 | 3,910,373 | 4,553,887 |
| Retained Earnings end of year | | 205,963 | 650,062 | 1,114,617 | 1,611,730 | 2,140,461 | 2,703,273 | 3,293,822 | 3,910,373 | 4,553,887 | 5,225,356 |

12.2 Projected Cash Flow Statement

| | Const Year | Year-1 | Year-2 | Year-3 | Year-4 | Year-5 | Year-6 | Year-7 | Year-8 | Year-9 | Year-10 |
|---|----------------|---------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Operating activities | | | | | | | | | | | |
| Net profit | | 205,963 | 444,099 | 464,555 | 497,113 | 528,730 | 562,812 | 590,549 | 616,551 | 643,515 | 671,468 |
| Amortization (Pre-operational Expenses) | | 9,730 | 9,730 | 9,730 | 9,730 | 9,730 | 9,730 | 9,730 | 9,730 | 9,730 | 9,730 |
| Depreciation | | 62,338 | 62,338 | 62,338 | 62,338 | 62,338 | 62,338 | 62,338 | 62,338 | 62,338 | 62,338 |
| Equipment Spare Parts Inventory | (12,500) | (625) | (656) | (689) | (724) | (760) | (798) | (838) | (879) | (923) | 19,392 |
| Accounts payable | | 151,049 | (9,836) | 7,061 | 7,414 | 7,784 | 8,174 | 8,582 | 9,011 | 9,462 | 7,899 |
| Cash provided by operations | (12,500) | 428,454 | 505,675 | 542,994 | 575,871 | 607,822 | 642,255 | 670,361 | 696,750 | 724,121 | 770,826 |
| Financing activities | | | | | | | | | | | |
| Long term debt principal repayment | | (34,593) | (39,436) | (44,957) | (51,251) | (58,427) | 0 | 0 | 0 | 0 | 0 |
| Lease Payment | (112,500) | (112,500) | (112,500) | (112,500) | (112,500) | (112,500) | (112,500) | (112,500) | (112,500) | (112,500) | 0 |
| Lease Expense | | 112,500 | 112,500 | 112,500 | 112,500 | 112,500 | 112,500 | 112,500 | 112,500 | 112,500 | 112,500 |
| Addition to long term debt | 228,665 | | | | | | | | | | |
| Running Finance Repayment | | (362,720) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Issuance of share | 591,385 | | | | | | | | | | |
| Cash provided by/ (used for) financing activities | 707,550 | (397,313) | (39,436) | (44,957) | (51,251) | (58,427) | 0 | 0 | 0 | 0 | 112,500 |
| Total | 695,050 | 31,141 | 466,238 | 498,037 | 524,620 | 549,396 | 642,255 | 670,361 | 696,750 | 724,121 | 883,326 |
| Investing activities | | | | | | | | | | | |
| Capital expenditure | (820,050) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cash (used for)/ provided by investing activities | (820,050) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Net Cash | (125,000) | 31,141 | 466,238 | 498,037 | 524,620 | 549,396 | 642,255 | 670,361 | 696,750 | 724,121 | 883,326 |
| Cash balance brought forward | 0 | 237,720 | 268,861 | 735,099 | 1,233,136 | 1,757,756 | 2,307,151 | 2,949,407 | 3,619,768 | 4,316,518 | 5,040,639 |
| Cash Balance | (125,000) | 268,861 | 735,099 | 1,233,136 | 1,757,756 | 2,307,151 | 2,949,407 | 3,619,768 | 4,316,518 | 5,040,639 | 5,923,966 |
| Running Finance | 362,720 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cash carried forward | 237,720 | 268,861 | 735,099 | 1,233,136 | 1,757,756 | 2,307,151 | 2,949,407 | 3,619,768 | 4,316,518 | 5,040,639 | 5,923,966 |

12.3 Projected Balance Sheet

| | Const Year | Year-1 | Year-2 | Year-3 | Year-4 | Year-5 | Year-6 | Year-7 | Year-8 | Year-9 | Year-10 |
|-------------------------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Current Assets | | | | | | | | | | | |
| Cash | 237,720 | 268,861 | 735,099 | 1,233,136 | 1,757,756 | 2,307,151 | 2,949,407 | 3,619,768 | 4,316,518 | 5,040,639 | 5,923,966 |
| Equipment Spare Parts Inventory | 12,500 | 13,125 | 13,781 | 14,470 | 15,194 | 15,954 | 16,751 | 17,589 | 18,468 | 19,392 | 0 |
| Pre-paid land lease | 112,500 | 112,500 | 112,500 | 112,500 | 112,500 | 112,500 | 112,500 | 112,500 | 112,500 | 112,500 | 0 |
| Pre-paid building rent | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 362,720 | 394,486 | 861,381 | 1,360,106 | 1,885,449 | 2,435,605 | 3,078,658 | 3,749,857 | 4,447,486 | 5,172,531 | 5,923,966 |
| Fixed Assets | 722,750 | 722,750 | 722,750 | 722,750 | 722,750 | 722,750 | 722,750 | 722,750 | 722,750 | 722,750 | 722,750 |
| Less: Accumulated depreciation | 0 | 62,338 | 124,675 | 187,013 | 249,350 | 311,688 | 374,025 | 436,363 | 498,700 | 561,038 | 623,375 |
| Net Fixed Assets | 722,750 | 660,413 | 598,075 | 535,738 | 473,400 | 411,063 | 348,725 | 286,388 | 224,050 | 161,713 | 99,375 |
| Intangible Assets | | | | | | | | | | | |
| Pre-operational Expenses | 97,300 | 87,570 | 77,840 | 68,110 | 58,380 | 48,650 | 38,920 | 29,190 | 19,460 | 9,730 | 0 |
| Total | 97,300 | 87,570 | 77,840 | 68,110 | 58,380 | 48,650 | 38,920 | 29,190 | 19,460 | 9,730 | 0 |
| Total Assets | 1,182,770 | 1,142,469 | 1,537,296 | 1,963,954 | 2,417,229 | 2,895,317 | 3,466,303 | 4,065,434 | 4,690,996 | 5,343,973 | 6,023,341 |
| Current Liabilities | | | | | | | | | | | |
| Running Finance | 362,720 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Accounts payable | | 151,049 | 141,213 | 148,274 | 155,687 | 163,472 | 171,645 | 180,227 | 189,239 | 198,701 | 206,600 |
| Total | 362,720 | 151,049 | 141,213 | 148,274 | 155,687 | 163,472 | 171,645 | 180,227 | 189,239 | 198,701 | 206,600 |
| Long-term liabilities | | | | | | | | | | | |
| Long-term Loan | 228,665 | 194,072 | 154,635 | 109,678 | 58,427 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 228,665 | 194,072 | 154,635 | 109,678 | 58,427 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equity | | | | | | | | | | | |
| Paid-up Capital | 591,385 | 591,385 | 591,385 | 591,385 | 591,385 | 591,385 | 591,385 | 591,385 | 591,385 | 591,385 | 591,385 |
| Retained Earnings | 0 | 205,963 | 650,062 | 1,114,617 | 1,611,730 | 2,140,461 | 2,703,273 | 3,293,822 | 3,910,373 | 4,553,887 | 5,225,356 |
| Total | 591,385 | 797,348 | 1,241,447 | 1,706,002 | 2,203,115 | 2,731,846 | 3,294,658 | 3,885,207 | 4,501,758 | 5,145,272 | 5,816,741 |
| Total Liabilities And Equity | 1,182,770 | 1,142,469 | 1,537,296 | 1,963,954 | 2,417,229 | 2,895,317 | 3,466,303 | 4,065,434 | 4,690,996 | 5,343,973 | 6,023,341 |

13 KEY ASSUMPTIONS

Table 13-1: Crop Assumptions

| Crop Assumptions | Cost per Seed in Rs. | Average Seed Requirement in unit/ Acre | Av. Seed Price/ Acre | Crop Yield per Acre in Kgs | Sale Price of Crop per Kg |
|------------------------|----------------------|--|----------------------|----------------------------|---------------------------|
| Tomato | 1.90 | 15,000 | 22,500 | 25,000 | 30 |
| Capsicum | 1.50 | 15,000 | 22,500 | 12,000 | 25 |
| Cucumber | 1.60 | 15,000 | 24,000 | 35,000 | 13 |
| Sale Price Growth Rate | | | | | 5% |

Table 13-2: Economy related Assumptions

| | |
|-------------------------|-----|
| Electricity Growth Rate | 10% |
| Water price growth rate | 10% |
| Wage Growth Rate | 5% |

Table 13-3: Cash Flow Assumptions

| | |
|--|----|
| Accounts Payable cycle (in days) | 15 |
| Equipment & Spare Part Inventory (in months) | 1 |

Table 13-4: Expenses Assumptions

| | |
|--|--------|
| Crop Wastage | 15% |
| Raw Material price growth rate | 5% |
| Administrative Overhead (% of Total Revenue) | 1.0% |
| Water cost per Irrigation per Acre (Rs.) | 200 |
| Irrigation (No. of Months) | 5 |
| No. of times land irrigated (per month) | 2 |
| Fixed Electricity per Month | 3,500 |
| Transport Cost per Kg (in Rs) | 2.50 |
| Packing Cost per Kg (Rs) | 1.50 |
| Maintenance Cost of Tunnel Structure | 2,500 |
| Machine Maintenance (machine/month) | 2,500 |
| Machine Maintenance Growth Rate | 5% |
| Pesticide Requirement per Acre per Year (Rs) | 15,000 |
| Fertilizer Cost per Acre per Year (Rs.) | 15,000 |

Table 13-5 Farmyard Manure Cost

| Farmyard Manure | Per Acre Cost |
|------------------------|----------------------|
| Tomatoes | 2,889 |
| Capsicum | 2,315 |
| Cucumber | 2,500 |

Table 13-6: Financial Assumptions

| | |
|----------------------------------|-----|
| Project Life (years) | 10 |
| Debt Ratio | 50% |
| Equity Ratio | 50% |
| Interest Rate on Long Term Loan | 14% |
| Interest Rate on Short Term Loan | 14% |
| Debt Tenure (Years) | 5 |
| Payments in a Year | 1 |