

## Off-Season Vegetable Farming in Tunnels



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# Table of Contents

|  |    |
|--|----|
| <i>Summary</i>   | 2  |
| <i>1. Introduction</i>   | 3  |
| <i>2. Project Cost</i>   | 3  |
| <i>3. Export Prospects</i>   | 4  |
| <i>4. Production Sequence of Cultivation</i>                           | 4  |
| <i>5. Suitable Vegetables for Cultivation</i>                          | 4  |
| <i>6. Nutrient Requirements</i>  | 5  |
| <i>7. Sowing and Transplanting Period of Off-season Vegetables</i>     | 6  |
| <i>8. Irrigation</i>   | 6  |
| <i>9. Types of Tunnels</i>   | 7  |
| <i>i) Low Tunnel</i>   | 7  |
| <i>ii) Walk-in Tunnels</i>   | 7  |
| <i>iii) High Tunnel</i>  | 8  |
| <i>a) Support Structure</i>  | 9  |
| <i>b) Seed Recommendations</i>   | 9  |
| <i>c) Important Points for Tunnel Farming</i>                          | 9  |
| <i>10. Suitable Site for Tunnel Farming</i>                            | 10 |
| <i>i) Preparation of Soil &amp; Sowing</i>                             | 10 |
| <i>ii) Expected Production</i>   | 10 |
| <i>11. Equipments and Machinery Requirements</i>                       | 11 |
| <i>12. Human Resource Requirements</i>                                 | 11 |
| <i>13. Infrastructure Requirements</i>                                 | 11 |
| <i>14. Project Detail</i>  | 13 |
| <i>15. Projected Income Statement of 54 tunnels on 9 acres project</i> | 14 |
| <i>16. Input Assumptions</i>   | 15 |
| <i>17. Disclaimer</i>  | 17 |

## *Summary*

*Vegetables are daily food requirements for balanced diet and a good source of vitamins, proteins, essential nutrients and carbohydrates. Due to lack of advanced production technology of vegetables, farmers are limited to grow seasonal vegetables and are dependent on marketing mechanism of demand and supply so could not get good prices to sustain vegetable business.*

*Due to presence of negligible number of vegetable processors and lack of cold storage infrastructure, farmers could not get the reasonable profit margins by selling their produce at the time when market is flooded with seasonal vegetables.*

*Summer vegetables are susceptible to insects, pests and diseases that can be grown in winter by maintaining the temperature through well established production technology of vegetable tunnel farming. 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. Mostly tunnels are of three types by their structure i.e. low tunnel, walk-in tunnel and high tunnel.*

*The off-season vegetable project using high tunnel technology on area of 9 acres needs a capital investment estimated at Rs. 6.6 million for construction, purchasing machinery and equipment. In addition to this, a sum of Rs. 0.3 million is required as working capital, which would be used for purchasing of seeds, fertilizers and pesticides etc. The total project cost is estimated at Rs. 7 million*

## ***1. Introduction***

To grow vegetables in unfavorable weather conditions is called “growing off-season vegetables”. Human nature ever wishes to get those things that are scarce. Off-season vegetables and fruits are sold at high prices in the market. Vegetables are rich source of vitamins, carbohydrates, salts and proteins. High population growth rate has 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 get benefited from this opportunity and still using traditional methods.

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 farmers produce.

## ***2. Project Cost***

By using high tunnel technology many off-season vegetables like tomatoes, cucumber, brinjal, hot pepper, sweet peppers and watermelon can be cultivated. This project is focused on the study of three crops only i.e. Tomato, Capsicum and Cucumber, cultivated on area of 9 acres. The land utilized for cultivation is recommended to be leased.

The off-season vegetable project using high tunnel technology on area of 9 acres needs a capital investment estimated at Rs. 6.64 million for construction, purchasing machinery and equipment. In addition to this, a sum of Rs. 0.3 million is required as working capital, which would be used for purchasing of seeds, fertilizers and pesticides etc. The total project cost is estimated at Rs. 6.94 million.

The estimated yield potential of the farm varies according to the selected type of vegetable. For this project, three proposed vegetables are selected which are listed below. For this vegetable crop mix, it is estimated that a 9-acre farm unit will yield a total of 210,000 kg vegetable per annum.

**Table 1: Total Production Capacity**

| <b>Vegetables</b> | <b>Area (Acres)</b> | <b>Production Quantity in (kg)/ Acre</b> | <b>Total Production Quantity</b> |
|-------------------|---------------------|--|----------------------------------|
| Cucumber          | 3                   | 28,000                                   | 84,000                           |
| Capsicum          | 3                   | 18,000                                   | 54,000                           |
| Tomatoes          | 3                   | 24,000                                   | 72,000                           |

### ***3. Export Prospects***

Pakistan is not yet exporting vegetables due to their perishable nature, although there is huge demand in international market. The facility of growing off-season vegetables also allows for growing non-conventional varieties and vegetables, which are in high demand in Europe, Middle East and Far Eastern countries.

### ***4. Production Sequence of Cultivation***

Production sequence considering the tomato crop is as follows:

- a. Selection of fertile soil for construction of tunnels.
- b. Production technology should be adopted through trained persons.
- c. Selection of good quality soil and sowing of seeds for nursery.
- d. Preparation of seedbeds in the field for cultivation of vegetables.
- e. Using fertilizer of different varieties for the smooth growth of plantation (Recommended fertilizers for different crops).
- f. Transplantation of nursery in the soil.
- g. Irrigate the soil to maintain the soil moisture. Drip irrigation is more economical.
- h. Use of pesticides/fungicides to protect the plants from insects and diseases.
- i. Harvesting at proper time as per requirement of the plantation.
- j. Grading of crop on the basis of quality standards.
- k. Transportation to the sale points in local or export markets after application of post harvest technology.

### ***5. Suitable Vegetables for Cultivation***

Growing of vegetables in tunnels under plastic can give superior yields and early spring production. Following crops are high value vegetables and have shown significant increase in earliness:

- Cucumber
- Capsicum
- Tomato
- Pepper
- Bitter Gourds
- Melons
- Brinjal
- Water melon

Vegetables can be grown in tunnels in all tropical and subtropical regions of the country. This technology can successfully be adopted in coastal districts of Sindh which have favorable conditions for off-season vegetable farming. The tunnel farming in districts Thatta, Badin and Hyderabad can reduce the production costs.

## 6. Nutrient Requirements

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

**Table 2: Fertilizers for High Tunnel**

| Vegetable                      | Fertilizer Time                             | Quantity per acre (kg)                        |
|--------------------------------|---|---|
| Cucumber (Kheera) & Ghyia Kadu | At the time of land preparation.            | Nitrogen = 37, Phosphorus = 100, Potash = 100 |
|                                | After one month at the time of earthing up. | Nitrogen = 37                                 |
|                                | At flower stage                             | Nitrogen = 37                                 |
|                                | One month after first picking               | Nitrogen = 37                                 |
| Tomato                         | At the time of land preparation.            | Nitrogen = 37, Phosphorus = 100, Potash = 100 |
|                                | At the time of earthing up.                 | Nitrogen = 37                                 |
|                                | At the time of first picking.               | Nitrogen = 37                                 |
|                                | One month after first picking               | Nitrogen = 37                                 |

**Table 3: Fertilizers for Walk in Tunnel**

| Vegetable                                | Fertilizer Time                          | Quantity per acre kg                        |
|--|--|---|
| Capsicum (Shimla Mirch) and Sweet pepper | At the time of land preparation.         | Nitrogen = 25, Phosphorus = 50, Potash = 50 |
|  | At the time of earthing up.              | Nitrogen = 25                               |
|  | At the time of first picking             | Nitrogen = 37                               |
|  | One month after first picking            | Nitrogen = 37                               |
| Bitter Gourds (Karrela)                  | At the time of land preparation.         | DAP = ½ bag, Potash = 1 bag                 |
|  | At the time when plants height is 10 cm. | Urea = ½ bag                                |
|  | At flower stage                          | Urea = ½ bag                                |
|  | One month after first picking            | Urea = ½ bag                                |
| Chappan Kadu                             | At the time of land preparation.         | DAP = ½ bag, Potash = 1 bag                 |
|  | At the time when plants height is 10 cm. | Urea = 1 bag                                |
| Halwa Kadu                               | At the time of land preparation.         | DAP = ½ bag, Potash = 1 bag                 |
|  | At flower stage                          | Urea = 1 bag                                |
| Ghyia Kadu                               | At the time of land preparation.         | DAP = ½ bag, Potash = 1 bag                 |
|  | At flower stage                          | Urea = 1 bag                                |

Note: The quantity of fertilizers at the time of sowing and after sowing must be used according to per line of vegetables in the tunnel. In spite of macronutrients, micronutrients i.e. Fe, Zn, Mn, B are also required to increase the yields of crops. These micronutrients are available in the market in liquid and solid forms.

## 7. Sowing and Transplanting Period of Off-season Vegetables

Following are the sowing and transplanting period of selected off-season vegetables with “plant to plant” and “row to row” distance:

**Table 4: Sowing period for the selected off-season vegetables**

| Vegetables    | Sowing Period Nursery | Transplanting Nursery | Direct Sowing | Plant to Plant Distance | Row to Row Distance |
|---------------|-----------------------|-----------------------|---------------|-------------------------|---------------------|
| Tomatoes      | 1-15 Oct              | 1-15 Nov              | -             | 30 cm                   | 75 cm               |
| Cucumber      | -                     | -                     | 15-31 Oct     | 30 cm                   | 100 cm              |
| Capsicum      | 1-15 Oct              | 1-15 Nov              | After mid Jan | 50 cm                   | 150 cm              |
| Sweet Pepper  | 1-15 Oct              | 1-15 Nov              | After mid Jan | 30 cm                   | 100 cm              |
| Chappan Kadu  | -                     | -                     | After mid Jan | 25 cm                   | 200 cm              |
| Bitter Gourds | -                     | -                     | After mid Jan | 30 cm                   | 250 cm              |
| Halwa Kadu    | -                     | -                     | After mid Jan | 50 cm                   | 300 cm              |
| Ghyia Toori   | -                     | -                     | After mid Jan | 50 cm                   | 300 cm              |

**Table 5: Requirements of Temperature for Best Growth of Vegetables**

| Sr. No | Vegetables    | Temperature (degree centigrade) |
|--------|---------------|---------------------------------|
| 1      | Cucumber      | 24-18                           |
| 2      | Capsicum      | 24-21                           |
| 3      | Tomatoes      | 29-21                           |
| 4      | Sweet Pepper  | 24-21                           |
| 5      | Bitter Gourds | 29-21                           |
| 6      | Ghyia Kadu    | 24-18                           |
| 7      | Chappan Kadu  | 24-18                           |
| 8      | Halwa Kadu    | 24-18                           |
| 9      | Ghyia Toori   | 24-18                           |

## 8. Irrigation

In severe summer irrigation to vegetables is required after every 5 - 7 days depending on the type of soil, whereas in December, January light water is required after 15-21 days. The quantity of water can be changed keeping in mind the climatic conditions. In water shortage areas the best way of irrigation is drip irrigation. Drip irrigation improves the water use efficiency if fertilizers are applied through drips as fertigation and offers more splits of fertilizers, even micronutrients can be used, through the initial growth periods.

The benefits of fertigation are in terms of increase in yield, quality of fruit and insect pest control. The best water for irrigation is canal water but if tube well is available then before irrigation or start of business, the water analysis must be done avoiding deteriorative effects if unfit for irrigation. It is not recommended to make investments of vegetable tunnel farming in saline soils and unfit water conditions. Drip irrigation is a technical matter which can be applied through trained technicians.

## ***9. Types of Tunnels***

Off-season Vegetable farming in tunnels 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. Tunnels help to gain maximum crop yield, to maintain the fertility of land and control on temperature.

Following are three main types of tunnels:-

### ***i) Low Tunnel***

Low tunnels are less expensive as compared with the High tunnels but crop yield is low. Soil preparation, spraying and picking is difficult in this tunnel. Cucumber, melons, watermelons, bitter gourds, squashes, and snake gourds etc can be grown in these tunnels.

### ***ii) Walk-in Tunnels***

These are lower in height as compared with High tunnels. Walk-in-tunnels provide high yield compared to Low tunnels. The tunnel is suitable for growing tomatoes, cucumbers, sweet pepper and hot pepper.





### iii) High Tunnel

High tunnels give maximum yield of crops and make easy soil preparation, picking, spraying due to its width and height. The tunnel is suitable for growing tomatoes, cucumbers and sweet peppers.



**Table 6: High Tunnel Dimensions**

|                               |                            |                              |
|-------------------------------|----------------------------|------------------------------|
| <b>Material Specification</b> | Pipe material              | Mild steel, zinc galvanized  |
|                               |                            | Diameter 40mm                |
|                               |                            | Thickness 1.6 mm             |
|                               |                            | Length 20-25 ft              |
|                               | Plastic                    | 0.10 mm thick and 20 ft wide |
| Height                        | Center 10 ft, Sides 6.5 ft |                              |
| <b>Tunnel Specification</b>   | Width                      | 30 ft                        |
|                               | Length                     | 190 ft                       |
|                               | No. of tunnels             | 6 per acre                   |

The cost of such tunnel amount to Rs. 95,450 excluding the cost related to plastic used as a shield (Cover) and mulch.

### ***a) Support Structure***

This tunnel is built by pipe material of 40-mm diameter 20-25 feet length. The tunnel will be 10 feet high from the centre and 6.5 feet high from the sides. Each tunnel structure will then be covered by 0.1 mm thick and 20 feet wide plastic sheet. Approximately 6 tunnels can be constructed on an acre of land. Each tunnel will be 190 feet long, 10 feet high and 30 feet wide.



### ***b) Seed Recommendations***

Hybrid seeds are produced through a special process and give crop yield 3 to 4 times more than ordinary seeds. F1 hybrid seeds are recommended for cultivation in tunnels because they have the ability to resist multiple diseases and have above 90% germination capacity as compared to that of ordinary one.

### ***c) Important Points for Tunnel Farming***

- Prior to start off-season vegetable farming in tunnels, the investor must have practical knowledge about farming.
- Soil and water quality should be tested before starting the farming.
- Self-pollinated plant should be grown.
- Recommended seed should be used.
- Farmer must have the updated market information to earn high profit.

## ***10. Suitable Site for Tunnel Farming***

The purchased land is recommended for tunnel farming but can also be taken on lease. Rural areas around the major cities of the country are the suitable areas for setting up tunnels.

### ***i) Preparation of Soil & Sowing***

- Soil should be properly leveled preferably by laser leveling.
- Preparation of soil with rotaveter/ cultivator.
- Application of well-decomposed Farm Yard Manure at least 10 ton per acre at least 90 days before sowing.
- Prepare beds before sowing.
- Make holes and prepare media mixed with loam soil, FYM and fertilizers to fill the holes at the time of sowing/ seeding.
- Field should not be flooded with water. Irrigation should be applied in such a way that water level be kept below the seeding place; only moisture reach the seed to wet it for germination. In this way the percent germination would be more.
- Keeping in mind the type of soil, light irrigation should be repeated after 2-3 days to assure the proper moistures for germination.

### ***ii) Expected Production***

Expected production, sale price and land utilization of some vegetable is as follows: -

**Table 7: Expected Production and Land Utilization**

| <b>Vegetable</b> | <b>Land Utilization (Acres)</b> | <b>Production Quantity (kg)/ Acre</b> | <b>Production Quantity (kg)</b> | <b>Sale Price* Rs./ (kg )</b> |
|------------------|---------------------------------|---------------------------------------|---------------------------------|-------------------------------|
| Cucumber         | 3                               | 28,000                                | 84,000                          | 27                            |
| Capsicum         | 3                               | 18,000                                | 54,000                          | 47                            |
| Tomatoes         | 3                               | 24,000                                | 72,000                          | 47                            |

\*The prices of vegetables depend on demand and supply and environment conditions. Normally the off – season vegetables prices are higher than seasonal vegetables.

### ***11. Equipments and Machinery Requirements***

Following equipments and machinery is required for an off-season vegetable farm of 9 Acres:

**Table 8: Equipments and Vehicles**

| <b>Description</b>                                  | <b>Number</b> | <b>Cost (Rs)</b> |
|---|---------------|------------------|
| Rotavator   | 1             | 65,000           |
| Ridger  | 1             | 18,000           |
| Soil Leveler/ Scraper                               | 1             | 12,000           |
| Spray Machines & Farm Tools                         | 1             | 50,000           |
| Peter Engine  | 1             | 45,000           |
| <b>Total cost of tools &amp; equipment cost</b>     |               | <b>190,000</b>   |
| Tractor & Cultivator                                | 1             | 500,000          |
| <b>Total cost of tools, equipment &amp; vehicle</b> |               | <b>690,000</b>   |

### ***12. Human Resource Requirements***

**Table 9: Number of Staff required for 54 tunnels (9 acres)**

| <b>Description</b> | <b>Number</b> | <b>Monthly Salary per Person (Rs.)</b> | <b>Annual Salary (Rs)</b> |
|--------------------|---------------|--|---------------------------|
| Farm Manager       | 1             | 10,000                                 | 120,000                   |
| Labor              | 8             | 5,500                                  | 528,000                   |
| Guard              | 1             | 6,000                                  | 72,000                    |
| <b>Total</b>       | <b>10</b>     |  | <b>720,000</b>            |

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

**Table 10: Part-time staff requirement for 54 tunnels (9 acres)**

| <b>Description</b> | <b>Number</b> | <b>Salary (Month) (Rs)</b> | <b>Total Salary (Rs)</b> |
|--------------------|---------------|----------------------------|--------------------------|
| Labor              | 108           | 5,500                      | 594,000                  |

### ***13. Infrastructure Requirements***

For three off-season vegetable crops nine acre agriculture land is required with availability of electricity, Diesel (for tube well operations) and water.

**Table 11: Construction Cost for High Tunnel per Acre (Rs)**

| <b>Description</b>                  | <b>No. of Units</b> | <b>Price per Unit</b> | <b>Total Cost</b> |
|-------------------------------------|---------------------|-----------------------|-------------------|
| Misc Pipe                           | 2,000               | 40                    | 80,000            |
| Clamps                              | 80                  | 30                    | 2,400             |
| M& F adopters                       | 20                  | 200                   | 4,000             |
| Galvanized Wire Guage               | 40                  | 75                    | 3,000             |
| Tensioners                          | 30                  | 45                    | 1,350             |
| Nets                                | 12                  | 250                   | 3,000             |
| Fabrication Cost                    | 1                   | 1,700                 | 1,700             |
| <b>Total Cost in Rs. per Tunnel</b> |                     |                       | <b>95,450</b>     |
| No. of Tunnels per Acre             | 6                   |                       |                   |
| <b>Total Cost in Rs. per Acre</b>   |                     |                       | <b>572,700</b>    |
| Plastic Cost Kg/ Acre)              | 350                 | 180                   | 63,000            |
| Black Mulch                         | 40                  | 190                   | 7,600             |
| Total Plastic Cost Kg/ Acre)        |                     |                       | 70,600            |
| <b>Total Per Acre Cost</b>          |                     |                       | <b>643,300</b>    |

#### 14. Project Detail

| <b>Capital Investment</b> | <b>Rs.</b>       |
|---------------------------|------------------|
| Building/Infrastructure   | 5,789,700        |
| Machinery & Equipment     | 190,000          |
| Furniture & Fixture       | 60,000           |
| Pre-operational Expenses  | 100,000          |
| Vehicles                  | 500,000          |
| <b>Total Capital Cost</b> | <b>6,639,700</b> |

| <b>Working Capital</b>       | <b>Rs.</b>     |
|------------------------------|----------------|
| Raw material inventory       | 250,000        |
| Cash                         | 50,000         |
| <b>Total Working Capital</b> | <b>300,000</b> |

|                         |                  |
|-------------------------|------------------|
| <b>Total Investment</b> | <b>6,939,700</b> |
|-------------------------|------------------|

| <b>Financing</b> | <b>Rs.</b> |
|------------------|------------|
| Equity 50%       | 3,469,850  |
| Debt 50%         | 3,469,850  |

**15. Projected Income Statement of 54 tunnels on 9 acres project**

|                                       | Rs.              |                  |                  |                  |                  |                  |                  |                  |                  |                  |
|---------------------------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
|                                       | Year-1           | Year-2           | Year-3           | Year-4           | Year-5           | Year-6           | Year-7           | Year-8           | Year-9           | Year-10          |
| <b>Revenue from sale of vegetable</b> | 6,961,500        | 7,309,575        | 7,675,054        | 8,058,806        | 8,461,747        | 8,884,834        | 9,329,076        | 9,795,530        | 10,285,306       | 10,799,571       |
| Cost of Sales                         |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |
| Cost of Seeds                         | 76,666           | 80,499           | 84,524           | 88,750           | 93,188           | 97,847           | 102,740          | 107,877          | 113,271          | 118,934          |
| Operations costs (direct labor)       | 1,242,000        | 1,304,100        | 1,369,305        | 1,437,770        | 1,509,659        | 1,585,142        | 1,664,399        | 1,747,619        | 1,835,000        | 1,926,750        |
| Machine Maintenance                   | 150,000          | 157,500          | 165,375          | 173,644          | 182,326          | 191,442          | 201,014          | 211,065          | 221,618          | 232,699          |
| Fertilizers Cost                      | 288,000          | 302,400          | 317,520          | 333,396          | 350,066          | 367,569          | 385,948          | 405,245          | 425,507          | 446,783          |
| Pesticide Cost                        | 270,000          | 283,500          | 297,675          | 312,559          | 328,187          | 344,596          | 361,826          | 379,917          | 398,913          | 418,859          |
| Direct Water                          | 54,000           | 59,400           | 65,340           | 71,874           | 79,061           | 86,968           | 95,664           | 105,231          | 115,754          | 127,329          |
| Plastic Cost                          | 635,400          | 667,170          | 700,529          | 735,555          | 772,333          | 810,949          | 851,497          | 894,072          | 938,775          | 985,714          |
| Total cost of sales                   | 2,716,066        | 2,854,569        | 3,000,268        | 3,153,548        | 3,314,819        | 3,484,513        | 3,663,087        | 3,851,025        | 4,048,838        | 4,257,067        |
| <b>Gross Profit</b>                   | <b>4,245,434</b> | <b>4,455,006</b> | <b>4,674,786</b> | <b>4,905,258</b> | <b>5,146,927</b> | <b>5,400,321</b> | <b>5,665,988</b> | <b>5,944,505</b> | <b>6,236,468</b> | <b>6,542,504</b> |
| Operating Expense                     |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |
| Payroll (Admin)                       | 72,000           | 75,600           | 79,380           | 83,349           | 87,516           | 91,892           | 96,487           | 101,311          | 106,377          | 111,696          |
| Fixed electricity                     | 60,000           | 66,000           | 72,600           | 79,860           | 87,846           | 96,631           | 106,294          | 116,923          | 128,615          | 141,477          |
| Administrative Overheads              | 69,615           | 73,096           | 76,751           | 80,588           | 84,617           | 88,848           | 93,291           | 97,955           | 102,853          | 107,996          |
| Amortization (Pre-operational Expense | 15,000           | 15,000           | 15,000           | 15,000           | 15,000           | -                | -                | -                | -                | -                |
| Transport Cost                        | 892,500          | 896,963          | 901,447          | 905,955          | 910,484          | 915,037          | 919,612          | 924,210          | 928,831          | 933,475          |
| Packing Cost                          | 357,000          | 358,785          | 360,579          | 362,382          | 364,194          | 366,015          | 367,845          | 369,684          | 371,532          | 373,390          |
| Depreciation                          | 140,000          | 140,000          | 140,000          | 140,000          | 140,000          | 140,000          | 140,000          | 140,000          | 140,000          | 140,000          |
| Total                                 | 1,606,115        | 1,625,443        | 1,645,757        | 1,667,133        | 1,689,658        | 1,698,423        | 1,723,528        | 1,750,084        | 1,778,209        | 1,808,033        |
| <b>Operating Profit</b>               | <b>2,639,319</b> | <b>2,829,562</b> | <b>3,029,029</b> | <b>3,238,125</b> | <b>3,457,270</b> | <b>3,701,898</b> | <b>3,942,460</b> | <b>4,194,421</b> | <b>4,458,260</b> | <b>4,734,471</b> |
| Non-Operating Expense                 |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |
| Interest expense on long term debt    | 432,000          | 405,000          | 350,000          | 270,000          | 150,000          |                  |                  |                  |                  |                  |
| Land Lease                            | 135,000          | 135,000          | 135,000          | 135,000          | 135,000          | 135,000          | 135,000          | 135,000          | 135,000          | 135,000          |
| Total                                 | 567,000          | 540,000          | 485,000          | 405,000          | 285,000          | 135,000          | 135,000          | 135,000          | 135,000          | 135,000          |
| <b>Earnings Before Tax</b>            | <b>2,072,319</b> | <b>2,289,562</b> | <b>2,544,029</b> | <b>2,833,125</b> | <b>3,172,270</b> | <b>3,566,898</b> | <b>3,807,460</b> | <b>4,059,421</b> | <b>4,323,260</b> | <b>4,599,471</b> |
| Commission of Arthi                   | 103,616          | 114,478          | 127,201          | 141,656          | 158,613          | 178,345          | 190,373          | 202,971          | 216,163          | 229,974          |
| <b>NET PROFIT</b>                     | <b>1,968,703</b> | <b>2,175,084</b> | <b>2,416,828</b> | <b>2,691,469</b> | <b>3,013,656</b> | <b>3,388,553</b> | <b>3,617,087</b> | <b>3,856,450</b> | <b>4,107,097</b> | <b>4,369,497</b> |

## 16. Input Assumptions

**Table 12: Seed Assumptions**

| Crop Assumptions       | Cost per Seed in Rs. | Average Seed Requirement in unit/ Acre | Av. Seed Price/ Acre |
|------------------------|----------------------|--|----------------------|
| Cucumber               | 1.70                 | 13,333                                 | 22,666               |
| Capsicum               | 1.60                 | 15,000                                 | 24,000               |
| Tomato                 | 2.00                 | 15,000                                 | 30,000               |
| Sale Price Growth Rate |                      |  | 5%                   |

**Table 13: Production Assumptions**

| Crop Assumptions       | Crop Yield per Acre in kg | Total Production Quantity (kg) | Sale Price of Crop per Kg |
|------------------------|---------------------------|--------------------------------|---------------------------|
| Cucumber               | 28,000                    | 84,000                         | 27                        |
| Capsicum               | 18,000                    | 54,000                         | 47                        |
| Tomato                 | 24,000                    | 72,000                         | 47                        |
| Sale Price Growth Rate |                           |                                | 5%                        |

**Table 14: Expense Assumptions**

|  |        |
|--|--------|
| Crop Wastage                                 | 15%    |
| Administrative Overhead (% of Total Revenue) | 1.00%  |
| Water cost per Irrigation per Acre (Rs.)     | 600    |
| Irrigation (No. of Months)                   | 5      |
| No. of times land irrigated (per month)      | 2      |
| Fixed Electricity per Month (Rs)             | 5,000  |
| Transport Cost per kg (Rs)                   | 5.00   |
| Packing Cost per kg (Rs)                     | 2.00   |
| Machine Maintenance (machine/month)          | 5,000  |
| Pesticide Requirement per Acre per Year (Rs) | 30,000 |
| Fertilizer Cost per Acre per Year (Rs)       | 20,000 |



**Table 15: Farmyard Manure Cost**

| <b>Farmyard Manure</b> | <b>Per Acre Cost</b> |
|------------------------|----------------------|
| Tomatoes               | 4,000                |
| Capsicum               | 4,000                |
| Cucumber               | 4,000                |

**Table 16: Growth Rate Assumptions**

|                                 |     |
|---------------------------------|-----|
| Electricity Growth Rate         | 10% |
| Water price growth rate         | 10% |
| Wage Growth Rate                | 5%  |
| Raw Material price growth rate  | 5%  |
| Machine Maintenance Growth Rate | 5%  |

## **17. Disclaimer**

*The content of the information memorandum does not bind NBP in any legal or other form as the purpose of this report is to provide a general idea and information to NBP staff to assist them evaluate the feasibility reports submitted by the clients, and for the farmers and organizations interested to grow off-season vegetables by using tunnel technology. The data and info reported in this document is gathered from various sources and is based on certain assumptions. In spite of taking due diligence in compiling this report, the contained information may vary due to any change in any of the relevant factors e.g. agro-climatic conditions, farm management, diseases, pests, low production, market prices etc. and the actual results may differ substantially from the presented information. NBP does not assume any liability for any financial or other loss resulting from this document in consequence of undertaking this Project.*