Detailed Project Report

for

Integrated Fruit and Vegetable Processing Unit at Sai Pravara Agro Processing Park, Ahmednagar on DBFOT basis

Maharashtra State Agricultural Marketing Board (MSAMB)

April 2013

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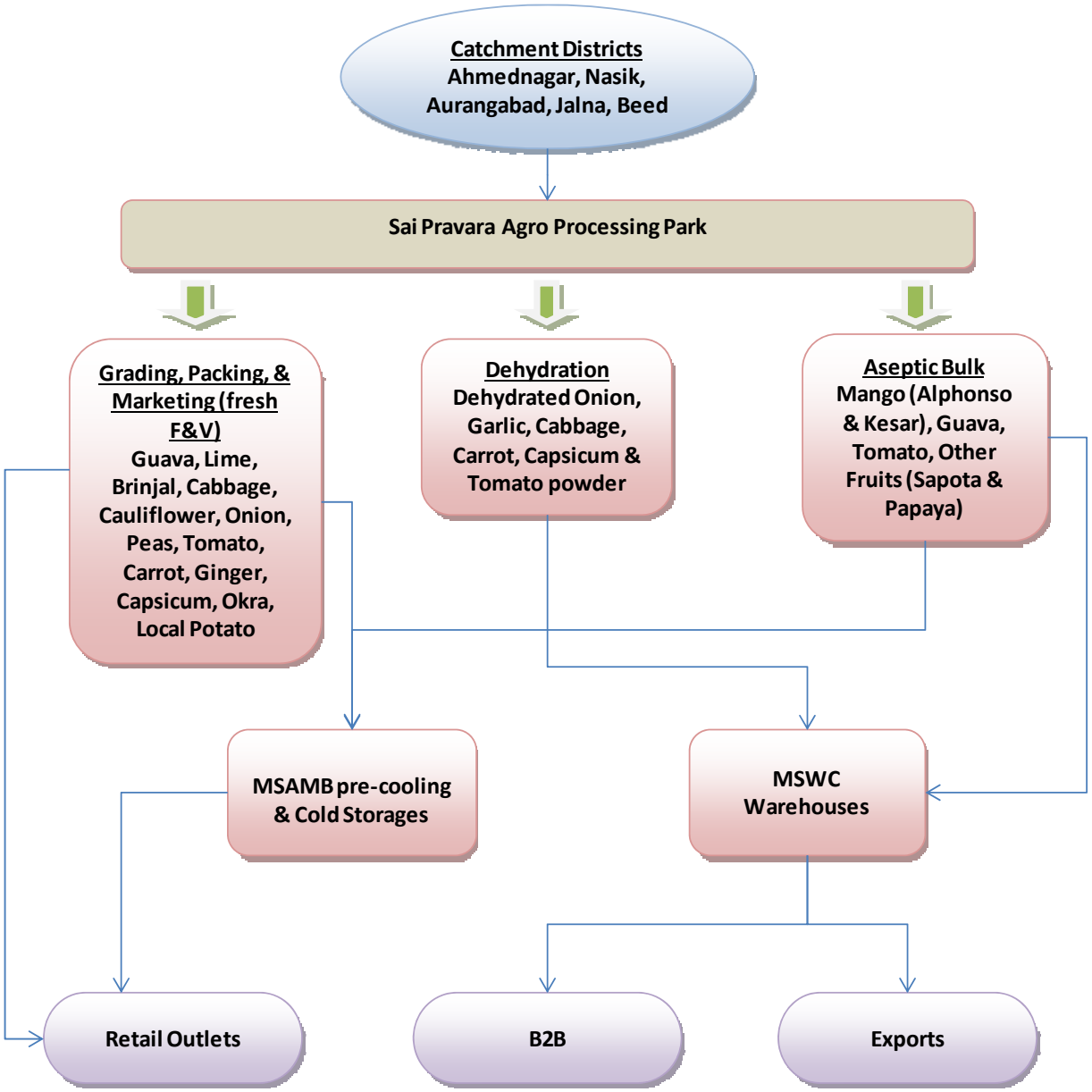
Abbreviations

No.	Abbreviation	Details
1	APEDA	Agriculture Produce Export Development Authority
2	APMC	Agriculture Produce Marketing Committee
3	AEZ	Agricultural Export Zone
4	CAGR	Compound Annual Growth Rate
5	◦c	Degree Centigrade
6	CWC	Central Warehousing Corporation
7	DIPP	Department of Industrial Policy and Promotion
8	DPR	Detailed Project Report
9	EOU	Export Oriented Unit
10	ESP	Electrostatic Precipitator
11	◦F	Degree Fahrenheit
12	FAO	Food Agriculture Organization
13	FDI	Foreign Direct Investment
14	GOI	Government of India
15	GoM	Government of Maharashtra
16	Ha	Hectares
17	INR	Indian Rupee
18	I.S.O.	International Standard Organization
19	J.N.P.T.	Jawaharlal Nehru Port Trust
20	Kg	Kilogram
21	Km	Kilometers
22	KW	Kilo Watts
23	LS	Lump Sum
24	MbPT	Mumbai Port
25	M.D.	Managing Director
26	Misc.	Miscellaneous
27	Mm	Millimeter
28	Mn	Million
29	M.S.	Maharashtra State
30	MoFPI	Ministry of Food Processing Industries
31	MoU	Memorandum of Understanding
32	MSAMB	Maharashtra State Agricultural Marketing Board
33	MSWC	Maharashtra State Warehousing Corporation Ltd.
34	M.T.	Metric Ton
35	N.B.	Net Block

No.	Abbreviation	Details
36	N.D.C.	National Development Council
37	N.E.	North East
38	NH	National Highway
39	NW	North West
40	N.W.C.	Net Working Capital
41	PBS	Pravara Society
42	PM	Particulate Matter
43	PPP	Public Private Partnership
44	RM	Raw Material
45	RKVY	Rashtriya Krishi Vikas Yojana
46	RSMD	Riot, Strike & Malicious Damages
47	RTC	Ready to Cook
48	RTE	Ready to Eat
49	SE	South East
50	SEZ	Special Economic Zone
51	SO_2	Sulphur Dioxide
52	SPPP	Sai Pravara Agro Processing Park
53	Sq. m	Square Meter
54	STFI	Storm Tempest Flood & Inundation
55	SW	South West
56	TPD	Tons Per Day
57	TPH	Tons Per Hour
58	UK	United Kingdom
59	USA	United States of America
60	VAT	Value Added Tax
61	V&F	Vegetables and Fruits
62	VGF	Viability Gap Funding

Project at a Glance



PROJECT SUMMARY

Proposed Business Activities

1. Marketing Operations of Fresh Fruits & Vegetables
2. Dehydration Plant
3. Multi Fruit Processing Plant (Aseptic Bulk Packaging/ Tomato Paste Plant)

Capacity and Turnover

Particulars	Raw Materials (in MT)	Finished Goods (in MT)	Annual Turnover (in Lakhs)
Marketing Operations of Fresh Fruits & Vegetables	15000	14085	1831.42
Dehydration Plant	12000	1052	1534.34
Multi Fruit Processing Plant (Aseptic Bulk Packaging/ Tomato Paste Plant)	18300	6280	2865.60
Total	**49800**	**21417**	

Target Market

A) **Fresh fruits & vegetables**- Maharashtra & Gujarat (Mumbai, Pune, Nasik, Surat and Ahmedabad)

B) **Dehydrated Products**

Product	Market
Dehydrated Onion	Export/Domestic
Dehydrated Garlic	Domestic
Tomato Powder	Domestic
Dehydrated Cabbage	Export/Domestic
Dehydrated Capsicum	Domestic
Dehydrated Carrot	Export/Domestic

C) **Aseptic and Concentrated products**

Product	Market
Aseptic Mango Pulp (Kesar & Alphonso)	Export/ Domestic
Aseptic Fruit Pulp (Papaya &Sapota)	Export/ Domestic
Aseptic Guava Pulp	Export/ Domestic
Tomato Paste	Domestic

Project Investment Summary

No.	Activity	Area required in sq.ms	Investment in Construction (Rs. In Lakhs)	Warehouse Requirement to be leased by MSWC (in sq.m)	Investment in P&M (Rs. In Lakhs)	Investment in Misc. F.A. (Rs. In Lakhs)	Total investment (Rs. In Lakhs)	Annual Turnover (in Lakhs at installed Capacity)	Power KW	Water Lit./ Day
1	Fresh Fruits & Vegetable-Grading, Packing Area	8800	312.00	-	462.23	32.55	806.78	1831.42	60	50,000
2	Fruits & Vegetable Dehydration Plant	23616	497.70	2000	1515.15	61.95	2074.80	1534.34	490	75,000
3	Multi Fruit aseptic & Concentrate Plant	17600	672.53	2000	1638.84	143.33	2454.69	2865.60	570	375,000

Chapter 1

1 Introduction

Government of Maharashtra (GoM's) Vision towards achieving rise in the income of the farmers through higher price discovery is supported by Government of India (GoI) through the following:

- Adaptation of modern production technology by the farmers to increase agricultural productivity
- Ease of access of market information to the farmers
- Establishment of various alternative marketing channels (such as agro processing projects, private markets, terminal markets) to fetch competitive price to their agricultural produce and
- Access to various market risk mitigation measures to reduce market stress

Project preparatory work has identified that Maharashtra has the potential for attracting private sector investment into post-harvest horticulture. In aligning with the GOI policy, Public Private Partnership (PPP) mode is being used to develop agro processing infrastructure in the State.

With this objective, Maharashtra State Agricultural Marketing Board (MSAMB) has decided set-up an Integrated Fruit and Vegetable (F&V) Processing Project as "Sai Pravara Agro Processing Park" at Khadkewaki, Taluka Rahata, District Ahmednagar on PPP mode.

1.1 Background and Rationale of the Project

Maharashtra is a bio-diverse state with 9 agro climatic zones and varying soil types, suitable for agricultural development. It has more than 60% of the area under drip irrigation. The State is one of the major **horticultural states** in India with more than **13.66 lakh hectares under fruits** and **4 lakh hectares under vegetables**. It is one of the **largest states in the production of fruits and vegetables**, contributing 4.5% of the total vegetable production and the largest producer of fruits at 14% of the total fruit production in the country.

Because of the Mumbai port and the Mumbai metropolitan market, the State enjoys comparative advantages in exports and domestic demand. The exports from Maharashtra for fresh vegetables & fruits account for 30% and for processed food products, it is almost 50%.

But Food Processing Industry in Maharashtra consists of very basic processing. Traditional methods of processing are predominant. It includes mango/ tomato pulp, canning of fruits, jams, pickles, fruit juices. With innovative technology such as vacuum preservation, aseptic packaging, freeze drying and industrial quick freezing plants have come up. As regards the cold storage and packing facilities are concerned, they are not sufficient and not modernized enough as per the international standards.

Thus, even today the growth of processing industry in the State has been guided largely by availability of infrastructural facilities and convenient markets, besides the ready availability of raw materials. Food Parks and wine parks are being set-up in the state to provide basic common infrastructural facilities to the processors.

Thus, the proposed project is aimed to:

- Increase the final value of the produce
- Increase the realization to the farmer
- Shelter the farmer from the vagaries of the market by providing alternative marketing options
- Increase the economic output of the State.

Pravara Society, a professionally managed co-operative society, was established in 1984, for the farmers and by the farmers. The primary objective of the Society is to provide knowledge to its members with regards to modern commercial agriculture so as to ensure supply of quality crops in the domestic and international markets. The Society works in diversified activities related to farmers – ex. supply of seeds, fertilizers, implementation of Government schemes, and assisting the farmers for marketing.

In the current scenario, the society intends to expand its operations in various other products in different areas of Ahmednagar and Aurangabad districts by expanding its current member base. Pravara Society has planned to establish a state-of-the-art F&V processing set-up with the help of Government Support on PPP model. The PPP model will give an opportunity to expand the base of Pravara Society; at the same time the project for this package will get an advantage of vast experience of successfully implementing farmer group based activities through improved technology management. The Society has acquired land of 13 Ha at a very strategic location near the proposed Shirdi airport for developing the park, out of which the PPP project will be spread over an area of 12.35 acres.

To accelerate the activity, the Pravara Society has signed a MoU (Memorandum of Understanding) with Government Institutes- Maharashtra State Agricultural Marketing Board (MSAMB), Maharashtra State Warehousing Corporation Ltd. (MSWC), and Government of Maharashtra Agriculture Department. The Government incentives and schemes will be extended to the proposed venture- RKVY, APEDA and MoFPI etc. Maharashtra State Agricultural Marketing Board Ltd. MSAMB will be the implementing agency of the project. The main attraction for the private player will be **VGF/ Grant.**

1.2 Mission

The Mission of the project is mainly to:

- increase the per capita income of the farmers in the catchment area of the project
- increase social wellness and
- increase value addition in agro produce (F&V);

which will ultimately take care of the upliftment of farmers.

The Sai Pravara Agro Processing Park (SPPP) proposed to be a Fruit & Vegetable Multi Product Processing Park to be set up on Public Private Partnership (PPP) basis, will be the first PPP project of its kind promoted by the State Government.

1.3 Objectives

The main objectives of the proposed project are:

- To create state-of-the-art export oriented F&V processing centre
- To ensure farmer – processor tie-up for assured market for F&V in the catchment area
- To promote Contract Farming
- To recycle wastage of F&V
- To generate direct and indirect employment
- To develop demand based farming practices
- To reduce wastage of F&V
- To promote women and social empowerment

1.4 Project Location

Ahmednagar district, which is known to be the ‘Place of Saints’, is located between Pune and Aurangabad on road line and between Manmad & Daund on railway line. It is the largest district in area in Maharashtra comprising 14 taluka places. The district has a well established road network connecting it to all the mega markets in the country. It can be said that the district is the ‘Gateway’ of Marathwada and Vidarbha to Mumbai.

It is situated on the west bank of the Sina River and is home to 19 sugar factories. Further, it is also the birthplace of the co-operative movement. The north belt of the district is richer in water resources due to Godavari and Pravara rivers whereas the south belt is dry land; except few spots in Shrirampur and Parner. The district has very high industrial growth.

Ahmednagar district; and especially Rahata Tehsil, has a very prestigious background and history with respect to co-operative movement and modern agriculture practices in India. The first co-operative sugar factory was established in this Tehsil. Further, the major watershed development has been undertaken since independence, which enabled increased development of the agriculture sector in the district.

Figure 1: Project Location

The catchment area for the proposed project will be Ahmednagar and adjacent districts of Nasik, Aurangabad and Jalna. These adjacent districts are the prime Fruit & Vegetable producing districts and hence backward linkage is assured for the project.

The tables below shows the distances between major catchment areas for the project:

Table 1: Distance between major catchment areas

Catchment Area	Distance (in kms)
Mumbai	253
Jalna	192
Nashik	156
Beed	126

Catchment Area	Distance (in kms)
Aurangabad	120
Pune	120

1.4.1 Location Advantage

An initial reconnaissance survey for the site has been conducted by the Consultant to identify the site features in terms of location, access, connectivity, surrounding features etc. Accordingly, site appraisal was done in order to understand the following features of the site:

- Location, area, nearest settlement
- Access and connectivity
- Surroundings – physical features (buildings, water body, hills, vegetation road, power grid etc), existing development
- Terrain
- Infrastructure availability (water, power, storm water disposal)

1.4.1.1 Site Analysis

The site is around 15 km from Shirdi. It is around 4.5 km from SH10 and lies on the bypass road from SH10. The site is located at the co-ordinates: latitude 19.66238 longitude 74.45172.The distances of major places from the site are:

Area	Distance from site (in kms)
Shirdi	5
Shirdi airport	10
Manmad	73 (it has a railway rake point)
Kopargaon	30 (it has a railway rake point)

JNPT- Jawaharlal Nehru Port Trust is the nearest port for export and Sahar is the International cargo hub for export by air. The site is well connected with all the major transportation modes like railway, road and air.

- Nearest railway station- Shirdi
- Nearest bus stand- Rahata
- Nearest airport- Nashik, Aurangabad and Proposed Sai Baba International Airport, Shirdi

The site land is rectangular in shape and has almost flat terrain. Site is at mean sea level 540-545m.

Site is situated in nearby clusters of abundant fruit & vegetable growing area (like Sangamner). The farmers in the project area are quite progressive and proactive; hence raw material

availability throughout the year is assured. The other utilities for the success of the project like water, power & skilled manpower is available at the location.

1.4.2 District Profile of Ahmednagar

1.4.2.1 Ahmednagar District Profile

Ahmednagar

Ahmednagar district, which is known to be the 'Place of Saints', is located between Pune and Aurangabad on road line and between Manmad and Daund on railway line. It is the largest district in area in Maharashtra comprising of 14 talukas. The district has well road network connecting it to all the mega markets in the country. It can be said that the district is the 'Gateway' of Marathwada and Vidarbha to Mumbai.

The north belt of the district is richer in water resources with the help of Godavari and Pravara rivers and south belt is dry land except few spots in Shrirampur and Parner. The district has very good industrial growth.

Ahmednagar district and specially Rahata Tehsil has a prestigious background in cooperative movement and modern agricultural practices in India. The first cooperative sugar factory was established in this Tehsil. Major watershed development has taken place in this district, which has enabled several development activities in agriculture.

Pravara Society was established in 1984 with primary objective to provide knowledge to its members (275 nos.) in modern commercial agriculture in order to supply good quality produce in domestic and international markets.

Administrative Division	Nasik Division
Headquarters	Ahmednagar
Area	17,413 sq. km (6,723 sq. m)
Population	4,543,083 (2011)
Tehsils	Akole, Jamkhed, Karjat, Kopargaon, Nagar, Nevasa, Parner, Pathardi, Rahata, Rahuri, Sangamner, Shevgaon, Shrigonda, Shrirampur

Ahmednagar District is the largest District of Maharashtra State in Western India. The District is known as the town of Shirdi Ke Sai Baba, a part of Nashik Revenue Division.
The Solapur (South East-SE), Osmanabad (SE), Beed (SE), Aurangabad (NE), Nashik (NW), Thane (NW), and Pune (SW) are the adjoining districts of Ahmednagar District.

1.4.2.2 Details of nearby Districts in the Catchment Area

1) Nasik District Profile

Administrative Division	Nasik Division
Headquarters	Nasik
Area	15,530 km² (6,000 sq mi)
Population	49,93,796 (2001)
Population Density	321.56/km²(832.8/sq mi)
Tehsils	1.Nasik, 2.Sinnar, 3.Igatpuri, 4.Trimbak, 5.Niphad, 6.Yeola, 7.Peth, 8.Dindori, 9.Chandwad, 10.Nandgaon, 11.Surgana, 12.Kalwan, 13.Deola, 14.Baglan, 15.Malegaon
Major Highway	NH-3, NH-50

Nasik district has an area of 15,530 square kilometers. It is bounded by Dhule district in the north, Jalgaon district in the east, Aurangabad district in the southeast, Ahmednagar district in the south, Thane district in the southwest, Valsad and Navsari districts of Gujratin the west, and the Dangs district in the northwest.

2) Aurangabad District

Administrative Division	Aurangabad Division
Headquarters	Aurangabad, Maharashtra
Area	10,100 km² (3,900 sq mi)
Population	2,897,013 (2001)

Population Density	286.83 /km² (742.49 /sq mi)
Tehsils	1.Aurangabad, 2.Paithan, 3.Vaijapur, 4.Gangapur, 5.Khuldabad, 6.Phulambri, 7.Kannad, 8.Sillod, 9.Soegaon
Major Highways	NH-211
Average Annual Precipitation	734 mm

Aurangabad district is located mainly in the Godavari River Basin and partly in the Tapi River Basin

3) Jalna District

Jalna district is situated in Central Maharashtra and northward in Marathwada region.
Jalna was formerly a part of Nizam State and after the Marathwada Mukti Sangram, it became a part of India, as a tehsil of Aurangabad District.
Jalna district was formed on 1st May 1981 by carving out Jalna, Bhokardan, Jafrabad, Ambad tahsils of Aurangabad district and Partur tahsil of Parbhani district. The boundaries of Jalna district are adjacent to Parbhani & Buldhana in east, Aurangabad in west, Jalgaon in north and Beed in south. Jalna district covers an area of 7,612 sq. kms, which is 2.47% of the total state area.

4) Beed District

Beed District (or Bid or Bhir) is an administrative district in Maharshtra. The district headquarters are located at Beed. The district occupies an area of 10.693 km² and has a population of 2,161,250 of which 17.91% were urban (as of 2001).

Agriculture is the main occupation in Beed, and it is largely dependent on monsoon rain.
This District is divided in to Eleven Talukas (or Tehsils). These are:

1. Beed
2. Ashti
3. Patoda
4. Shirur (Kasar)
5. Gevrai
6. Ambajogaj
7. Wadwani
8. Kaij
9. Dharur
10. Parli (Vaijinath)
11. Majalgaon

Before 1992, work of soil conservation was scattered in nature. But after August 1992, a systematic approach of integrated watershed development was adopted by Department of Agriculture throughout the State. Centrally sponsored program for watershed development like National Watershed development Program, Draught Pune area project, River valley project, SGRY were implemented in this district.

Two harvests, kharif and Rabi are practiced. In Kharif, the crops are jawar, bajra, tur, udid, cotton and ground nut while in Rabi the crops are Jawar, wheat, Harbara, Kardai etc. In annual cropping pattern, crops are sunflower and summer groundnuts. Fruits and vegetables are grown as per availability of water resources. In Beed, Patoda, Kaij, Ambajogai and Ashti, Kharif harvest is practiced while at Georai and Majalgaon both Kharif and Rabi harvests pattern is practiced. In 1998-99, out of total cultivated area, Jowar 33.23 %, Bajra 18.83%, Cereals 57.60%, Kaddhanya 10.62%, Sugarcane 2.17%.

The commercial crops are sugarcane and cotton. With the increase in number of Sugar factories, the area under sugarcane cultivation has increased. There are 8 Marketing Communities each one at –

1. Beed
2. Gavarai
3. Majalgaon
4. Ambajogai
5. Parli Vaijnath
6. Dharur
7. Patoda
8. Kava (Taluka Ashti)

Mango, sweet lime, sapota, banana and leafy vegetables are the major V&F cultivated in the district.

1.5 The Public Private Partnership Model

Public Private Partnership means an arrangement between a government / statutory entity / government owned entity on one side and a private sector entity on the other, for the provision of public assets and/or public services, through investments being made and/or management being undertaken by the private sector entity, for a specified period of time, where there is well defined allocation of risk between the private sector and the public entity and the private entity receives performance linked payments that conform (or are benchmarked) to specified and pre-determined performance standards, measurable by the public entity or its representative.

To establish and run an F&V processing project requires expertise right from raw material procurement/ handling to marketing of the produce. The requirement of land shall be met by MSAMB, while the business efficiencies and initiatives will be managed by the Private Entrepreneur. Pravara Society is an expert in cultivation of F&V.

The Society has a good network and association of large number of farmers. The Society wishes to share its strengths with the private player. Thus it is proposed to identify and invite Private Players to design, build, finance, operate & transfer the project on PPP basis.

For the private players who are already in the F&V processing, this would provide a good opportunity to expand their operations in this field and to enhance their market share. Incentives will be available to the private player such as Grant/ VGF along with backward linkage.

1.5.1 The Key Features of the Project PPP Model

a. MSAMB is the implementing agency and owner of the infrastructure after the concession period
b. Single private player or consortium of more than one player can bid for the project
c. Supporting facilities like warehouse, pre-cooling and cold storage are being established on site by respective government agencies. The private player can take advantage of these facilities
d. The main component of the project is Grant/ VGF.
e. Strong backward linkage by Pravara Society. Farmers are progressive, contract farming will be possible in future
f. The project area (12.35 acres) area will be maintained by private player
g. The selection of private player will be on the criteria- minimum demand for VGF

1.5.2 Nodal Agency: MSAMB

The following important role has to be undertaken by the key promoter of the Project. As an implementing Agency, MSAMB should endeavor for the following:

a. Frame attractive conditions for better commercial liaison of the Project. Thus, liaison with the various State Government agencies for concession in electricity rates, tax tariffs etc.
b. Provision of water for the project as per the demand given in the detailed project report
c. Assist the PPP Entrepreneur to obtain various Statutory clearances for commencement of the project for speedy implementation

d. To provide various grants/concessions to the entrepreneur for timely completion of Project
e. To receive financial assistance/ Grant under the applicable Scheme, and utilize it in a transparent and judicious manner by maintaining a proper monitoring system.

Chapter 2

2 Status of Food Processing Industries

2.1 Global Food Processing Industry

The level of processing in agriculture varies from country to country &sector to sector. In the case of fruits & vegetables, it is very high in developed countries (80% in USA, 70% in France) as well as in developing countries (80% in Malaysia, 45% in Philippines, 30% Thailand) but a mere 2% in India.

The level of processing of fruits and vegetables can be categorized into **Primary processing** (packed/branded fresh fruits and vegetables) and **Secondary processing** (juices, concentrates, pickles, jams, squashes). The overall markets for processed food products is about US$ 4 trillion, with long term CAGR of over 2.5%. Of this, the packaged food, meat and poultry sector accounts for 40% followed by agriculture and beverages at about 30% each. The business of cross-border transfer of processed foods has an average value of 500 billion dollars, and is consistently growing. The products traded include processed and preserved foods of plant, animal and marine origin, as well as fresh fruits and vegetables, and grains &beverages.

While the developed countries are mainly importers, the developing nations export these processed food items. Market size of processed food in develop countries is enormous in term of retail sales value. United States, European Union and Japan together account for over 60 percent of total retail processed food sales in the world. However, market growth has generally been faster among developing countries, particularly in countries such as China, Morocco, Philippines, and many Eastern European countries. The transitioning Eastern European countries, such as Bulgaria, Romania and Ukraine, experienced double-digit growth in retail sales of many processed food and beverage products during the late 1990s. Whereas, sales of processed food and beverage in these markets have been stabilized, Asian markets including India, are registering a significant growth in production and consumption of proceeds food and beverages.

2.2 Indian Food Processing Industry

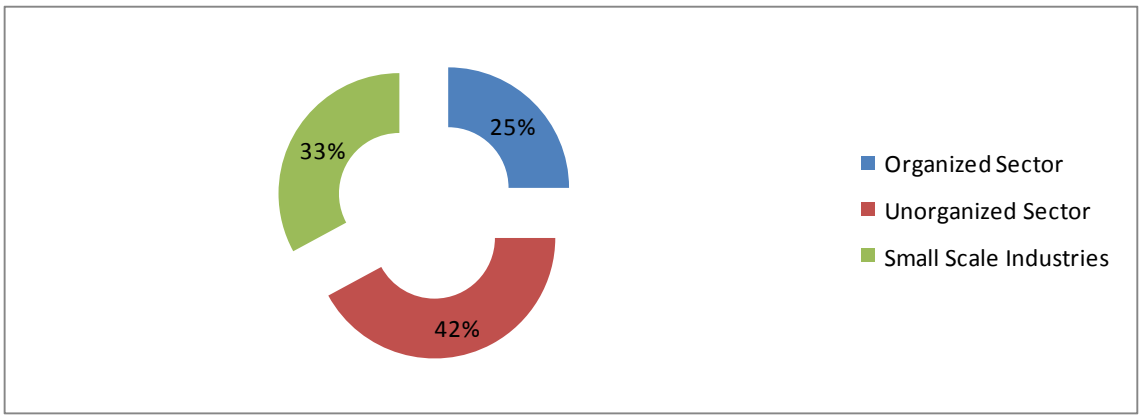
According to a study by Mckinsey and Company, the Indian food market is poised to touch $310 billion by 2015 and $344 billion in 2025, recording an approximate CAGR of 4.1%.Important sub sectors in food processing industry are:-

Table 2: Sub-sectors of Food Processing Industry

Sectors	Products
Dairy	Whole Milk Powder, Skimmed Milk Powder, Condensed milk, Ice cream, Butter and Ghee, Cheese
Fruits & Vegetables	Beverages, Juices, Concentrates, Pulps, Slices, Frozen & Dehydrated products, Potato Wafers/ Chips, etc
Grains & Cereals	Flour, Bakeries, Starch Glucose, Cornflakes, Malted Foods, Vermicelli, Beer & Malt extracts, Grain based Alcohol
Fisheries	Frozen & Canned products mainly in fresh form
Meat & Poultry	Frozen & Packed- mainly in fresh form, Egg Powder
Consumer Foods	Snack food, Namkeens, Biscuits, Ready to eat food, Alcoholic and non-alcoholic beverages

(Ministry of Food Processing Industry, India)

Figure 2: Structure of Indian food Processing Industry



The food processing industry in India ranks fifth in size, contributes about 6.3 per cent to GDP and 19 per cent to India's industrial force. **One third of the Indian food market share comprises processed food**. The turnover of the total food market is approximately Rs.250, 000 Crore (US $ 69.4 billion). Value-added food products comprise Rs. 80,000 Crore (US $ 22.2 billion). The size of the semi-processed and ready to eat packaged food industry is over Rs. 4,000 Crore (US $ 1 billion) and is growing at over 20%.

India is the World's second largest producer of fruits & vegetables, but hardly 2% of the produce is processed. The main reason is that domestic consumption of processed items is quite meager because of economic reasons and also as a matter of habit. The Indian consumers by and large prefer fresh fruit & vegetables. The high cost of packaging pushes up the cost of the processed items and thereby makes them out of reach of the common man. Further, due to the varied agro climatic conditions, some fresh fruit & vegetables are available throughout the

year. Some fruits like guavas & oranges have two seasons; hence they are available in fresh form for four to five months in a year.

Indians spend half of their household expenditure on food items at present. The industry would create 9 million employment opportunities from the current 1.6m and investment of Rs. 1,50,000 crores in the coming 10 years.

Table 3: Market growth over the years

Financial Year	Market		
	Total	Domestic	Exports
2004 - 05	118.8	67.5	51.3
2005 - 06	187.9	80.0	107.9
2006 - 07	297.3	124.0	173.3
2007 - 08	416.2	173.6	242.6
2008 - 09	541.0	225.7	315.3
2009 - 10	649.2	270.8	378.4
2010 - 11	779.0	325.0	454.1
2011 - 12	934.8	390.0	544.9
CAGR	**34.3**	**28.5**	**40.2**

Growth Trend of Processed Fruits & Vegetable Products in the Domestic market (Categories of products under consideration are growing at a brisk pace for the last 3 years).

2.3 Export Scenario

The Indian food processing industry is primarily export oriented. India's geographical situation gives a unique advantage of connectivity to Europe, Middle East, Japan, Singapore, Thailand, Malaysia and Korea. Exports of agricultural products from India are expected to cross around US$ 22 billion mark by 2014 and account for 5 per cent of the world’s agriculture exports, according to the Agricultural and Processed Food Products Export Development Authority (APEDA).India's exports of Processed Food was Rs.34864.36 Crores in 2011-12, which included the share of products like Mango Pulp (Rs.620.83 Crores), Dried and Preserved Vegetable (Rs.700.19 Crores), Other Processed Fruit and Vegetable (Rs. 2117.86 Crores), Pulses (Rs. 1067.93 Crores), Groundnuts (Rs. 5246.45 Crores), Guargum (Rs. 16523.87 Crores), Jaggery& Confectionary (Rs. 3459.40 Crores), Cocoa Products (Rs. 175.98 Crores), Cereal Preparations (Rs. 1870.04 Crores), Alcoholic and Non-Alcoholic Beverages (Rs. 1469.54 Crores) and Miscellaneous Preparations (Rs. 1291.03 Crores).

Table 4: The Export Market Summary: Raw, Semi Processed & Processed Fruits &Vegetables

Category	Value Rs. Crore	Volume '000 MT	Major Destination Countries
Fruits - Processed	161.4	36.9	Netherlands, Saudi Arabia, UK, USA, Japan
Fruits - Raw	551.5	258.4	Bangladesh, UAE, Netherlands, UK, Nepal, Belgium, Germany
Vegetables – Processed	391.4	199.7	Russia, USA, Belgium, Netherlands, France
Vegetables - Raw	1526.7	1611.9	Bangladesh, UAE, Malaysia, Sri Lanka, Pakistan
Vegetables - Semi Processed	263.4	75.2	USA, Germany, UK, Bangladesh, Russia, UAE, Sri Lanka

For the products under consideration, Bangladesh & UAE are the biggest buyers followed by Malaysia, Russia, Netherlands and Sri Lanka.UK & USA are also amongst the major buyers of processed fruits & semi processed vegetables.

2.4 Growth Potential

Food processing industry is a dominant segment in the food industry commanding 32% share. While, India has established an abundant food supply chain, the processed food industry is still at its nascent stages registering only a meager share of 2% of fruits and vegetables and 15% of dairy processed food.

The food processing industry, which has been growing at 7%, is likely to register a growth of about 10% per annum in the near future, considering a step-up in investment and increase in consumer demand.

Till some time back, the processing industry was limited to pulps, particularly of tomatoes & mangoes, ready to serve juices, canned fruits, jam, pickles, squashes, etc. Recently, items like frozen fruits, dehydrated & frozen dried vegetables, canned mushrooms & other seasonal vegetables etc. are generating a lot of demand. In the coming years new items like carbonated fruit drinks, dehydrated and frozen dried fruits, fruit juice concentrate are also expected to add to the list. A new segment which has suddenly emerged with a huge untapped potential is Ready To Eat/ Ready to Cook food items (RTE/RTC).

As per the study conducted by AC Nielsen, the estimated potential of RTE/ RTC products in Domestic market Rs. 1098 Crores and in International market – Rs. 2722 Crores. Consumers in

cities prefer Ready to Eat Products owing to the Convenience factor involved with the RTE name and Brand preference noted amongst users.

To realize India's potential in this industry, the Government has set an investment target of US$ 25.07 billion by 2015 to double its share in global food trade from 1.6% to 3%; share of processing of perishable foods from 6% to 20% value addition from 20% to 35%.

2.5 Processed Food Products in India

2.5.1 Dehydrated Fruits and Vegetables

Vegetables are available during specific seasons and they are perishable. Hence, majority of them are not available during off-season. To overcome this problem, dehydration technique has been developed by which vegetables in dehydrated form are preserved for a longer period and are made available during off-season. With this technology, certain high value and popular vegetables can be profitably sold.

With growing income, changing lifestyles and hectic daily schedule, market for dehydrated vegetables is growing especially in urban areas. Proper placement of products in the departmental stores, super markets, shopping malls etc. backed-up by publicity is the key to success. It is also possible to have tie-up with exclusive restaurants, star hotels, renowned caterers etc. for regular supplies.

India is the major producer of dried &preserved Vegetables like preserved Onions, Cucumber & Gherkins, provisionally preserved Mushrooms of the gensus agaricus, other mushrooms and truffles, Green Pepper in Brine, Dried Truffles, Asparagus Dried, Dehydrated Garlic Powder, Dehydrated Garlic Flakes, Garlic Dried, Potatoes Dried, Grams, Grams Dal, Onion Prepared/Preserved etc. Many non-traditional vegetables mainly, processed cucumber and gherkins are also being increasingly exported. India is also a prominent exporter of dried and preserved vegetables to the world. The country has exported 1,38,464 MT of dried and preserved vegetables to the world for the worth of Rs. 700.20 crores during the year 2011-12.

Major Export Destinations (2011-12): Germany, France, Russia, United States and United Kingdom.

Some of the major players in Dehydration Industry are as follows:

- Oceanic Foods Pvt. Ltd. Jamnagar, Gujarat
- Jain Irrigation System Ltd., Jalgaon, Maharashtra
- Pan Food Limited, Panipat, Haryana

- Chhatariya Foods Pvt. Ltd. Mahuva, Gujarat
- Khushi Foods Private Limited, Ahmedabad, Gujarat
- VT Foods Pvt. Ltd., Mahuva (Gujarat)
- Anmol Dehydration Pvt. Ltd., Surendranagar, Gujarat

Table 5: Export Data for Dried and Preserved Vegetables

(Value in Rs. Crore, Quantity in MT)

Product	2011-12		2010-11		2009-10	
	Quantity	Value	Quantity	Value	Quantity	Value
Onions, dried, whole/cut/sliced/broken/in powder but not further prepared	28,964.07	238.65	38,337.02	287.49	56,089.32	388.00
Cucumbers & gherkins, provisionally preserved	88,465.29	245.16	59,533.92	139.11	73,709.31	202.89
Mushrooms of the genus agaricus, Dried but not further prepared	28.85	15.46	68.44	25.09	90.14	41.53
Other Vegetables dehydrated, dried	424.34	2.76	2,752.64	13.02	976.97	18.45
Green Pepper in Brine	1,382.07	8.42	1,389.07	8.47	1,226.42	13.94
Mushrooms of the gensus agaricus	767.66	4.06	294.07	2.04	2,019.02	13.63
Other	1,713.76	6.05	1,235.63	4.90	1,409.44	5.71
Dehydrated Garlic Flakes	425.71	2.00	1,093.26	6.97	628.79	4.96
Dehydrated Garlic Powder	646.20	2.98	1,012.41	5.46	629.80	4.52
Assorted Canned Vegetables	416.57	2.15	434.05	3.91	406.37	3.08
Potatoes, Dried	851.19	1.97	1,700.07	2.31	998.66	1.62
Marjoram Oregano	98.50	0.52	119.51	0.55	73.50	0.71
Garlic, Dried	81.13	0.57	333.37	1.68	92.26	0.58
Other Mushrooms & Truffles Provisionally Preserved	340.08	1.27	183.23	0.74	98.43	0.45
Olives, provisionally preserved	8.00	0.05	0.00	0.00	15.25	0.11
Asparagus, Dried	0.08	0.00	0.17	0.00	0.35	0.01
Total	**124,613.5**	**532.07**	**108,486.86**	**501.74**	**138,464.03**	**700.19**

(Source: DGCIS Annual Export)

2.5.2 Mango Pulp/Other Fruit Pulps

Mango Pulp/other Fruit Pulps are perfectly suited for conversion to juices, nectars, drinks, jams, fruit cheese and various other kinds of beverages. It can also be used in puddings, bakery fillings, fruit meals for children and flavors for food industry, and also to make the most delicious ice creams, yoghurt and confectionery. India is a major exporter of Mango Pulp in the World. The country has exported 1, 50, 499.07 MT of Mango Pulp to the world worth Rs. 620.80 crores during the year 2011-12.

Table 6: Indian Export of Mango Pulp
(Source: DGCIS Annual Export)

(Value in Rs. Crore, Qty in MT)

Product	2011-12		2010-11		2009-10	
	Quantity	Value	Quantity	Value	Quantity	Value
Mango Pulp	1,86,197.85	744.61	1,70,219.72	818.93	1,50,499.06	620.83
Total	**1,86,197.85**	**744.61**	**1,70,219.72**	**818.93**	**1,50,499.06**	**620.83**

Major Export Destinations (2011-12): Saudi Arabia, Netherland and other destinations in Europe, Yemen Republic, United Arab Emirates and Kuwait.

The major companies engaged in manufacturing and export of mango and other pulps in aseptic packs are ITC limited, Unilever, Nestle, Food and Inns, Jain Irrigation, Exotic Foods, Tropical Foods ltd etc.

2.6 Opportunities in Food Processing in Maharashtra

Maharashtra has diverse agro climatic conditions suitable for the cultivation of a wide range of crops, and a progressive farming community. The State has a large urban population with high purchasing power. It is one of the major horticulture States in India. Maharashtra is the pioneer and leader in the use of water saving technology like drip and sprinkler irrigation, and accounts for 60 percent of the total area under drip irrigation in the country. Almost all the area under grapes and more than 60 percent of the area under banana in the state has access to drip irrigation. The State is the largest exporter of Thompson seedless grapes, Alphonso mangoes, onions and long stem cut flowers.

Mumbai port (MbPT) and Jawaharlal Nehru Port (JNPT) are major ports used for exporting processed food products. The state has a strong skill base with a total of 113 agri Institutions with an intake capacity of 8747 students. There are 4 Agriculture Universities and 5 national level research organizations. Maharashtra has 8 Agricultural Export Zones (AEZ)

In the food processing sector, Maharashtra has as many as 16,512 small and medium and 322 large scale food processing units. 13 mega projects (not including textiles) have also been approved under the Package Scheme of Incentives since 2005 with an investment of nearly Rs. 2600 crores. At the grassroots level, there are more than 45,000 agro processing cooperatives. In fact, food products and beverages were one of the major industries in Maharashtra, and contributed 9.7% in terms of total value of output in 2007-08.The food processing sector in the State has attracted Rs. 1039 crores worth of Foreign Direct Investment through 173 projects since 1991.

Source: Maharashtra Agro Industrial Policy 2010 (draft)

Thus, Maharashtra is one of the country's leaders in agro-industry in general, and food processing, in particular. However, the current level of processing in the State, as in the rest of India, is very low by international standards. However, there is tremendous potential for higher value addition through processing.

Chapter 3

3 Business Plan of the Food Park

3.1 Location Analysis

The food park is situated in one of the main fruits and vegetable growing cluster of Maharashtra and close to the Consumer markets as well as has a great opportunity for export being close to JNPT, Mumbai. The locational advantage has been discussed in detail in Chapter 1.

3.2 Raw Material Availability

The vegetables and fruits in the Ahmednagar district from 2008-09 to 2010-11 is presented in the following table. This clearly indicates that sufficient amount of raw material is available near the site and hence fresh and processed activity can be taken up.

Table 7: Raw Material Production in Ahmednagar

Particulars	2008-09	2009-10	2010-11
Vegetable Production (in MT)			
Onion	693617	1019619	693617
Tomato	53074	56258	46582
Brinjal	26613	27132	22653
Cabbage	13069	13444	10682
Green Peas	24267	24794	22972
Carrot	7493	8686	7852
Okra	6973	7392	5995
Cauliflower	5130	5308	4440
Cucumber	5928	6334	5740
Bottle Ground	4376	4580	3780
Potato	6577	7155	5800
Fruit Production (in MT)			
Lime	44125	205856	205856
Sweet Lime	44400	44400	44400
Guava	182874	182874	182874
Mango	73473	73473	73473
Sapota	84410	84410	84410

Particulars	2008-09	2009-10	2010-11
Grapes	34702	34702	NA
Pomegranate	47866	47866	47866
Papaya	25840	12641	NA
Custard Apple	23030	23030	23030
Tamarind	17228	17228	17228
Ber	14151	14151	14151
Banana	44185	31637	NA
Anola	8366	8366	8366
Orange	9279	9279	9279
Spices Production (in MT)			
Chilies	758475	765855	650992
Garlic	6139	7408	8141
Ginger	711	1025	1280

3.3 Business Activities Proposed

3.3.1 Fresh Fruits and Vegetable Operations

Maximum value addition takes place immediately after harvesting. The produce should be carefully handled to avoid physical injury and packed for the market. Series of activities involved are sorting, grading, washing and packing. Rahata is situated in nearby clusters of abundant vegetables growing area like Sangamner and the farmers showed enormous interest in growing vegetables for fresh as well as for processed use particularly the green leafy vegetables and onions. Considering that there is sufficient fresh produce available, ***it is proposed to set up a pack house for Grading, Packing and Marketing.***

Produce: The following produce will be handled:
Fruits: Guava, Lime
Vegetables: Brinjal, Cabbage, Cauliflower, Onion, Peas, Tomato, Carrot, Ginger, Capsicum, Okra, Local Potato

The proposed product mix may change according to the market demand in future.

Assumptions:

1. **Product mix capacity has been taken on assumption based on the seasonality**

Harvesting Calendar in Maharashtra												
Particulars	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Fruits												
Guava												
Lemon												
Vegetables												
Onion												
Tomato												
Cabbage												
Cauliflower												
Brinjal												
Peas												
Carrot												
Capsicum												
Okra												
Ginger												
Local Potato												

Peak Season
Lean Season
Round the year

2. **Annual capacity is worked out based on 50 tons per day of assorted vegetables for 300 days**

   Annual Capacity of the operations will be 15000 MT. Initial target markets suggested are Mumbai, Pune, Surat and Ahmedabad. The quantities have been worked out based on successful marketing of these products in the beginning and it may enhance in future with the acceptability of these graded and packed products in the above mentioned markets and also in the new markets. In case the quantity increases, there is a provision for increasing the capacity of the packaging facilities.

The following table indicates the capacity proposed for each commodity based on their demand in the proposed markets and their availability.

Table 8: Capacity Segregation for Fresh Fruits & Vegetables

Particulars	Capacity per day (in MT)	No. of days	Total capacity taken (in MT)
Onion	17	300	5100
Guava	2.5	210	525
Tomato	10	300	3000
Cabbage	2.5	120	300
Brinjal	3	300	900
Okra	3.5	210	735
Carrot	2.5	120	300
Capsicum	0.5	180	90
Cauliflower	2	300	600
Local Potato	4.5	210	945
Peas	6	180	1080
Lemon	7	180	1260
Ginger	0.75	300	225
Grand Total			**15060**

The following table indicates the total production in Ahmednagar district against the capacity initially proposed for fresh fruits and vegetable operation. It is evident that sufficient raw material is available in the Ahmednagar district itself.

Table 9: Production-Capacity Ratio

Particulars	Current Production (in MT)	Capacity Taken (in MT)	Capacity (% of total production)
Onion	693617	5100	0.74
Tomato	46582	3000	6.44
Brinjal	22653	900	3.97
Cabbage	10682	300	2.81
Green Peas	22972	1080	4.70
Carrot	7852	300	3.82
Okra	5995	735	12.26
Cauliflower	4440	600	13.51
Potato	5800	945	16.29
Lime	205856	1260	0.61
Guava	182874	525	0.28
Ginger	1280	225	17.57

3. Procurement and Sale prices

The average procurement price was calculated for the selected commodities as well as the average sale price in the proposed markets.

Table 10: Procurement and Sale Price

No.	Product	Average Procurement Price (Rs./kg)	Potential Market	Average Sale Price (Rs./kg)
1.	Guava	6.30	Mumbai	12.96
2.	Lime	15.55	Mumbai/Pune	23.13
3.	Brinjal	5.23	Pune/Surat/Mumbai/Ahmedabad	12.68
4.	Cabbage	4.58	Mumbai/Pune	6.08
5.	Cauliflower	6.48	Surat/Ahmedabad/Pune/ Mumbai	8.96
6.	Onion	5.18	Mumbai/Pune/North India	9.79
7.	Peas	12.50	Mumbai/Pune	24.30
8.	Tomato	4.70	Mumbai/Surat/Delhi/Export	8.36
9.	Carrot	7.60	Mumbai/Pune/Surat/Ahmedabad	13.05
10.	Ginger	17.14	Mumbai/Pune/Surat/Ahmedabad	23.85
11.	Capsicum	10.20	Mumbai/Pune	18.00
12.	Okra	5.55	Mumbai/Pune/Surat/Ahmedabad	16.20
13.	Local Potato	9.48	Mumbai/Pune	16.20

(Note: The prices were calculated based on monthly arrival prices given by MSAMB)

3.3.1.1 Business Plan

On the basis of production and market arrivals in the catchment area, it is proposed to set up a **Fresh Produce Pack House** with an **annual capacity of 15,000 tonnes**. Two grading and packing lines (semi-automatic) of 2 tons/hr capacity each will be installed. An output of 50 tonnes per day can be achieved. There will be sufficient space for future expansion.

The targeted markets for fresh fruits & vegetables will be major towns of Maharashtra and Gujarat like Mumbai, Pune, Nasik, Surat and Ahmedabad.

The business module has been designed as per the procurement prices derived from MSAMB arrival and price data for the last 3 years and the market prices achieved for these commodities in Mumbai, Pune, Surat and Ahmedabad markets. The quantities of these produce has been suggested to avoid any price crashes. The quantity of the individual produce has also been taken based on the seasonality/availability of the produce.

Table 11: Business Plan of Fresh Fruits & Vegetable Operations

Produce/ Raw Material	Quantity to be handled annually (MT)	Average Procurement Price (Rs. in kg)	Wastage (%)	Quantity available for sale (MT)	Average sale price (Rs./kg)	Total Sales (Rs. lacs)	Production Mix
Guava	500	6.30	8	460	12.96	59.62	3%
Lime	1500	15.55	5	1425	23.13	329.60	10%
Brinjal	900	5.23	5	855	12.68	108.42	6%
Cabbage	300	4.58	5	285	6.08	17.31	2%
Cauliflower	600	6.48	5	570	8.96	51.04	4%
Onion	5000	5.18	8	4600	9.79	450.43	31%
Peas	1000	12.50	5	950	24.30	230.85	6%
Tomato	3000	4.70	5	2850	8.36	238.29	19%
Carrot	300	7.60	5	285	13.05	37.19	2%
Ginger	200	17.14	5	190	23.85	45.32	1%
Capsicum	100	10.20	5	95	18.00	17.10	1%
Okra	700	5.55	5	665	16.20	107.73	4%
Local Potato	900	9.48	5	855	16.20	138.51	6%
Total	**15000**			**14085**		**1831.41**	

3.3.1.2 Packaging & Marketing of Fresh Fruits & Vegetables

The marketing of fruits & vegetables in India is one of the biggest challenges of the horticulture sector. The traditional marketing system in which the produce passes through a number of intermediaries before reaching the consumer is typical of a developing country setting. This not only reduces farmers share in consumer rupee but also leads to deterioration of the produce. Several studies have estimated loss of fresh produce due to lack of postharvest management in the range of 30-40% of production. It is necessary to identify the gaps in the supply chain and take appropriate measures to address these gaps.

The local traders are the traders close to the farmers who procure the produce from the farmers and bring them to the market. Commission agents are the intermediaries in the APMC market who sell the produce to the wholesaler who in turn sell to retailers. These retailers include road-side &neighborhood stalls, kiosks and door step delivery by hand carts. The last link in the chain is the consumers.

Marketing through traditional means is characterized by very little attention to grading, sorting & storage, and poor handling during loading, unloading &transportation. The high percentage of post-harvest damage can largely be attributed to such poor handling of the produce. Post-harvest losses occur at each and every step of the value chain. These can be classified as losses at the farm level, losses at the wholesaler's level and losses at the retailer's level.

Farm Level:

The losses at the farm level occur due to improper harvesting methods, handling techniques, & aggregation of the produce and in transportation. Farmers do not employ the scientific methods of harvesting, collection of produce and appropriate transportation practices.

Whole Seller's Level:

At the whole sellers' level, the major losses occur due to rough handling and inappropriate storage. Bruising, physical and mechanical injury more often occur during the various stages of loading, unloading, handling and storage. The produce is handled in a casual manner. Losses of fresh fruits and vegetables in developed countries at wholesaler's level are estimated to range from 2 per cent for potatoes to 23 per cent in fruit crops, with an overall average of 12 per cent losses between production and consumption sites.

Retail Level/Consumer Level:

Losses at the retail, food-service, and consumer levels are estimated at approximately 20 per cent in developed countries and about 10 per cent in developing countries. Overall, about one third of horticultural crops produced are never consumed by humans.

According to the Ministry of Food Processing Industries, "the lack of processing and storage of fruits &vegetables results in huge wastages estimated at about 35%, the value of which is approximately Rs. 33,000 crores for perishables and Rs. 15,000 crores for non-perishables annually".

Table 12: Estimation of Post-Harvest Losses

Crop	Post-Harvest Losses
Fruits	
Mango	17-35%
Banana	12-19%
Oranges	8-13%
Apples	10-13%
Grapes	23-25%

Crop	Post-Harvest Losses
Pineapple	15-25%
Pomegranate	12-18%
Sweet Lime (Mosambi)	12-18%
Papaya	12-25%
Sapota	10-15%
Guava	3-15%
Vegetables	
Potato	30-40%
Cauliflower	10-13%
Onion	6-40%
Tomato	7-40%

Source: http://www.delagrimarket.org/phm.htm

Table 13: Causes and Effect of Post-Harvest Losses

Problems	Effects
Water loss (weight loss)	Shrivelling, wilting of fruits and vegetable
Water loss (loss of textural quality)	Softening, limpness, loss of crispiness or juiciness
Mechanical damage	Bruises, cuts, surface abrasions or crushing
Physical losses due to pests	Fungal and bacterial diseases, insect attack
Contamination	Soil, pathogenic bacteria (soil-borne diseases)
Losses from physiological disorders	Chilling injury, freezing injury, heat due to temperature injury, sunburn
Losses from physiological disorders blossom due to nutrient imbalances	Calcium deficiency (bitter pit end rot), Boron toxicity
Losses from physiological disorders due to atmospheric gases	Damage from ethylene (russet spotting, softening, induced browning), low oxygen, high carbon dioxide, or refrigerant gas leaks (ammonia)
Losses due to continued growth and development after harvest	Rooting, sprouting, shoot development, (loss of color, flavor, firmness)
Nutritional losses	Loss of stored carbohydrates, Vitamin C

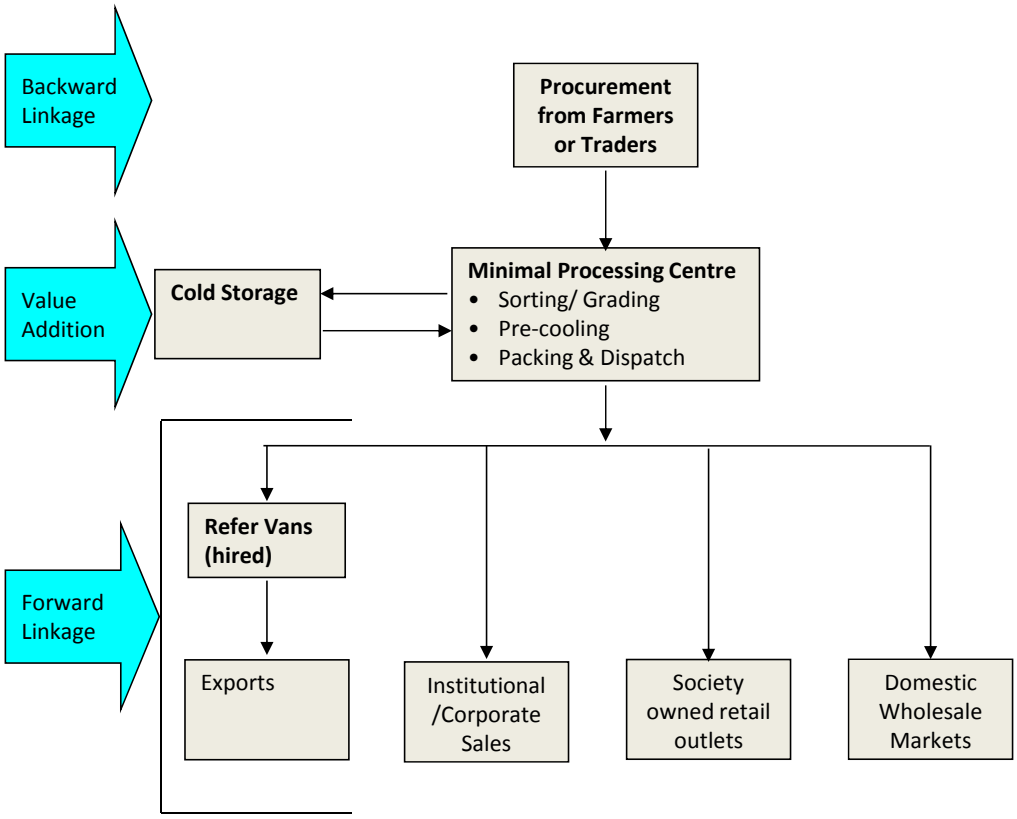
3.3.1.3 Need for Packaging & Handling infrastructure to reduce post-harvest losses

Most of the F&V grown in the country are location/area specific and distributed throughout the country (within the state and outside the state) and export markets. As mentioned above, many factors are responsible for rotting and deterioration of quality. This can be addressed if the produce is handled in a cold & under controlled conditions. The complex already has a cold network created by MSAMB that can be used for these operations.

3.3.1.4 Flow of Produce from Farm to Market

The following figure shows the flow of produce from the farm to the market. For estimating the Financials of the project, it is assumed that the produce is procured from traders. However, the PPP developer can enter into Agreement for Contract farming with the farmers in which case, produce will be directly procured from the farmers.

Figure 3: Flow of Produce from Farm to Market



3.3.1.5 Pack House Operations

Reception: The plastic crates containing produce would be received from the farm/ trader. From the reception area, crates would be moved to sorting &grading lines through roller conveyers after weighing.

Sorting and Grading: Produce will be graded on moving conveyors on the basis of size, colour and shape. On the grading line, poor quality produce are separated manually and rejected while the acceptable ones are allowed to continue and fill directly into the cartons *(Grades and Standards for some of the commodities are given in Annexure 3)*

Packaging: The fruits & vegetables will be packed in corrugated fibreboard cartons, which help in protection and also helps in delaying value loss.

Pre-cooling (MSAMB Infrastructure): Removal of field heat by the process of pre cooling/hydro-cooling is necessary to bring the produce to a recommended storage temperature and relative humidity. This will help in maintaining the quality of produce. The quality of most of the produce will deteriorate rapidly if field heat is not removed before transportation or storage.

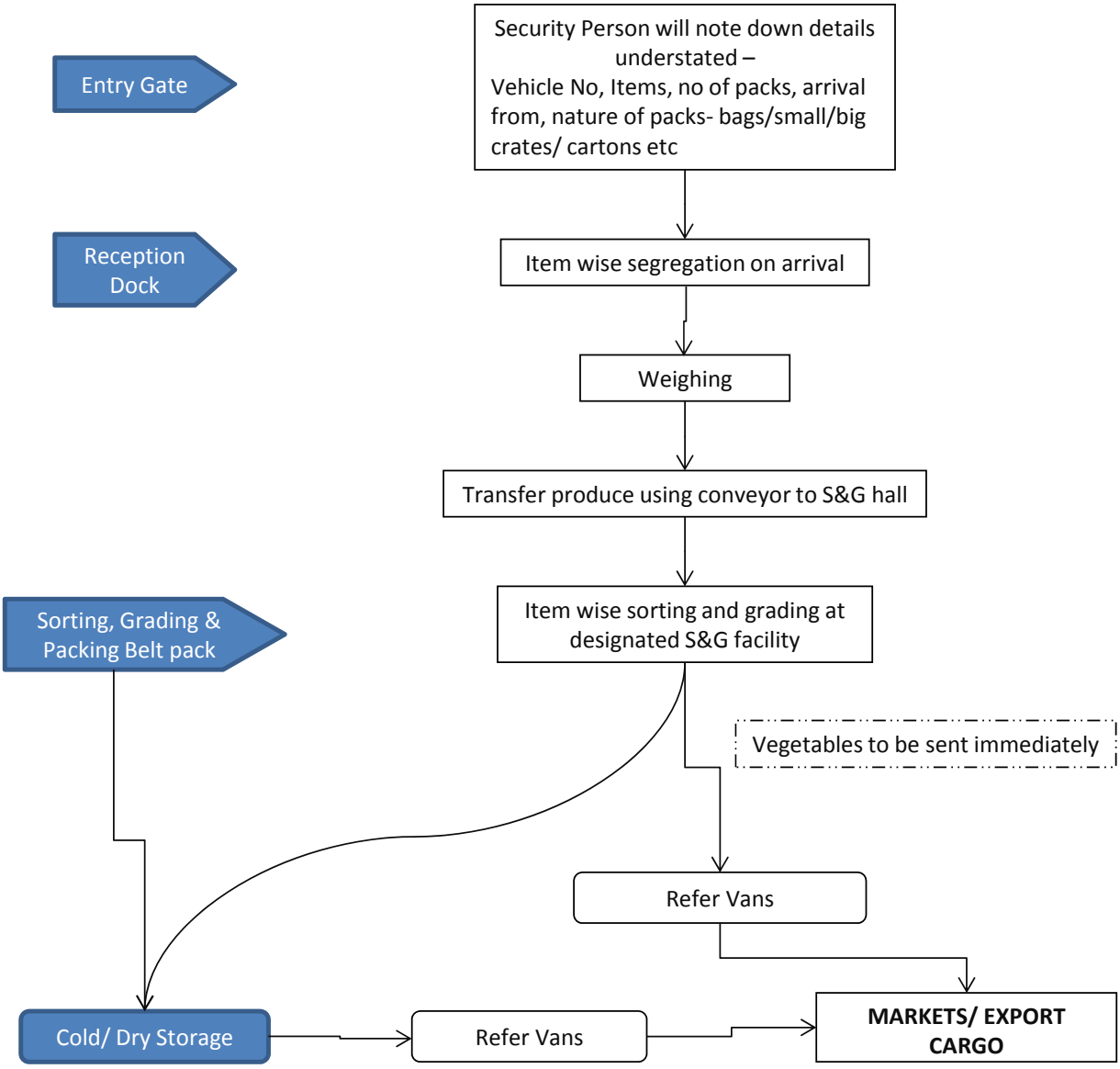
Cold/Dry storage (MSAMB Infrastructure): Produce (packed/bulk) will be kept in a cold room in which temperature and relative humidity are maintained according to the nature of the product stored. The duration of storage differs from short term (a few days) to long term (three to four months) depending upon the storage capacity of the produce. The development of cold storages including cold chain for transport has an important role to play in reducing the wastage of vegetables, thus providing remunerative price to growers. Considering the temperature and humidity requirement of various fruits and vegetables, the proposed **Minimal Processing Centre** will have cold storages with variable temperature (2-15 degree C) and humidity (65-95%). The vegetables will be stored after packaging and till it is transported to the market. Each chamber would have the facility to maintain requisite temperature and humidity.

Logistics: To maintain the quality of produce up to shipment/marketing, refrigerated vans (long distance) will be used. For marketing of the produce in distant markets, refer vans would be required. Packed boxes will be loaded with the help of hydraulic pallet trolleys for dispatch and directed to market destinations in different modes of transport.

3.3.1.6 Operations of Fruits and Vegetables at Packaging Centre

The figure below shows the operations of F&V at the Packaging centre.

Figure 4: Operations of Fruits and Vegetables at Packaging Centre



3.3.1.7 Project Cost

The table below shows the Project cost for the F&V operations (including contingencies)

Table 14: Project Cost of Fruits & Vegetable Operations

Particulars	Area (sqm)	Quantity	Unit Rate (Rs.)	Total Cost (Rs. lakhs)
Land	8800			
Road and Pavement area	1800		550	**60.00**
Building				
Technical building pre-engineered Structure inclusive of Office, lab, change rooms, raw material storage, packing material storage, utility	2000		12,000	**252.00**
Plant and Machinery				
Cleaning, grading and packing lines (2 tons per hour)		2	LS	26.25
Crate Washer				9.45
Fork Lift		1	LS	9.45
Hydraulic pallet jack		4	25,000	1.05
Weighing Bridge				10.50
Various weighing platforms		2.00	75,000	1.58
Weighing scales		10	5,000	0.53
Online jet printing system				5.25
Electrical and electrical fitting etc			12.5%	33.08
Generator (20 KW)				7.35
Water Storage and water supply system				5.25
33KW dedicated electricity line				300.00
Total - Plant and Machinery				**409.73**
Utility Plant & Machinery				
HVAC				**52.50**
Miscellaneous fixed asset				
Plastic Crates for material handling		8,000	300	25.20
Miscellaneous processing accessories				2.10
Furniture and fixtures				5.25
Total - Miscellaneous Fixed Asset				32.55
Total Cost				**806.78**

Note:*Technical Specification

Item	Particulars	Number	Unit Price	Total Price
A	Belt Conveyor 25M(82 feet) Long	02	Rs. 6,47,000/-	Rs. 12,94,000/-
B	Gravity Type Roller Conveyor- 1.5m Long×0.8m Width	02	Rs. 2,24,000/-	Rs. 4,48,000/-
C	Loading Table Quantity 12 Nos.	06	Rs. 71,000/-	Rs.4,26,000/-
D	Truck Load Conveyor	01	Rs.3,05,000/-	Rs. 3,05,000/-
			Total	Rs. 24,73,000/-

Cost: Rounded Off –Rs.25,00,000/-

The Quotation for Grading and Packing lines is give at Annexure 4.

Table 15: Operating Cost of Fresh Fruits &Vegetables Operation (at installed capacity)

Particulars	Cost (Rs. Lakhs)
Variable Cost	
Raw Material	*1,102.62*
Packaging Cost	*41.39*
Processing Cost (Water, Power Labor)	*56.59*
Maintenance Cost	*1.25*
Transportation Cost	*291.03*
Handling charges (% turnover)	*18.31*
Mandi Tax (% of turnover)	*27.47*
Commission Charges (% of turnover)	*109.88*
Administrative Cost (% of turnover)	*18.31*
Marketing Cost (% of turnover)	*36.63*
Fixed Cost	
Manpower Cost	28.92
Total Operating Cost	**1,732.41**

Table 16: Manpower required for Fresh Fruits & Vegetables Operation

Particulars	Nos.	Annual Salary (Rs.)
Manager (Operations)	1	420000
Marketing Executives	2	480000
Procurement Executives	2	360000
Operator	2	192000
Maintenance Executive	1	180000
Quality Control Executives	1	180000
Helpers	8	576000
Admin and Accounts	2	360000
Security	2	144000
Total (Rs. Lacs)		**28.92**

3.3.2 Dehydration Plant

Fruits & Vegetables are available during specific seasons and they are perishable. Hence, majority of them are not available during off-season. To overcome this problem, dehydration technique has been developed by which vegetables in dehydrated form are preserved for a longer period and are made available during off-season. With this technology, certain high value and popular vegetables can be profitably sold.

The principle of preservation by dehydration process is to remove the moisture content of a material to a level where micro-organism may not be able to grow and spoil it. Dehydration of vegetables by sun-drying is the oldest known method. Now modern techniques have been developed for dehydration of vegetables. In this process, the dehydrated product has better flavor, color, aroma, acceptability, etc. in comparison to sundried dehydrated products.

The vegetables selected for preparing dehydrated products in the project are onion, garlic, tomato, cabbage etc. The products have been selected based on availability of raw materials and market potential of the finished product.

The dehydrated vegetables are used to manufacture instant vegetable noodles, soups, snacks and fast food. Dehydrated onion is used as condiment and flavoring agent in manufacturing of tomato ketchups, sauces, salad, pickles, chutneys, meat sausages, masala bread and buns, breakfast foods, etc.

Dehydrated garlic is used as an aid for digestion and for absorption of food having athelemetic and antiseptic properties and in some medicinal formulations. The latest technique for dehydration of vegetables known as osmotic dehydration has been developed by Bhabha Atomic Research Centre, Mumbai.

Product Mix for Dehydration plant: Onion, Garlic, Tomato, Cabbage, Capsicum, Carrot

Suggested production mix has been considered based on the availability of various vegetables during the peak season of growing. However, the product mix can be changed in future depending upon the domestic and export market requirements. This activity can be profitable since availability of vegetables is in plenty and the farmers are willing to undertake contract farming exclusively for this project. Hence, further expansion of capacities can be considered after 3 -4 years of operation.

3.3.2.1 Seasonality

Harvesting Calendar in Maharashtra												
Particulars	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Onion												
Tomato												
Cabbage												
Carrot												
Capsicum												
Garlic												

Peak Season
Lean Season
Round the year

The market plan for dehydrated products will be-

Product	Market
Dehydrated Onion	Export/Domestic
Dehydrated Garlic	Domestic
Tomato Powder	Domestic
Dehydrated Cabbage	Export/Domestic
Dehydrated Capsicum	Domestic
Dehydrated Carrot	Export/Domestic

3.3.2.2 Business Plan

Table 17: Business Plan of Dehydration Plant

Product	Raw material Quantity in MT	Finished Product Quantity MT	Sale Price per ton in Lakhs	Annual Sales in Lakhs
Dehydrated Onion	4400	440	1.43	627.00
Dehydrated Garlic	1200	185	1.43	263.63
Tomato Powder	2400	120	1.52	182.40
Dehydrated Cabbage	1600	107	1.33	142.31
Dehydrated Capsicum	1200	80	1.43	114.00
Dehydrated Carrot	1200	120	1.71	205.20
Total	**12000**	**1052**		**1534.54**

3.3.2.3 Dehydration of Fruits & Vegetables

Dehydration of fruits & vegetables is one of the oldest forms of food preservation techniques known to man and consists primarily of establishments engaged in sun drying or artificially dehydrating fruits and vegetables. Although food preservation is the primary reason for dehydration, it also lowers the cost of packaging, storing, and transportation by reducing both, the weight and volume of the final product. Given the improvement in the quality of dehydrated foods, along with the increased focus on instant and convenience foods, the potential of dehydrated fruits and vegetables is greater than ever.

3.3.2.4 Process

Dried or dehydrated fruits and vegetables can be produced by a variety of processes. These processes differ primarily by the type of drying method used, which depends on the type of food and the type of characteristics of the final product. In general, dried or dehydrated fruits and vegetables undergo the following process steps: pre-drying treatments, such as size selection, peeling, and color preservation; drying or dehydration, using natural or artificial methods; and post dehydration treatments, such as sweating, inspection, and packaging.

Pre Drying (Preparatory Process) Treatment:

Pre-drying treatments prepare the raw product for drying or dehydration and include **raw product preparation** and **color preservation**. Raw product preparation includes selection and sorting, washing, peeling (for some fruits and vegetables), cutting into the appropriate form, and blanching (for some fruits and most vegetables). Fruits and vegetables are selected; sorted

according to size, maturity, and soundness; and then washed to remove dust, dirt, insect matter, mould spores, plant parts, and other material that might contaminate or affect the color, aroma, or flavor of the fruit or vegetable. Peeling or removal of any undesirable parts follows washing. The raw product can be peeled with mild abrasion, with steam pressure, with high-pressure washers, or with flame peelers. Vegetables normally peeled include carrots, onions, and garlic. Next, the product is cut into the appropriate shape or form (i. e., halves, wedges, slices, cubes, nuggets, etc.). Some fruits and vegetables are blanched by immersing in hot water (95 to 100 C [203 to 212 F]) or exposure to steam.

The final step in the pre-dehydration treatment is color preservation, also known as sulphuring. The majority of fruits are treated with sulphur dioxide (SO_2) for its antioxidant and preservative effects. The presence of SO_2 is very effective in retarding the browning of fruits, which occurs when the enzymes are not inactivated by the sufficiently high heat normally used in drying. In addition to preventing browning, SO_2 treatment reduces the destruction of carotene and ascorbic acid, which are the important nutrients for fruits. Sulphuring dried fruits must be closely controlled so that enough sulphur is present to maintain the physical and nutritional properties of the product throughout its expected shelf life.

This treatment is not practical for vegetables. Instead, most vegetables (potatoes, cabbage, and carrots) are treated with sulphite solutions to retard enzymatic browning. In addition to color preservation, the presence of a small amount of sulphite in blanched, cut vegetables improves storage stability and makes it possible to increase the drying temperature during dehydration, thus decreasing drying time and increasing the drier capacity without exceeding the tolerance for heat damage.

Dehydration:

Dehydration is the removal of the majority of water contained in the fruit or vegetable and is the primary stage in the production of dehydrated fruits and vegetables. Several drying methods are commercially available and the selection of the optimal method is determined by quality requirements, raw material characteristics, and economic factors. There are three types of drying processes: sun and solar drying; atmospheric dehydration including stationary or batch processes (kiln, tower, and cabinet driers) and continuous processes (tunnel, continuous belt, belt-trough, fluidized-bed, explosion puffing, foam-mat, spray, drum, and microwave-heated driers); and sub atmospheric dehydration (vacuum shelf, vacuum belt, vacuum drum, and freeze driers).

Sun drying (used almost exclusively for fruit) and solar drying (used for fruit and vegetables) of foods use the power of the sun to remove the moisture from the product. Sun drying of fruit crops is limited to climate with hot sun and dry atmosphere, and to certain fruits, such as prunes, grapes, dates, figs, apricots, and pears. These crops are processed in substantial quantities without much technical aid by simply spreading the fruit on the ground, racks, trays, or roofs and exposing them to the sun until dry. Advantages of this process are its simplicity and its small capital investment. Disadvantages include complete dependence on the elements and moisture levels no lower than 15 to 20 percent (corresponding to a limited shelf life). Solar drying utilizes black-painted trays, solar trays, collectors, and mirrors to increase solar energy and accelerate drying.

Atmospheric forced-air driers artificially dry fruits and vegetables by passing heated air with controlled relative humidity over the food to be dried, or by passing the food to be dried through the heated air, and are the most widely used method of fruit and vegetable dehydration. Various devices are used to control air circulation and recirculation. Stationary or batch processes include kiln, tower (or stack), and cabinet driers. Continuous processes are used mainly for vegetable dehydration and include tunnel, continuous belt, belt-trough, fluidized-bed, explosion puffing, foam-mat, spray, drum, and microwave-heated driers. Tunnel driers are the most flexible, efficient, and widely used dehydration system available commercially.

Sub atmospheric (or vacuum) dehydration occurs at low air pressures and includes vacuum shelf, vacuum drum, vacuum belt, and freeze driers. The main purpose of vacuum drying is to enable the removal of moisture at less than the boiling point under ambient conditions. Because of the high installation and operating costs of vacuum driers, this process is used for drying raw material that may deteriorate as a result of oxidation or may be modified chemically as a result of exposure to air at elevated temperatures. There are two categories of vacuum driers. In the first category, moisture in the food is evaporated from the liquid to the vapor stage, and includes vacuum shelf, vacuum drum, and vacuum belt driers. In the second category of vacuum driers, the moisture of the food is removed from the product by sub lamination, which is converting ice directly into water vapor. The advantages of Freeze drying are high flavor retention, maximum retention of nutritional value, minimal damage to the product texture and structure, little change in product shape and color, and a finished product with an open structure that allows fast and complete rehydration. Disadvantages include high capital investment, high processing costs, and the need for special packing to avoid oxidation and moisture gain in the finished product.

3.3.2.5 Post Dehydration Treatments/ Packaging:

Treatments of the dehydrated product vary according to the type of fruit or vegetable and the intended use of the product. These treatments may include sweating, screening, inspection, instantiation treatments, and packaging. Sweating involves holding the dehydrated product in bins or boxes to equalize the moisture content. Screening removes dehydrated pieces of unwanted size, usually called "fines". The dried product is inspected to remove foreign materials, discolored pieces, or other imperfections such as skin, carpel, or stem particles. Instantiation treatments are used to improve the rehydration rate of the low-moisture product. Packaging is common to most all dehydrated products and has a great deal of influence on the shelf life of the dried product. Packaging of dehydrated fruits and vegetables must protect the product against moisture, light, air, dust, micro flora, foreign odor, insects, and rodents; provide strength and stability to maintain original product size, shape, and appearance throughout storage, handling, and marketing; and consist of materials that are approved for contact with food. Cost is also an important factor in packaging. Package types include cans, plastic bags, drums, bins, and cartons, and depend on the end-use of the product.

3.3.2.6 Emissions and Controls:

Air emissions may arise from a variety of sources in the dehydration of fruits and vegetables. Particulate matter (PM) emissions may result mainly from solids handling, solids size reduction, and drying. Some of the particles are dusts, but other is produced by condensation of vapors and may be in the low-micrometer or sub micrometer particle-size range.

Particulate control commonly employs methods such as venturi scrubbers, dry cyclones, wet or dry electrostatic precipitators (ESPs), or dry filter systems. The most common controls are likely to be the venturi scrubbers or dry cyclones. Wet or dry ESPs could be used depending upon the particulate loading of the gas stream.

Condensation methods and scrubbing by chemical reaction may be applicable techniques depending upon the type of emissions. Condensation methods may be either direct contact or indirect contact with the shell and tube indirect method being the most common technique. Chemical reactive scrubbing may be used for odor control in selective applications.

3.3.2.7 Plant & Machinery

Machinery for Capsicum/ Tomato Dehydration Section
(Capacity to handle 20 MT per day Raw Material/ 2 MT per day of Tomato & 1.5 MT per day of Capsicum of finished products):

- Sorting Conveyor
- Washers

- Slicers/ Cutting machine
- Tray Dryers with trays- Each 1 Ton capacity of row*20 nos.
- Air Conditioned Room
- Metal Detector
- Grinding Machine- 150 kg/ hr
- Gyro Machine
- Digital Weighing machine
- Box strapping machine or continuous sealer
- Packing machine
- Electrical control panels
- Machine wiring & lighting
- Fluid heater to main dryer interconnecting piping

Machinery for Onion/ Ginger/ Garlic/ Cabbage/ Cauliflower Dehydration section (capacity to handle 40 MT of Raw Material/ 4000 kg per day of finished product):

- Sorting conveyor
- Top & tail cutting table
- Peeling machine
- Inclined conveyors
- Washing Machine
- Slicer machine
- 5 belt imperial dryer- 2 nos.
- Bin dryers- 10 nos.
- Air conditioned room
- Metal detector
- Flakes grader
- Flakes sorting table
- Grinding machine
- Vibro sifter (gyro screen)
- Digital weighing machine
- Paddle bag sealing machine
- Box strapping machine
- Electrical control panels
- Machine wiring & lighting
- Fluid heater to main dryer interconnecting piping
- Fire fighting equipments
- Air compressor

3.3.2.8 Project Cost

Table 18: Project Cost of Dehydration Plant (including contingency)

Particulars	Area (sqm)	Quantity	Unit Rate (Rs.)	Total Cost (Rs. lacs)
Land	23,616.00			
Road and pavement area	4,000.00		**550.00**	**23.10**
Building				
Technical building RCC Structure inclusive of lab, change rooms, raw material storage, packing material storage,	2,000.00		15,000.00	315.00
Administrative Office	300.00		15,000.00	47.25
Total - Building				**362.25**
Utility Buildings				
Warehouse of finished goods leased from MSWC	2,000.00			-
Coal Yard	500.00		1,000.00	5.25
Boiler House	400.00		8,000.00	33.60
Onion Storage Chawl for 1500 MT	9,266.00		LS	73.50
Total - Utility Buildings				112.35
Plant & Machinery				
Plant and Machinery filling (inclusive of excise duty, VAT and freight)				1,359.75
Utility Plant & Machinery				
Boiler with dust collection, chimney and other accessories				52.50
Water treatment plant	450.00			10.50
Raw (1 lakh litre capacity)				12.60
Air Compressor with storage tanks				6.30
Steam/ water pipeline etc			L.S	10.50
Electrical Substation, Cables, Electrical Panels etc			L.S	52.50
ETP (Effluent treatment plant connected to the other plant, hence connecting water line cost)				10.50
Total - Utility Plant & Machinery				**155.40**

Particulars	Area (sqm)	Quantity	Unit Rate (Rs.)	Total Cost (Rs. lacs)
Miscellaneous Fixed Assets				
Laboratory equipment				8.40
Crates (1000)		1,000.00	300.00	3.15
Hydraulic Pallet		8.00	25,000.00	2.10
Other processing equipment				10.50
Generator & Accessories				22.05
Workshop accessories				3.15
Furniture and fixtures				5.25
weighing Platform		1.00	1,00,000.00	2.10
Firefighting and other safety equipment				5.25
Total - Miscellaneous Fixed Assets				**61.95**
Total Plant Cost				**2,074.80**

***Quotation for Plant and Machinery at Annexure 5**

Table 19: Operating Cost of Dehydration Plant (at Installed Capacity)

Particulars	Cost (Rs. lacs.)
Variable Cost	
Raw Material	*675.21*
Packaging Cost	*31.88*
Processing Cost	*321.68*
Maintenance Cost	*2.89*
Administrative Cost (% of turnover)	*30.69*
Marketing Cost (% of turnover)	*30.69*
Fixed Cost	
Manpower Cost	*81.60*
Total Operating Cost	**1174.64**

Table 20: Manpower required for Dehydration Plant

Particulars	Nos.	Monthly Salary (Rs.)	Annual Salary (Rs.)
Manager Operation	1	50000	600000
Shift leaders	3	25000	900000
Operators	4	10000	480000
Junior Operators	4	6000	288000
Quality Control Executive	1	30000	360000
Chemist	3	20000	720000
Microbiologist	1	20000	240000
Maintenance Executive	1	20000	240000
Electrician	3	10000	360000
Mechanics	3	10000	360000
Sales Manager (Export and domestic sales)	1	50000	600000
Export Executive	1	25000	300000
Domestic Sales Executive	1	25000	300000
Procurement Executive	1	15000	180000
Procurement Assistant	2	10000	240000
Store Executive	1	15000	180000
Store Assistant	2	8000	192000
HR Executive	1	12000	144000
Accounts Executive	1	30000	360000
Accounts Assistant	2	15000	360000
Security Incharge	1	15000	180000
Security Guards	4	6000	288000
Housekeeping	4	6000	288000
		Total (Rs. lacs)	**81.60**

3.3.3 Multi fruit Aseptic Processing Plant

The domestic and international market of fruit pulps mainly mango is shrinking due to the canning technology and **Aseptic Bulk Packaging** is gaining popularity due to less cost of packaging, easy to handle by the Consumers and internationally accepted by end users. Hence keeping in view, the future of the project, it is important to make the transition to the aseptic bulk packaging plant from canning. The product mix and the plant capacities proposed for canning will remain the same for aseptic. Secondarily, we have proposed a concentrate plant for manufacturing tomato paste as this location has abundant production of tomatoes and the farmers will be benefitted if the tomatoes can be utilized for processing as they do not get remunerative prices during the peak maturity period due to surplus. The current situation is that India is importing more than 70% of its tomato paste requirement from China, hence there is a ready domestic market. The other products like mango, guava, papaya & sapota have a large ready export/ domestic market.

Product Mix
Mango (Alphonso, Kesar), Guava, Tomato, Other Fruits (Papaya &Sapota)

The market for aseptic and concentrated products will be:

Product	Market
Aseptic Mango Pulp (Kesar & Alphonso)	Export/ Domestic
Aseptic Fruit Pulp (Papaya &Sapota)	Export/ Domestic
Aseptic Guava Pulp	Export/ Domestic
Tomato Paste	Domestic

3.3.3.1 Business Plan

Table 21: Business Plan for Multi fruit Aseptic Processing Plant

Item	Quantity of raw material (MT)	Quantity of finished product (MT)	No. of processing days	Sale Price (Rs./MT)	Annual Turnover (Rs. Lacs)
Mango			45.00		
Alphonso (70%)	*3150*	*1510*	*30.00*	*72,000.00*	1,087.20
Kesar (30%)	*1350*	*650*	*15.00*	*54,000.00*	351.00
Guava	4000	2400	100.00	27,000.00	648.00
Tomato	9000	1400	75.00	49,500.00	693.00
Other Fruits (Papaya & Sapota)	800	320	10.00	27,000.00	86.40
Total	**18300**	**6280**	**275.00**		**2,865.60**

3.3.3.2 Aseptic Bulk Packaging

Aseptic packaging can be defined as the filling of a commercially sterile product into asterile container under aseptic conditions and hermetically sealing the containers so that re-infection is prevented. This results in a product, which is shelf-stable at ambient conditions. The term "aseptic" is derived from the Greek word "septicos" which means the absence of putrefactive micro-organisms.

In practice, generally there are two specific fields of application of aseptic packaging technology:

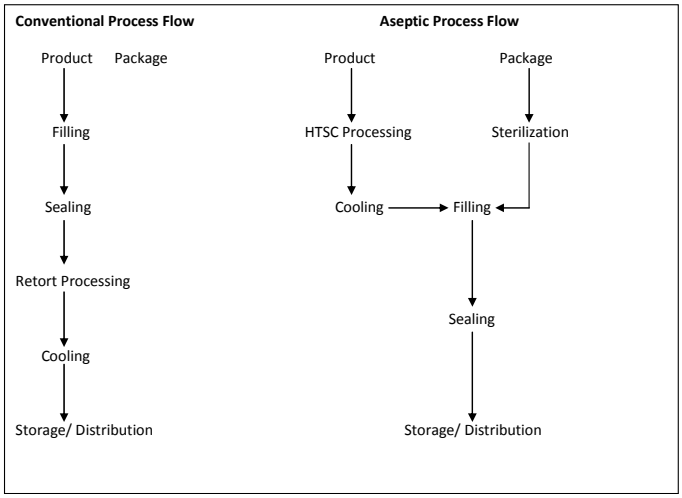
- Packaging of pre-sterilized and sterile products. Examples are milk and dairy products, puddings, desserts, fruit and vegetable juices, soups, sauces, and products with particulates
- Packaging of non-sterile product to avoid infection by micro-organisms. Examples of this application include fermented dairy products like yoghurt

Aseptic packaging technology is fundamentally different from that of conventional food processing by canning. In canning, the process begins with treating the food prior to filling. Initial operations inactivate enzymes so that these will not degrade the product during processing. The package is cleaned, and the product is introduced into the package, usually hot. Generally, air that can cause oxidative damage is removed from the interior. The package is hermetically sealed and then subjected to heating. The package must be able to withstand heat up to about 100°C for high acid products and up to 127°C for low acid products, which must receive added heat to destroy heat-resistant microbial spores. Packages containing low-acid (above pH 4.5) food must withstand pressure as well.

Although conventional canning renders food products commercially sterile, the nutritional contents and the organoleptic properties of the food generally suffer in the processing. Moreover, tinplate containers are heavy in weight, prone to rusting and are of high cost.

The figure below shows a simple illustration comparing the basic difference between conventional canning and aseptic packaging processes for the production of shelf-stable food products.

Figure 5: Conventional Vs Aseptic Process Flow



3.3.3.3 Aseptic Processing- Methodology

Aseptic processing comprises the following:

- Sterilization of the products before filling
- Sterilization of packaging materials or containers and closures before filling
- Sterilization of aseptic installations before operation (UHT unit, lines for products, sterile air and gases, filler and relevant machine zones)
- Maintaining sterility in this total system during operation; sterilization of all media entering the system, like air, gases, sterile water
- Production of hermetic packages

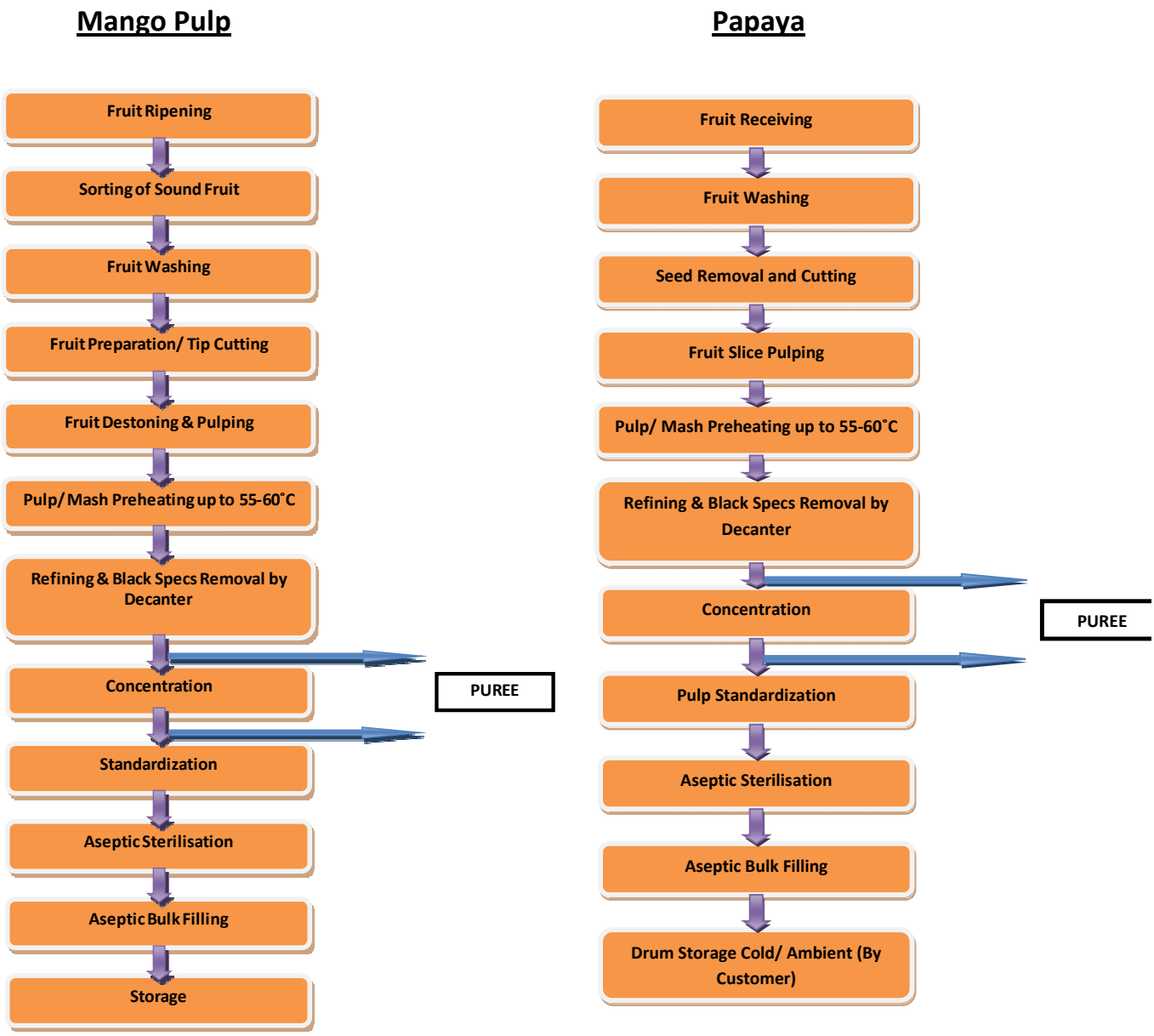
3.3.3.4 Advantages of Aseptic Packaging Technology

The three main advantages of using aseptic packaging technology are:

- Packaging materials, which are unsuitable for in-package sterilization, can be used. Therefore, light weight materials consuming less space offering convenient features and with low cost such as paper and flexible and semi-rigid plastic materials can be used gainfully.
- Sterilization process of high-temperature-short time (HTST) for aseptic packaging is thermally efficient and generally gives rise to products of high quality and nutritive value compared to those processed at lower temperatures for longer time.
- Extension of shelf-life of products at normal temperatures by packing them aseptically.

Besides the features mentioned above, additional advantages are that the HTST process utilizes less energy, as part of the process-heat is recovered through the heat exchangers and the aseptic process is a modern continuous flow process needing fewer operators.

3.3.3.5 Process Steps in Aseptic Packaging:



Washing, Sorting, Tip Cutting

The unit takes the fruits through two subsequent washing processes: by immersion in the basin and by shower on the elevator. The sorting consists of a roller belt conveyor which, slowly rotating, allows leaves and other foreign matters to fall.

Destoning

Main features of the mango destoner:

- High reliability
- High efficiency in pulp recovery
- High efficiency in peel separation (70% or more)

The destoning machines have been especially designed and manufactured for destoning of fresh mango in order to achieve the best performance in terms of yield.

Turbo Refining

The Supercreamer is a single stage pulper with interchangeable screens used to refine the puree to the required level. Low degree of air inglobation and therefore less oxidation is assured.

Pulp Treatment

For enzymatic deactivation, mango pulp can be sent to a tubular preheater. The machine can furthermore be set up to be used for both, before and after refining in order to possibly reach a higher production yield.

Decanting (Black Specks Elimination)

The decanter separation takes place in a horizontal cone-cylindrical bowl equipped with a screw conveyor. Centrifugal force causes sedimentation of the solids on the wall of the bowl. In mango processing the machine is used for a further delicate depulping, but especially for the elimination of black specks.

Deaeration

The main final products processed on our mango lines are natural puree or concentrated puree. In the first case, the natural puree is deaerated in order to extend the product's shelf life. The deaerator is used for the elimination of air incorporated in liquid or thick alimentary products, by nebulization under vacuum – in order to avoid oxidation.

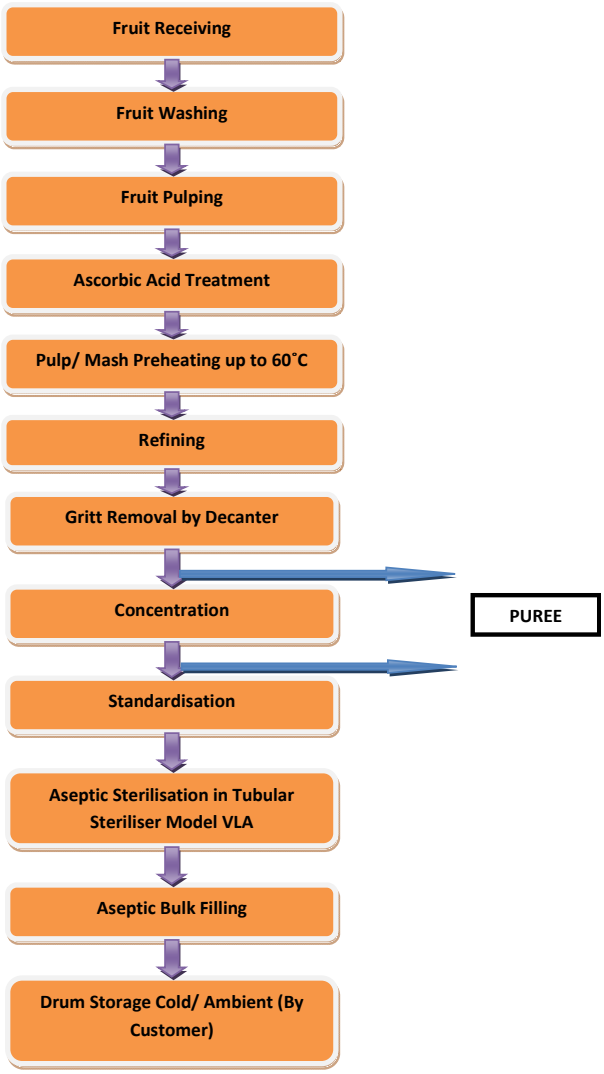
Sterilization

The tube in tube sterilizers are composed of 4 concentric pipes. The machines are completely skid-mounted in order to simplify to the maximum, the installation at site. The units just have to be connected to the utilities (steam, condensate, compressed air, cooling waters) and to the product.

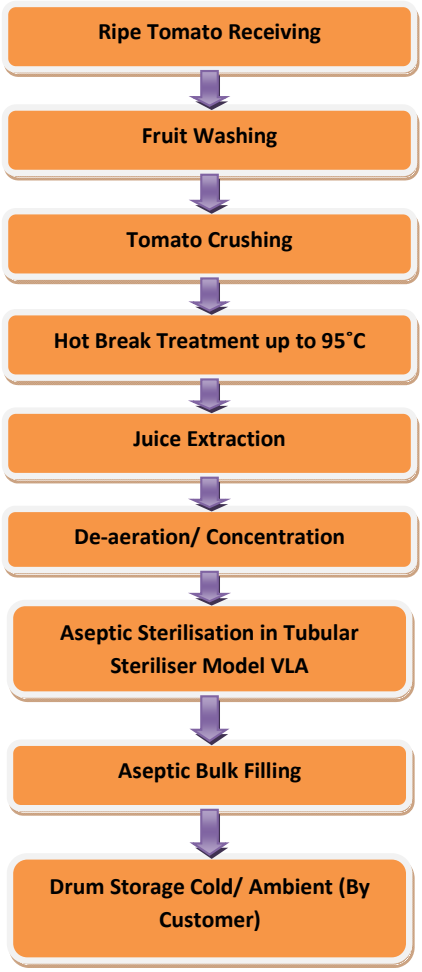
Aseptic Filing

The aseptic filler CAF is state-of-the-art and is also the only non- American filler approved by the FDA for application with non-acid products. Its reliability is therefore extremely high particularly when working with products that have a high PH.

Process Steps of Guava



Tomato Processing



Tomato is one of the most widely spread vegetable and also serves as a major supplement to the cuisines world over. Tomato paste can be converted into classical products such as concentrates, sauces and ketchup as well as sophisticated products such as tomato juices.

Receiving, Washing, Sorting

Complete line for receiving tomatoes in water with mud disposal system, scraped bottom type, and leaves removal system, roller type.

Hot Break and Turbo-Refining

After a quick pre-heating in the HOT BREAK system, the chopped tomato is fed to the Therm Viscoline, which assures very soft refining.

Concentration- Tomato Paste

Viscovap Forced Circulation Evaporator

It is a double effect evaporator with capacity 5000 kg/ hr of water with semi-barometric condenser and water cooling towers. The product is heated in the calendria and flashed in the vapor separator and the product is concentrated, the vapors being separated from the product in highly efficient cyclone separator.

Sterilization and Filling in Aseptic Bags

Sterilization plants, tube in tube type (four concentric pipes) for high pressure, suitable for the treatment of tomato paste. The plants are connected and integrated to the aseptic bag-inbox filler. After Sterilization, the tomato paste can be filled in aseptic bags kept in drums or boxes of various sizes between 5 to 1000 kg. Depending on the final product‘s thickness the machines can be equipped with 1” filling head.

3.3.3.6 Project Cost

Table 22: Project Cost of Multi fruit Aseptic Processing Plant

Particulars	Area (sqm)	Qty	Unit Rate (Rs.)	Total Cost (Rs. lacs)
Land	17600			
Road and pavement area	3000		550	**17.33**
Building				
Technical building RCC Structure inclusive of , lab, change rooms, raw material storage, packing material storage	2000		15000	315.00
Administrative Office	300		15000	142.00
Total – Building				**362.25**
Utility Buildings				
Ripening Chamber	2000			84.00
Warehouse of finished goods leased from MSWC	2000			-
Raw material unloading area (25m x20 m)	500		8000	42.00
Coal Yard	500		1000	5.25
ETP civil works	400		8000	33.60
Boiler House	400		8000	33.60
Total - Utility Buildings				**198.45**
Plant & Machinery				
Plant and Machinery of multi fruit aseptic plant, preparatory pasteurization, fining, decanting, sterilization and aseptic filling (inclusive of excise duty, VAT and freight)				**1,326.15**
Utility Plant & Machinery				
Boiler with dust collection, chimney and other accessories				89.25
Water treatment plant				21.00

Particulars	Area (sqm)	Qty	Unit Rate (Rs.)	Total Cost (Rs. lacs)
Water storage tank				-
Raw (1 lakh liter capacity)				12.60
Soft (40000 liter)			Rs. 12 per liter	5.04
Chiller -50 TR				21.00
Cooling tower with pumps, pipeline				12.60
Water softening Plant				8.40
Air Compressor with storage tanks				6.30
Steam/ water pipeline etc			L.S	21.00
Electrical Substation, Cables, Electrical Panels etc			L.S	84.00
ETP (Effluent treatment plant and accessories)				31.50
Total - Utility Plant & Machinery				**312.69**
Miscellaneous Fixed Assets				
Laboratory equipments				15.75
Crates (2500)		2500	300	7.88
Hydraulic Pallet		8	25000	2.10
Fork Lift		2	900000	18.90
Other processing equipments				10.50
Generator & Accessories				44.10
Nitrogen Plant				8.40
Ripening Chamber Equipments				12.60
Workshop accessories				5.25
Furniture and fixtures				10.50
Weighing Platform		2	100000	2.10
Fire fighting and other safety equipments				5.25
Total - Miscellaneous Fixed Assets				**143.33**
Total Plant Cost				**2,454.69**

***Quotation for Plant and Machinery at Annexure 6**

Ripening Facilities Utilization

Ripening facility can be used in off season and will be able to give 40 MT output per day for a period of 275 days in a year. It will generate Rs. 505 per MT margin.

Table 23: Operating Cost of Multi fruit Aseptic Processing Plant (at installed capacity)

Items	Cost (Rs. Lacs)
Variable Cost	
Raw Material	*1454.63*
Packaging Cost	*450.19*
Processing Cost	*338.50*
Maintenance Cost	*34.54*
Administrative Cost (% of turnover)	*57.31*
Marketing Cost (% of turnover)	*57.31*
Fixed Cost	
Manpower Cost	99.96
Total Operating Cost	**2492.45**

Table 24: Manpower required for Dehydration Plant

Particulars	Nos.	Monthly Salary (Rs.)	Annual Salary (Rs.)
General Manager	1	75000	900000
Production Manager	1	50000	600000
Shift leaders	3	25000	900000
Operators	6	10000	720000
Junior Operators	6	6000	432000
Quality Control Manager	1	40000	480000
Chemist	3	20000	720000
Junior Chemist	3	12000	432000
Microbiologist	1	20000	240000
Maintenance Executive	1	20000	240000
Electrician	3	10000	360000
Mechanics	3	10000	360000
Sales Manager (Export and domestic sales)	1	50000	600000
Export Executive	1	25000	300000
Domestic Sales Executive	1	25000	300000
Procurement Executive	1	15000	180000
Procurement Assistant	2	10000	240000
Store Executive	1	15000	180000
Store Assistant	2	8000	192000
HR Executive	1	12000	144000
Accounts Executive	1	30000	360000
Accounts Assistant	2	15000	360000
Security Incharge	1	15000	180000

Particulars	Nos.	Monthly Salary (Rs.)	Annual Salary (Rs.)
Security Guards	4	6000	288000
Housekeeping	4	6000	288000
Total		***(in lacs)***	**99.96**

3.3.4 Common Infrastructure

Based on the various discussions held with MSAMB and Sai Pravara Society, it was decided that the common facilities proposed in the original DPR should be redesigned, keeping in view more flexibility for the selection of PPP entrepreneur/ entrepreneurs. The following common facilities have been proposed:

- Multistorey administrative building for Central Offices
- Central Laboratory
- Conference hall and
- Auditorium

A common Effluent Treatment Plant has been designed which will be situated in multi fruit processing plant and the effluent of that of the dehydration plant will be connected to it.

Boiler

It is not technically feasible to have a common boiler for both the plants because of the distance. Hence, a separate boiler house of suitable capacity has been provided at both the plants. This will be more flexible for operations.

Separate Water Tanks and Treatment facilities have been given to various units. The total demand of water will be 5 lakh litres of portable water per day. The cost for laying the water pipeline and treatment plant has been assumed in the project cost. It was agreed that the MSAMB will make arrangement of dedicated line of 5 lakh litres per day. This is the most important factor the success for the success of the project and to attract the PPP Entrepreneur.

Social Amenities/Facilities: like change rooms, toilets, canteen has been provided in each plant and central administrative building.

Table 25: Cost for Common Infrastructure

Facility	Unit Cost	Cost (Rs. In Lakhs)
Water Storage (Underground tank) capacity 5 lakh litre, RCC construction	LS	52.5
Water Pumping Station, Distribution lines etc	LS	12.6

Facility	Unit Cost	Cost (Rs. In Lakhs)
Water Treatment System, Filtration, Carbon Filtration and Degermination, Chemical treatment plant etc.	LS	23.1
Utility Civil Buildings, etc		61.8
Dedicated water line from Canal to food park	LS	501.375
Total		**651.38**

3.4 Project Summary of Annual Capacity and Turnover

The installed Annual Capacity and Turnover on installed capacity are as follows:

Particulars	Raw Materials (in MT)	Finished Goods (in MT)	Annual Turnover (in Lakhs)
Marketing Operations of Fresh Fruits & Vegetables	15000	14085	1831.42
Dehydration Plant	12000	1052	1534.34
Multi Fruit Processing Plant (Aseptic Bulk Packaging/ Tomato Paste Plant)	18300	6280	2865.60
Total	**49800**	**21417**	

3.5 Area Statement of Units

No.	Activity	Area required (sqm)
1.	Fresh Fruits & Vegetable- Grading, Packing Area	8800
2.	Fruits & Vegetable Dehydration Plant	23616
3.	Multi Fruit aseptic & Concentrate Plant	17600
	Total Area	**50016 sqm**
		12.35 acre

3.6 Detailed Layout Area of Units

Particulars	Area (sqm)
Fresh Fruits & Vegetable Grading, Packing and Operation Unit	
Plant building - sorting & grading hall	2000
Roads & loading / unloading bays (Other than Existing Roads)	1800
Green / Future Expansion	5000
Total	**8800**
Fruits & Vegetable Dehydration Plant	
Onion Storage	9266
Plant Building (Technical building RCC Structure inclusive of lab,	2000

Particulars	Area (sqm)
change rooms, raw material storage, packing material storage etc)	
Water Treatment & Storage	450
Boiler & Coal Yard	900
Roads & Loading / Unloading Bays (Other than Existing Roads)	4000
Green / Future Expansion	7000
Total	**23616**
Multi-fruit Aseptic Processing Plant	
Plant Building	2000
Raw Material Unloading Area	500
Ripening Chambers	2000
Boiler & Coal Yard	900
Admin Block	900
Water Storage	400
Roads & loading / unloading bays (Other than Existing Roads)	3000
Green / Future Expansion	7400
ETP	500
Total	**17600**

A common weighbridge is suggested for all complexes. The below mentioned area can be utilized to establish a ready-to-serve (tetra pack) plant OR an IQF (Individual Quick Freezing) plant

Future Expansion below Weighbridge **9000 sqm**

(Note: Please refer Annexure 1 & 2 for Overall Plant Layout and Individual Plant Layouts)

Chapter 4

4 Financial Feasibility

4.1 Project Financials

Project financials will comprise the project development cost, revenue streams and project feasibility. An overall financial model has been prepared for the project that consolidates the financials of all the project components and highlights the overall return expected from the project. The viability of the project is evaluated on the basis of Project IRR and Equity IRR.

4.2 Basic Assumptions

Some of the key assumptions and facts that have been considered for arriving at the financial summary are as follows:

- The Construction period is assumed at 12 months, extendable upto maximum 24 months
- Term loan and Working Capital Loan is assumed at 14% interest
- Term loan repayment period is assumed at 8 years
- Effective Corporate Tax rate of 32.45% (including surcharge & cess) and Minimum Alternate Tax rate of 20.01% (including surcharge & cess)
- Debt to Equity ratio is assumed as 55:45 in the base case
- Financial model has been prepared for 25 years of operation
- The area requirement for the PPP project is 12.35 acres as estimated by the Consultant. Thus the Conceptual Master Plan/ layout has been made considering 12.35 acres
- The other infrastructure to be developed on site by MSWC and MSAMB like warehouses, cold stores is assumed to be utilized by the Developer
- Inflation is assumed as below:

Cost Heads	F&V	Processing	Dehydration
Variable Costs			
Raw Material	5.91%	5.79%	5.82%
Packaging Cost	4.14%	4.14%	4.14%
Processing Cost	4.94%	4.94%	4.94%
Maintenance Cost	5.00%	5.00%	5.00%
Transportation Cost	10.47%	10.47%	10.47%
Selling Price	**5.91%**	**5.00%**	**5.00%**

- Capacity Utilization is assumed as below:

Year	%
1	50%
2	60%
3	75%
4 on	90%

- Manpower Utilization is assumed as below:

Year	%
1	70%
2	80%
3 on	100%

- Interest During Construction (IDC), which is the cost of funding incurred on the loan taken for the project has been calculated on the basis of an interest rate of 14% per annum
- Working Capital norms are assumed as below:

Working Capital Norms	Months
Raw material	3
Finished Goods stock	2
Debtors	1
Creditors	1

The following sections cover the detailed financials of all project components and overall project.

4.3 Overall Project Cost

The table below shows the total project cost.

Table 26: Overall Project Cost

Particulars	Rs. Lakhs
Land Cost	0
Land Development and Landscaping	105.45
Building	1515.78
Plant & Machinery	4416.08
Miscellaneous Fixed Assets	249.72
Preliminary and pre-operative expenses	314.35
IDC	186.97
Total Project Cost/ Capex	**6788.35**

The **means of finance** will be a mix of debt, equity and grant. Since, grant is the bidding criteria, it shall be determined by the Bidder.

Annexure

Annexure 1: Overall Plant Layout

PARTICULAR	AREA SQM
FRESH FRUITS & VEGETABLE GRADING, PACKING AND OPERATION UNIT	
SORTING & GRADING HALL	2000
ROADS & LOADING / UNLOADING BAYS	1800
GREEN / FUTURE EXPANSION	5000
TOTAL	**8800**
FRUITS & VEGETABLE DEHYDRATION PLANT	
ONION STORAGE	9266
PLANT BUILDING	2000
WATER TREATMENT & STORAGE	450
BOILER & COAL YARD	900
ROADS & LOADING / UNLOADING BAYS	4000
GREEN / FUTURE EXPANSION	7000
TOTAL	**23616**
MULTIFRUIT ASEPTIC PROCESSING PLANT	
PLANT BUILDING	2000
RAW MATERIAL UNLOADING AREA	500
RIPENING CHAMBERS	2000
BOILER & COAL YARD	900
ADMIN BLOCK	900
WATER STORAGE	400
ROADS & LOADING / UNLOADING BAYS	3000
GREEN / FUTURE EXPANSION	7400
ETP	500
TOTAL	**17600**

Project

Proposed Fruit & Vegetable Processing Plant at Ahmadnagar

Sheet Content

Master Plan

Consultants

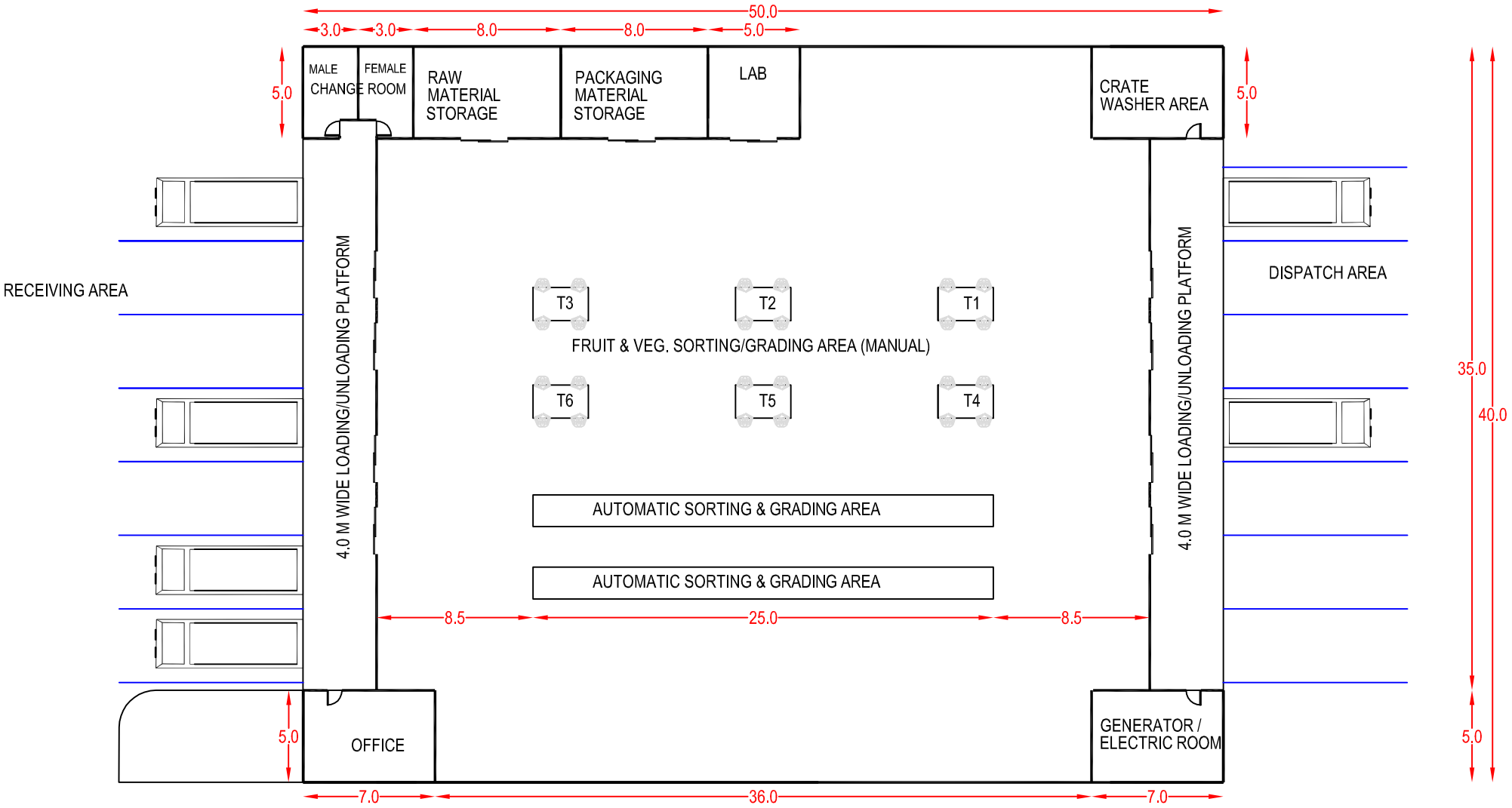
Global Agri Systems Pvt. Ltd.
K-13A, HauzKhas Enclave
New Delhi

Scale:

0 5 20 100 m
10 50

Annexure 2: Individual Plant Layouts

1) Fruit & Vegetable Operations



Project

Proposed Fruit & Vegetable Processing Plant at Ahmadnagar

Sheet Content

Fresh Fruits & Vegetable Grading, Packing Unit

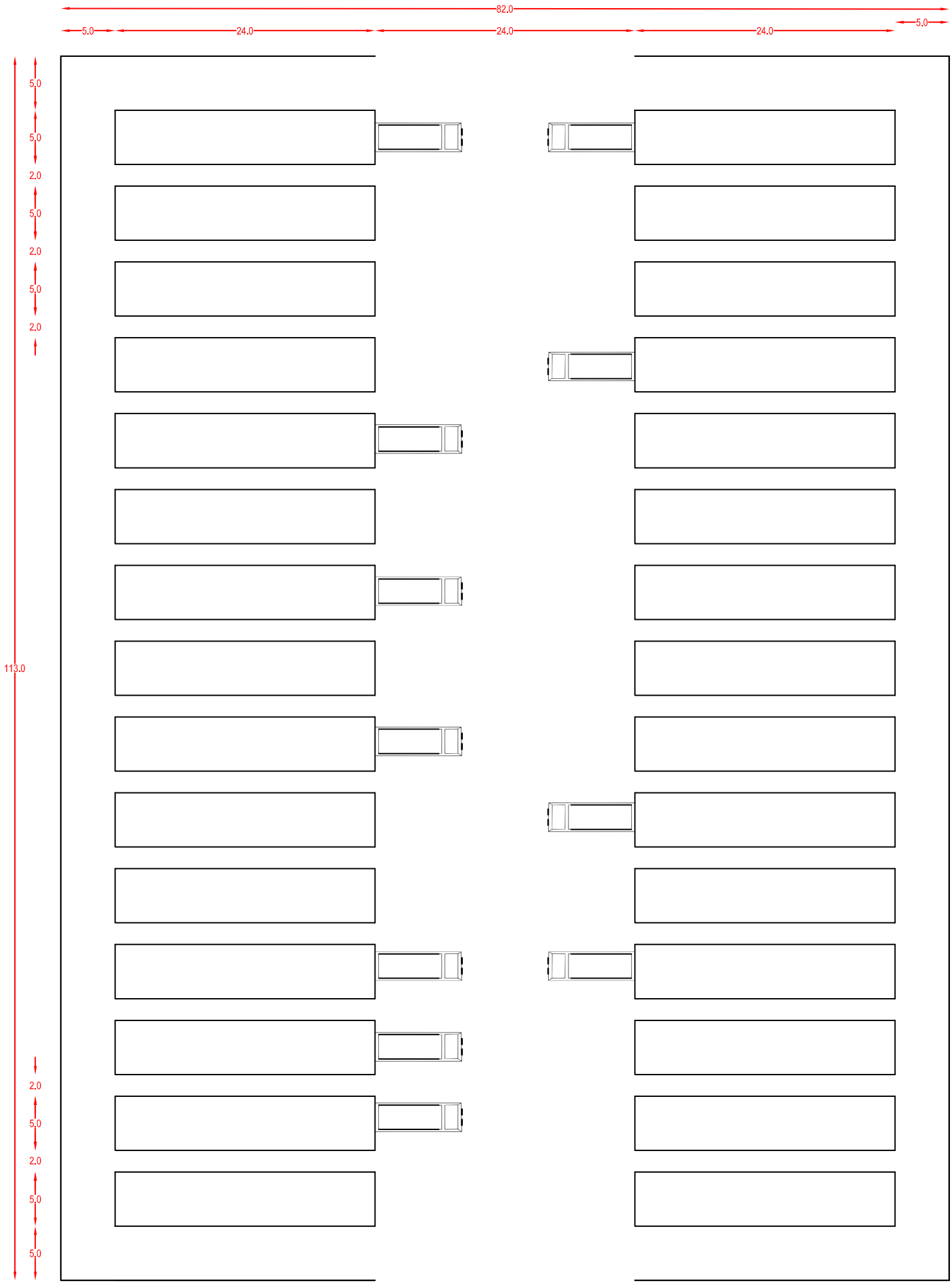
Consultants

Global Agri Systems Pvt. Ltd.
K-13A, HauzKhas Enclave
New Delhi

Scale:

0 1 2 5 10 m

2) Dehydration Plant



Project

Proposed Fruit & Vegetable Processing Plant at Ahmadnagar

Sheet Content

Fruit & Vegetable Dehydration Plant - Onion Storage Unit

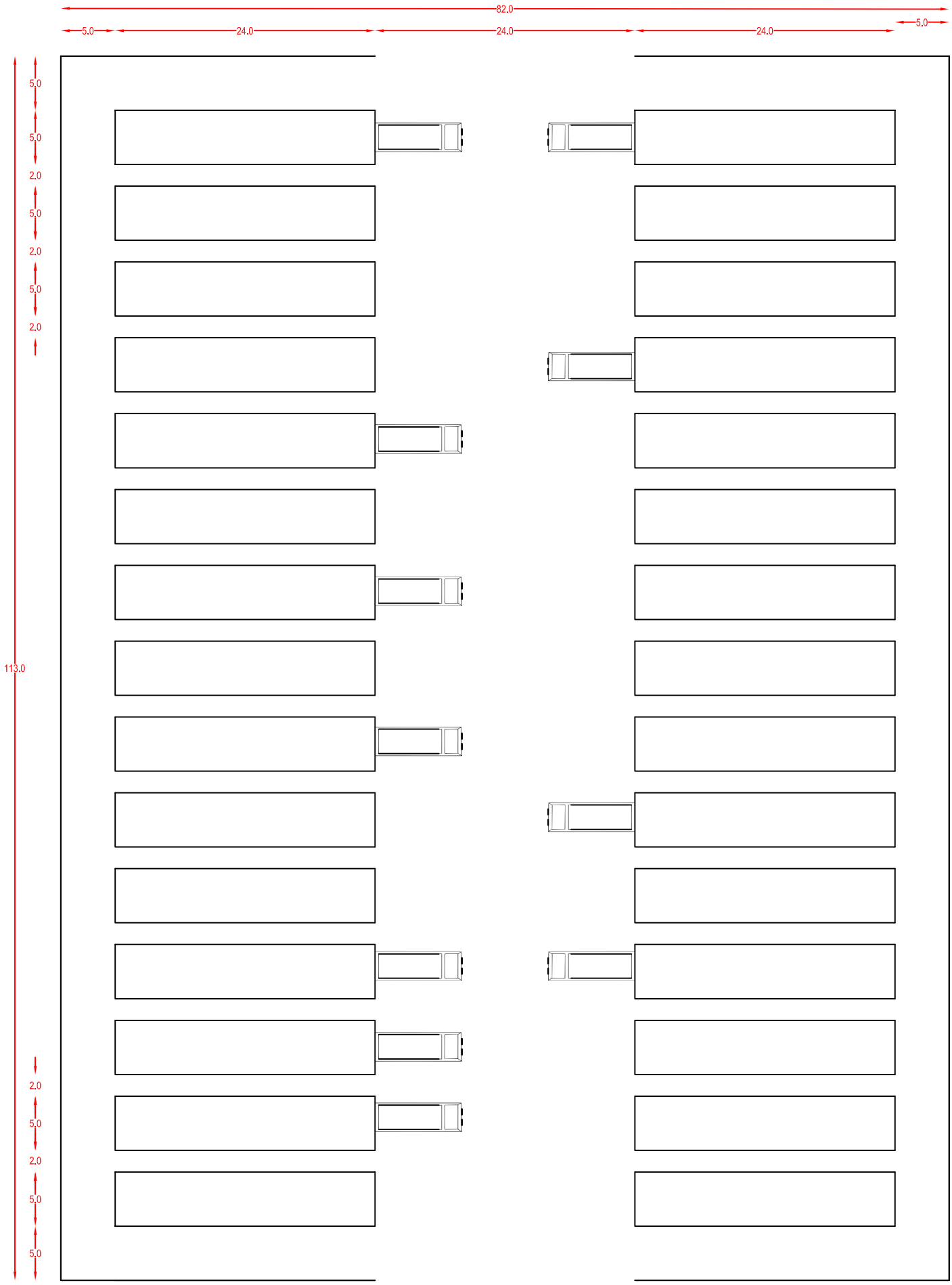
Consultants

Global Agri Systems Pvt. Ltd.
K-13A, HauzKhas Enclave
New Delhi

Scale:

0 1 2 5 10 m

3) Onion Storage Chawl in Dehydration Plant



Project

Proposed Fruit & Vegetable Processing Plant at Ahmadnagar

Sheet Content

Fruit & Vegetable Dehydration Plant - Onion Storage Unit

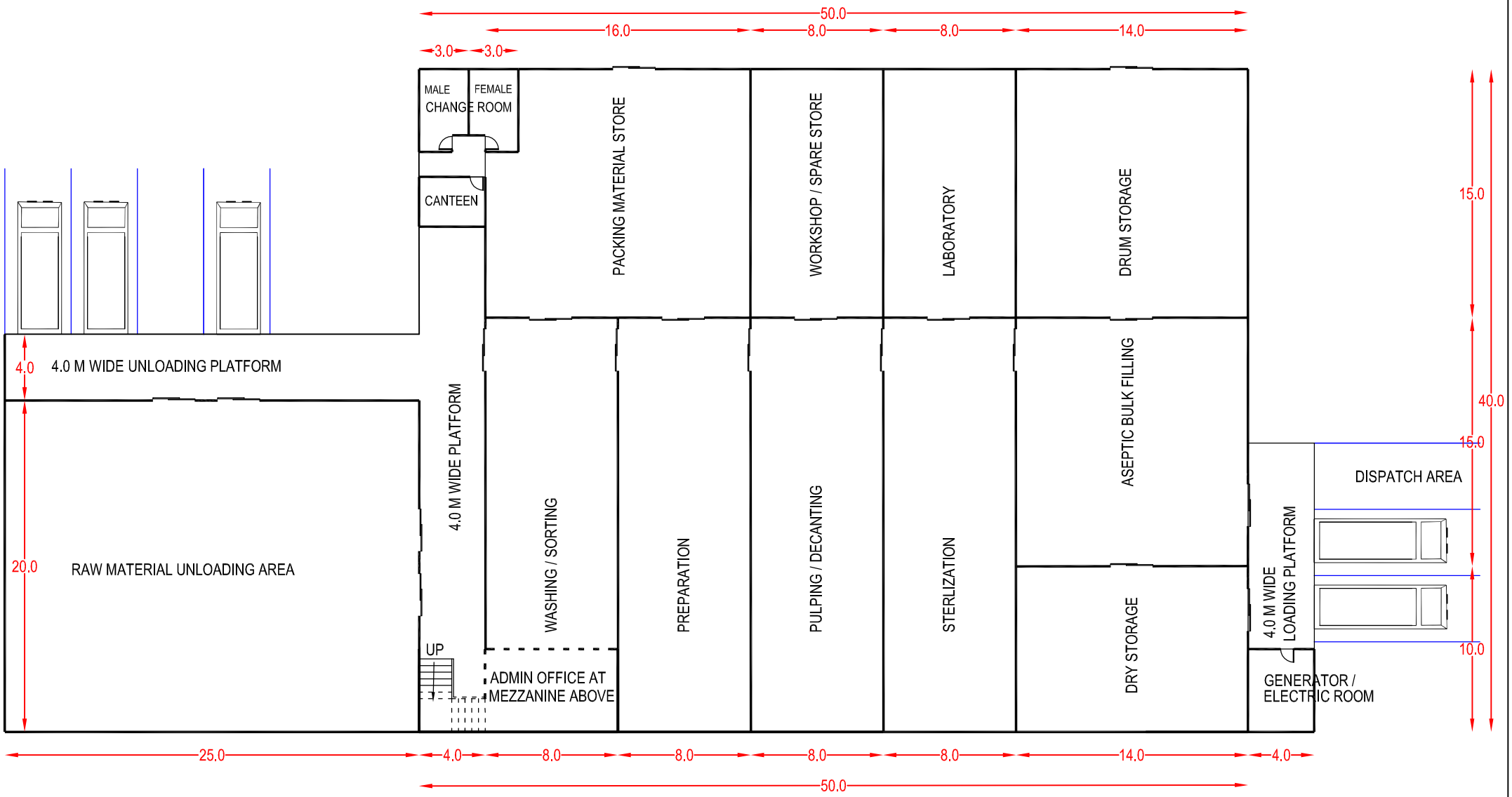
Consultants

Global Agri Systems Pvt. Ltd.
K-13A, HauzKhas Enclave
New Delhi

Scale:

0 1 2 5 10 m

4) Multi Fruit Aseptic Plant



Project

Proposed Fruit & Vegetable Processing Plant at Ahmadnagar

Sheet Content

MultiFruit Aseptic Processing Plant - Plant Building with Raw Material Unloading Area

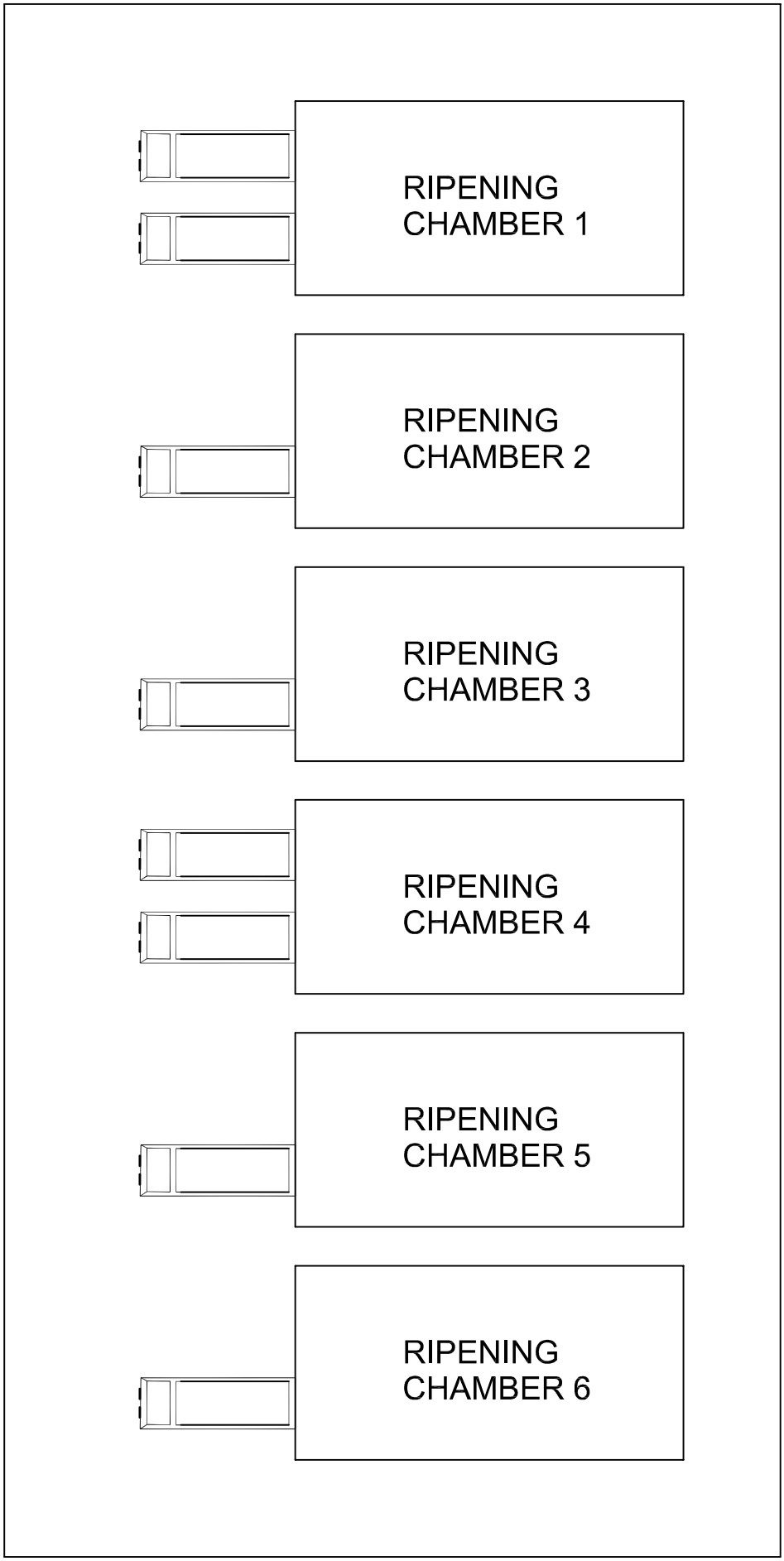
Consultants

Global Agri Systems Pvt. Ltd.
K-13A, HauzKhas Enclave
New Delhi

Scale:

0 1 2 5 10 m

5) Ripening Chamber in Multi Fruit Aseptic



Project

Proposed Fruit & Vegetable Processing Plant at Ahmadnagar

Sheet Content

MultiFruit Aseptic Processing Plant - Ripening Chambers

Consultants

Global Agri Systems Pvt. Ltd.
K-13A, HauzKhas Enclave
New Delhi

Scale:

0 1 2 5 10 m

Annexure 3: Grades and Standards for selected fruits and vegetables

FRUITS AND VEGETABLES GRADING AND MARKING RULES OF SOME FRUITS AND VEGETABLES

FRUITS AND VEGETABLES GRADING AND MARKING RULES, 2004

(TO BE PUBLISHED IN THE GAZETTE)

EXTRACT FROM THE GAZETTE OF INDIA: PART II, SECTION 3, SUB SECTION (i)

SCHEDULE – VII

GRADE DESIGNATION AND QUALITY OF GUAVAS

1. Guavas shall be fruits obtained from plant Psidium guajava (L) of Myrtaceae family.

2. MINIMUM REQUIREMENTS

(i) Guavas shall be:

(a) Whole, firm, sound and clean;

(b) Free from any visible foreign matter;

(c) Practically free from bruising;

(d) Free of pests affecting the general appearance of the produce;

(e) Free of damage caused by pests;

(f) Free of abnormal external moisture, excluding condensation following removal from cold storage;

(g) Free of any foreign smell and/or taste;

(ii) Guava shall comply with the residue levels of heavy metals, Pesticides and other food safety parameters as laid down by the Codex Alimentarius Commission for exports.

3. CRITERIA FOR GRADE DESIGNATION

Grade Designation	Grade Requirements	Grade Tolerances
1	2	3
Extra class	Guavas must be of superior quality. They must be characteristic of variety and/or commercial type. They must be free of defects. Very slight superficial defects may be there, provided these do not affect general appearance of the produce, the quality, the keeping quality and presentation in the package.	5% by number or weight of guavas not satisfying the requirements of the grade, but meeting those of Class I grade or, exceptionally coming within the tolerances of that grade.
Class I	Guavas must be of good quality. They must be characteristics of the variety and/or commercial type. Following slight defects however, may be allowed, provided these do not affect the general appearance of the produce,	10% by number or weight of guavas not satisfying the requirements of the grade, but meeting those of class II grade or exceptionally, coming within the tolerance of that grade.

Grade Designation	Grade Requirements	Grade Tolerances
	the quality, the keeping quality and presentation in the package. ▪ slight defects in shape and colour; ▪ slight skin defects due to rubbing and other superficial defects such as sunburns, blemishes and scars not exceeding 5% of the total surface area. The defects should not affect the pulp of the fruit.	
Class II	This grade includes guavas which do not quality for inclusion in the higher grades, but satisfy the minimum requirements. Following defects may be there, provided the guavas retain their essential characteristics as regards the general appearance, quality, the keeping quality and presentation; ▪ defects in shape and colour; ▪ skin defects due to rubbing and other defects such as sunburns, blemishes and scars not exceeding 10% of the total surface area. The defects should not affect the pulp of the fruit.	10% by number or weight of guavas not satisfying the requirements of the grade but meeting the minimum requirements with the exception of produce affected by rotting or any other deterioration rendering it unfit for consumption

4. OTHER REQUIREMENTS

The guavas must have been carefully picked and have reached an appropriate degree of development and ripeness in accordance with criteria proper to the variety and to the area in which they are grown. The development and condition of the guavas must be such as to enable them;

- To withstand transport and handling, and
- To arrive in satisfactory condition at the place of destination.

5. PROVISIONS CONCERNING SIZING

Size is determined by the weight or maximum diameter of the equatorial section of the fruit, in accordance with the following table:

Size Code	Weight (In grams)	Diameter (In millimetres)
A	>350	>95
B	251-350	86-95
C	201-250	76-85
D	151-200	66-75
E	101-150	54-65
F	61-100	43-53

SIZE TOLERANCES:

For all grades, 10% by number or weight of guavas corresponding to the size immediately above and/or below that indicated on the package.

SCHEDULE – VIII
GRADE DESIGNATION AND QUALITY OF SHELLING PEAS

1. Shelling peas shall be obtained from varieties (cultivars) of Pisum sativum L.
2. **MINIMUM REQUIREMENTS**

(i) the pods shall be -

(a) Intact and sound;
(b) Clean, free of any visible foreign matter including parts of the flowers;
(c) Fresh in appearance;
(d) Free from pests and damage caused by pests;
(e) Free from abnormal external moisture;
(f) Free from foreign smell and/or taste;

(ii) The seeds shall be:-

(a) Fresh;
(b) Sound;
(c) Normally developed;
(d) Free from pests and damage caused by pests;
(e) Free from foreign smell and/or taste;

(iii) Pods and seeds shall not be affected by rotting or deterioration such as to make it unfit for consumption.

(iv) They shall comply with the residue levels of heavy metals, pesticides and other food safety parameters as laid down by the Codex Alimentarius Commission for exports.

3. **CRITERIA FOR GRADE DESIGNATION**

Grade Designation	Grade Requirements	Provision concerning Sizing	Grade Tolerances
1	**2**	**3**	**4**
Extra class	Shelling peas shall be of good quality. They must be characteristic of variety and/or commercial type The pods shall be:- ▪ fresh and turgid; ▪ free from damage caused by hail; ▪ free from damage caused by heating; ▪ with peduncles attached; if removed it should be neatly cut; ▪ well filled containing at least five seeds.	Not required	5% by weight of peas not satisfying the requirements, but meaning those of Class I grade.

Grade Designation	Grade Requirements	Provision concerning Sizing	Grade Tolerances
	The seeds shall be:- ▪ well formed; ▪ tender; ▪ succulent and sufficiently firm, they should become flat without disintegrating when squeezed between to fingers; ▪ at least half of the full grown size but not full grown; ▪ non;-farinaceous; ▪ undamaged without cracks in the skin of the seeds.		
Class I	Shelling peas shall be of good quality. They must be characteristic of the variety and/or commercial type. The pods shall be:- ▪ fresh and turgid; ▪ free from damage caused by hail; ▪ free from damage caused by heating; ▪ with peduncles attached, if removed it should be neatly cut; ▪ well filled containing at least five seeds. The seeds shall be:- ▪ well formed; ▪ tender; ▪ succulent and sufficiently firm, they should become flat without disintegrating when squeezed between to fingers; ▪ at least half of the full grown size but not full grown; ▪ non-farinacious; ▪ undamaged without cracks in the skin of the seeds.	Not required	10% by weight of peas not satisfying the requirements, but meeting those of class I grade.

Grade Designation	Grade Requirements	Provision concerning Sizing	Grade Tolerances
Class II	The pods - ▪ shall be fresh and turgid; ▪ with peduncle attached; if removed it should be neatly cut; ▪ shall contain at least three seeds; ▪ may be riper than those in Extra class grade, over mature pods are to be excluded, the pods may have following defects; provided they retain their essential characteristics as regards the quality, the keeping quality and presentation; ▪ slight skin defects, injuries & bruises provided they are not progressive and there is no risk of the seeds being affected; ▪ slight defects in shape; ▪ slight defects in colouring; ▪ some loss of freshness. Seeds may have- ▪ slight defects in shape; ▪ slight defects in colouring; ▪ slightly harder; ▪ slightly damaged.	Not required	10% by weight of peas not satisfying the requirements of the grade but meeting the minimum requirements.

4. **OTHER REQUIREMENTS**

(i) The peas shall be sufficiently developed and conditions shall be such as to enable them:

- to withstand transport of handling, and
- to arrive in satisfactory condition at the place of destination.

(ii) Seeds if graded and packed separately, shall be marked”Pea seeds".

SCHEDULE - IX

GRADE DESIGNATION AND QUALITY OF MANGETOUT (SNOW PEAS) AND SUGAR SNAP PEAS

1. The Mangetout (Snow peas) and sugar snap peas shall be obtained from varieties (cultivars) of Pisum sativum L.

2. **MINIMUM REQUIREMENTS**

(i) The pods shall be -

(a) intact and sound;

(b) clean, free of any visible foreign matter including parts of the flower;

(c) free from hard filaments or films;

(d) free from abnormal external moisture;

(e) free from pest and damage caused by pests;

(f) free of any foreign smell and/or taste;

(ii) The pods shall not be affected by rotting or deterioration such as to make it unfit for consumption.

(iii) Mangetout (snow peas) and sugar snap peas shall comply with the residue levels of heavy metals, pesticides and other food safety parameters as laid down by the Codex Alimentarius Commission for exports.

3. **CRITERIA FOR GRADE DESIGNATION**

Grade Designation	Grade Requirements	Provision concerning Sizing	Grade Tolerances
1	2	3	4
Extra class	The peas shall be of good quality. They must be characteristic of variety and/or commercial type. The seeds if present shall be small and undeveloped. The pods shall be:- ▪ characteristics of the variety in shape, size and colouring; ▪ free and turgid; ▪ with peduncles attached if removed it should be neatly cut; ▪ free from damage by hail;	Not required	5% by weight of peas not satisfying the requirements of the grade, but meeting those of Class I grade.

Grade Designation	Grade Requirements	Provision concerning Sizing	Grade Tolerances
	▪ free from damage caused by heating.		
Class I	The peas shall be of good quality. They must be characteristic of the variety and/or commercial type. The seeds if present shall be small and undeveloped. The pods shall be:- ▪ characteristics of the variety in shape, size and colouring; ▪ fresh and turgid; ▪ with peduncles attached, if removed it should be neatly cut; ▪ free from damage caused by hail; ▪ free from damage caused by heating;	Not required	10% by weight of peas not satisfying the requirements, but meeting those of class II grade.
Class II	This grade includes peas; which do not qualify for inclusion in Class I grade but satisfy the minimum requirements. The seeds, if present, can be slightly more developed than Extra class. The following defects of the pods may be allowed provided the peas retain their essential characteristics as regards the quality, the keeping quality and presentation:- ▪ slight skin defects, injuries bruises; ▪ slight defects in shape; including those due to the seed formation; ▪ slight defects in colouring; ▪ some loss of freshness excluding wilted and uncoloured pods.	Not required	10% by weight of peas not satisfying the requirements of the grade but meeting the minimum requirements.

4. **OTHER REQUIREMENTS**

(i) The pods shall be sufficiently developed and condition shall be such as to enable them-

- to withstand transport and handling, and
- to arrive in satisfactory condition at the place of destination.

(ii) Package shall be marked "trimmed", `topped' or other indications for peas that have their peduncle and/or blossom end removed, where appropriate.

SCHEDULE - X

GRADE DESIGNATION AND QUALITY OF RIBBED CELERY

1. Ribbed celery shall be obtained from Varieties (cultivars) Apium graveolens L. var. dulce Mill;

2. **MINIMUM REQUIREMENT**

(i) Ribbed celery shall be -

(a) fresh in appearance;

(b) clean and free of any visible foreign matter;

(c) free from damage caused by frost;

(d) free from cavities, suckers and flower stems;

(e) free from pests and damage caused by pests;

(f) free of excessive external moisture, properly dried if washed;

(g) free of any foreign smell and/or taste;

(ii) Whole, upper part of it may be trimmed.

(iii) It shall not be rotten or deteriorated so as to make it unfit for consumption;

(iv) It shall be normally developed, having regard to the production period.

(v) Main root should not exceed 5 cm in length and should be well cleaned.

(vi) Ribbed Celery shall comply with the residue levels of heavy metals, pesticides and other food safety parameters as laid down by the Codex Alimentarius Commission for exports.

3. **CRITERIA FOR GRADE DESIGNATION**

Grade Designation	Grade Requirements	Provision concerning sizing	Grade Tolerances
1	2	3	4
Extra class	Ribbed celery shall be of quality, in shape and free of traces of disease on leaves and leaf stalks. The leaf stalk shall not be broken, stringy, crushed or split. In the case of balanced ribbed celery, the leaf stalk shall be white to yellowish white or greenish white in colour for at least half of their length.	As per Table 'A'	5% by number of ribbed celery not satisfying the requirements of the grade, but meeting the requirements for Class I grade.
Class I	Ribbed celery must be of good quality, regular in shape and free of traces of disease on	As per Table 'A'	10% by number of ribbed celery not satisfying the requirements of the grade,

Grade Designation	Grade Requirements	Provision concerning sizing	Grade Tolerances
	leaves and leaf stalks. The leaf stalk shall not be broken, stringy, crushed or split. In the case of blanched ribbed celery, the leaf stalk shall be white to yellowish white or greenish white in colour for at least half of their length.		but meeting the requirements for Class II grade
Class II	Ribbed celery in this grade may have slight traces of rust, deformation or slight bruises and have not more than two leaf stalk that are broken, crushed or split. In the case of blanched ribbed celery, the leaf stalk shall be white to yellowish white or greenish white in colour for at least one third of their length.	As per Table 'A'	10% by number of ribbed celery not satisfying the requirements of the grade but meeting the minimum requirements.

4. **OTHER REQUIREMENTS**

(i) It's condition shall be such as to allow it –

- to withstand transport and handling, and
- to arrive in satisfactory condition at the place of destination.

(ii) The ribbed celery may be presented

- either bundled in the package, or
- stacked in the package.

When presented in bundles, all bundles in the same package shall have the same number of pieces.

(iii) The content of each package shall be uniform and comprise only ribbed celery of the same origin, quality, colour and size.

Table `A'

Provisions concerning sizing

Size is determined in relation to net weight. The minimum weight of ribbed celery shall be 150 gms.

Size Code	Weight (In gms)	Difference in size in the same package (max)
A	150-500	100
B	501-800	150

Size Code	Weight (In gms)	Difference in size in the same package (max)
C	Over 80 gms	200

Size Tolerance- for all grades, 10% by number of ribbed celery not confirming to size requirements.

SCHEDULE - XI
GRADE DESIGNATION AND QUALITY OF SPINACH

1. Spinach shall be obtained from Varieties (cultivars) of Spinacia oleracea L.

2. **MINIMUM REQUIREMENTS**

(i) Spinach shall be -

(a) fresh in appearance,

(b) clean, free of visible foreign matter;

(c) free from pests and damage caused by pests;

(d) free of floral stems;

(e) free of any foreign smell and/or taste;

(f) properly drained if washed;

(ii) It shall not be affected by rotting or deterioration such as to make it unfit for consumption.

(iii) In the case of spinach heads, the portion comprising of the root shall be cut close to the base of the outer leaves.

(iv) Spinach shall comply with the residue levels of heavy metals, pesticides and other food safety parameters as laid down by the codex Alimentarius Commission for exports.

3. **CRITERIA FOR GRADE DESIGNATION**

Grade Designation	Grade Requirements	Provision concerning Sizing	Grade Tolerances
1	2	3	4
Extra class	Spinach shall be of good quality. It may be in leaf or in heads. The leaves shall be ▪ normal in colour and appearance for the variety and time of harvest; ▪ free from damage by frost, animal parasites or diseases impairing appearance or edibility. ▪ In the case of leaf spinach, the leaf stem must not exceed 10 cm. in length.	Not required	5% by weight of Spinach not satisfying the requirements for the grade, but meeting the requirements for Class I grade
Class I	Spinach shall be of good quality. The leaves shall be ▪ normal in colour and	Not required	10% by weight of spinach not satisfying the requirements for the grade, but meeting the

Grade Designation	Grade Requirements	Provision concerning Sizing	Grade Tolerances
	appearance for the variety and time of harvest; ▪ free from damage caused by frost, animal parasites or diseases impairing appearance or edibility ▪ In the case of leaf spinach, the leaf stem must not exceed 10 cm. in length.		requirements for Class II grade.
Class II	Leaf spinach may have slight defects in colourand slight defects caused by frost. However, it shall satisfy the minimum requirements.	Not required	10% by weight of spinach not satisfying the requirements of the grade but meeting the minimum requirements. In the case of spinach heads, a tolerance of 10 % by weight of heads, having roots attached which do not exceed 1cm in length from the base of the outer leaves may be allowed.

4. **OTHER REQUIREMENTS**

(i) The Spinach shall be sufficiently developed and in such condition as to enable it:

- to withstand transport and handling, and
- to arrive in satisfactory condition at the place of destination.

(ii) Leaf spinach and spinach heads shall not be mixed in the same package.

(iii) Each package shall be marked `leaf spinach' or` spinach heads' as the case may be.

SCHEDULE –XII
GRADE DESIGNATION AND QUALITY OF HEADED CABBAGES

1. Headed Cabbages shall be obtained from varieties (cultivars) of Brassica oleracea L. var. capitata L. (including red cabbages and pointed cabbages) and from Brassicaoleracea L. var. bullata DC and var. sabauda L (savoy cabbages);

2. **Minimum requirements**

(i) Headed Cabbages shall be

(a) fresh in appearance, sound and intact;

(b) free of bursts and showing no signs of flower development;

(c) free of bruises and injury;

(d) free of damage due to frost;

(e) free from pests and damage caused by pests;

(f) free of abnormal external moisture

(g) free of any foreign smell and/or taste;

(ii) It shall not be rotten or deteriorated so as to make it unfit for consumption.

(iii) The stem should be cut slightly below the lowest point of leaf growth. Cut should be clean and leaves should remain firmly attached.

(iv) Headed Cabbage shall comply with the residue levels of heavy metals, pesticides and other food safety parameters as laid down by the Codex Alimentarius Commission for exports.

3. **CRITERIA FOR GRADE DESIGNATION**

Grade Designation	Grade Requirements	Provision concerning Sizing	Grade Tolerances
1	2	3	4
Extra class	Headed Cabbage shall be of good quality and possess all the characteristics typical of the variety; they should be compact, having regard to the species. Headed Cabbages, according to the variety, must have firmly attached leaves. They should be uniform in shape and colour Store headed cabbages may have some of their outer leaves removed. Green Savoy headed cabbages and early headed cabbages, taking	Not required	5% by number or weight of headed cabbages not satisfying the requirements for the grade, but meeting the requirements for Class I grade.

Grade Designation	Grade Requirements	Provision concerning Sizing	Grade Tolerances
1	2	3	4
	into account their variety, must be properly trimmed, but in doing so a number of leaves may be left for protection. They may have following slight defects:- ▪ small cracks in the outer leaves, ▪ slight bruising and light trimming of the outer leaves, provided that it does not affect the good condition of the produce.		
Class I	Headed Cabbage shall be of good quality and possess all the characteristics typical of the variety. They should be compact, having regard to the species. Headed Cabbages, according to the variety, must have firmly attached leaves. They should be uniform in shape and colourStore headed cabbages may have some of their outer leaves removed. Green Savoy headed cabbages and early headed cabbages, taking into account their variety, must be properly trimmed, but in doing so a number of leaves may be left for protection. They may have following slight defects:- ▪ small cracks in the outer leaves, ▪ slight bruising and light trimming of the outer leaves, provided that it does not affect the good condition of the produce.	Not required	10% by number or weight of headed cabbages not satisfying the requirements for the grade, but meeting the requirements for Class II grade.
Class II	Headed Cabbage which do not qualify for inclusion in the Class I	Not required	10% by number or weight of headed cabbages

Grade Designation	Grade Requirements	Provision concerning Sizing	Grade Tolerances
1	2	3	4
	grade, but meet the minimum requirements. They may have following defects. ▪ Cracks in the outer leaves, ▪ More of the outer leaves may be removed, ▪ Larger bruises and the outer leaves may be more extensively trimmed, ▪ Less compact.		not satisfying the requirements of the grade but meeting the minimum requirements.

4. **OTHER REQUIREMENTS**

Headed Cabbage must be such as to enable them.-

- to withstand transport and handling, and
- to arrive in satisfactory condition at the place of destination.

5. **PROVISIONS CONCERNING SIZING**

Size is determined in relation to net weight. The minimum weight of headed cabbage shall not be less than 200 gms.

Table `A'

Size Code	Weight in gms
A	201 - 600
B	601 - 1200
C	1201 and above

Sizing is compulsory for headed cabbages presented in packages. In that case, the weight of the heaviest head in any one package shall not be more than double the weight of the lightest head.

Size Tolerance - For all classes 10% by number or weight of Headed Cabbages.

SCHEDULE - XIV

GRADE DESIGNATION AND QUALITY OF TOMATOES

1. (i) Tomatoes shall be fruits obtained from varieties of Lycopersicum esculentum Mill of the Solanaceae family.

(ii) Tomatoes may be classified into four commercial types:

- Round
- Ribbed
- Oblong or elongated
- Cherry tomatoes (including cocktail tomatoes)

2. **MINIMUM REQUIREMENTS**

(i) Tomatoes shall be

(a) whole, sound and fresh in appearance;

(b) clean, free of any visible foreign matter;

(c) free of pests affecting the general appearance of the produce;

(d) free of damage caused by pests;

(e) free of abnormal moisture excluding condensation following removal from cold storage;

(f) free of any foreign smell and/or taste;

(ii) In the case of trusses of tomatoes, the stalk must be fresh, healthy, clean and free from all leaves and any visible foreign matter.

(iii) Tomatoes shall comply with the residue levels of heavy metals, Pesticides and other food safety parameters as laid down by the Codex Alimentarius Commission for exports.

3. **CRITERIA FOR GRADE DESIGNATION**

Grade Designation	Grade Requirements	Provision concerning sizing	Grade Tolerances
1	2	3	4
Extra class	Tomatoes shall be of superior quality. They shall have firm fresh and must be characteristics of the variety as regards shape, appearance and development. They must be free of green backs and other defects. Very slight superficial defects may be there provided these do not affect the general appearance of the produce, the quality, the		5% by number or weight of tomatoes not satisfying the requirements of the grade, but meeting those of Class I or exceptionally, coming within the tolerances of that grade.

Grade Designation	Grade Requirements	Provision concerning sizing	Grade Tolerances
	keeping quality and presentation in the package.		
Class I	Tomatoes shall be of good quality. They shall have reasonably firm flesh and shall be characteristics of the variety as regards shape, appearance and development. They must be free of cracks and visible green back. The following slight defects may be there provide these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package: slight superficial defects may be there provided these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package. ▪ a slight defect in shape and development; ▪ a slight defect in colouring; ▪ slight skin defects; ▪ very slight bruises; ”Ribbed” tomatoes may show; ▪ healed cracks not more than 1 cm. long; ▪ no excessive protuberances; ▪ small non ▪ lignified unbilical scars; ▪ suberization of the stigma upto 1 sq.cm; ▪ no more than one headed scar; ▪ unbilical lignified scars not greater than 1 sq.cm or linear lscar no longer; than 2/3rdof the greatest diameter of the fruit.		10% by number or weight of tomatoes not satisfying the requirements of the grade, but meeting those of Class II or, exceptionally, coming within the tolerances of that grade.
Class II	Tomatoes shall be reasonably firm flesh and shall be character (but may be slightly less firm than in class I) and must not show unhealed cracks. Following defects may be there provided the tomatoes retain their essential characteristics as regards the		10% by number or weight not satisfying the requirements of the grade but meeting the minimum requirements. In case of trusses of tomatoes, 10 % by number or weight of

Grade Designation	Grade Requirements	Provision concerning sizing	Grade Tolerances
	quality, the keeping quality and presentation. ▪ defects in shape, development andcolouring; ▪ skin defects or bruises, provided the fruit is not seriously affected; ▪ healed cracks not more than 3 cm. in length.“Ribbed” tomatoes may show: - more pronounced protuberances but without being misshapen; - one umbilicus; - unbilical lignified scars not greater than 2sq.cm; - fine blossom scar in elongated form.		tomatoes detached from the stalk.

4. **OTHER REQUIREMENTS**

(i) The contents of each package must be uniform and contain tomatoes of same origin, variety and/or commercial type, quality and size.

(ii) The ripeness and colouring of tomatoes in "Extra class" and class I must be uniform. In addition, the length of `Oblong' tomatoes must be sufficiently uniform.

(iii) The tomatoes may be presented as follows:

(a) As individual tomatoes, with or without calyx and short stalks;

(b) As trusses of tomatoes, (in entire inflorescence or part of inflorescence). Each inflorescence or part of inflorescence should comprise at least the following number of tomatoes.

- 3 (2 if pre-packaged) or
- in case of trusses of "Cherry" tomatoes 6 (4 if pre-packaged).

(iv) The development and conditions of the tomatoes shall be such as to enable them :

- to withstand transport and handling, and
- to arrive in satisfactory condition at place of destination.

5. **PROVISIONS CONCERNING SIZING:-**

Sizing is determined by the maximum diameter of the equatorial section in accordance with following table. The provisions shall not apply to "cherry" tomatoes. The minimum size is set at 35 mm for "round and "ribbed" tomatoes and 30 mm for "oblong" tomatoes:

Size Code	Diameter (in mm)	
	Minimum*	Maximum
1	From 30 to 34	
2	From 35 to 39	
3	From 40 to 46	
4	From 47 to 56	
5	From 57 to 66	
6	From 67 to81	
7	From 82 to 101	
8		From 102 and over

* When the tomato in vertical position can pass through a circular opening of the designated diameter.

@ —When the tomato in any position can pass through a circular opening of the designated diameter.

(i) Observance of the sizing scale is compulsory for "Extra class" and "class I" tomatoes;

(ii) The sizing scale shall not apply to trusses of tomatoes.

(iii) For all classes:

- 10% by number or weight of tomatoes corresponding to the size immediately above or below that indicated on the package with a minimum of 33 mm. for "round" and "ribbed" tomatoes and 28 mm. for "Oblong" tomatoes.

6. **PROVISIONS CONCERNING COLOUR**

Following terms may be used in the description of the colour as an indication of the storage and brightness of any lot and matured tomatoes.

- **Mature green** : when the tomatoes present a yellow colour;
- **Green**: when the surface of the tomato is completely green varying from light to dark green.
- **Breakers**: when there is a definite break in colour from green to tannish - yellow, pink or red on not more than 10% of the surface.
- **Mottled**: When yellow, rose or red are present in more than 10% but no more than 30% of the fruits.
- **Rose**: when rose or red colour are present in more than 30% but less than 60% of the fruit (yellow is not included.
- **Red**: When more than 60% but no more than 90% of the fruits are rose or red colour.
- **Mature red**: when more than 90% of the surface of the fruit shows red colour.

SCHEDULE - XV

GRADE DESIGNATION AND QUALITY OF BANANAS

1. Bananas shall be obtained from Varieties (cultivars) of Musa. spp. of the Musaceae family.

2. **MINIMUM REQUIREMENTS**

(i) Bananas shall be :

(a) whole (taking the finger as the reference),

(b) firm,

(c) sound,

(d) clean, free of any visible foreign matter,

- free of bruisings,

(e)free of pests affecting the general appearance of produce,

(f) with the stalk intact, without bending, fungal damage or dessication,

(g)with pistils removed,

(h) free of malformation or abnormal curvature of the fingers,

(i) free of damage caused by low temperature,

(j) free of abnormal external moisture excluding condensation following removal from cold storage and bananas packed under modified atmosphere condition,

(k) free of any foreign smell and/or taste.

(ii) In addition, hands and clusters must include:

- a sufficient portion of the crown of normal colouring, sound and free of fungal contamination,
- a cleanly cut crown, not bevelled or torn, with no stalk fragments.

(iii) Bananas shall comply with the residue levels of heavy metals, Pesticides and other food safety parameters as laid down by the Codex Alimentarius Commission for exports.

3. **CRITERIA FOR GRADE DESIGNATION**

Grade Designation	Grade Requirements	Grade Tolerances
1	2	3
Extra class	Bananas shall be of superior quality. They must be characteristics of the variety and/or commercial type. The fingers must be free of defects, with the exception of very slight superficial defects, provided	5% by number or weight of bananas not satisfying the requirements of the grade, but meeting those of for Class I grade or, exceptionally,

Grade Designation	Grade Requirements	Grade Tolerances
	these do not affect the general appearance of the produce, quality, the keeping quality and presentation in the package.	coming within the tolerances for that class.
Class I	Bananas shall be of good quality. They must be characteristics of the variety and/or commercial type. The following slight defects of the fingers, however, may be allowed, provided these do not affect the general appearance of the produce, quality, the keeping quality and presentation in the package. ▪ slight defects in shape and colour; ▪ slight defects due to rubbing and other superficial defects not exceeding 2 sq.cm. of the total surface area. The defects must not affect the flesh of the fruit.	10% number or weight of bananas not satisfying the requirements of the grade class, but meeting those of Class II or, exceptionally, coming within the tolerances of that grade.
Class II	This includes bananas which do not qualify for inclusion in the higher classes, but satisfy the minimum requirements. The following defects may be there, provided the bananas retain their essential characteristics as regards the quality, the keeping quality and presentation. ▪ defects in shape and colour provided the product remains the normal characteristics of bananas; ▪ skin defects due to scrapping, scabs, rubbing, blemishes or other causes not exceeding 4sq.cm. of the total surface area; The defects must not affect the flesh of the fruit.	10% by number or weight of bananas not satisfying the requirements of the grade, but meeting the minimum requirements.

4. **OTHER REQUIREMENTS**

(i) The development and condition of the bananas must be such as to enable them:

- to reach the appropriate stage of physiological maturity corresponding to the particular characteristics of the variety,
- to withstand transport and handling, and
- to arrive in satisfactory condition at the place of destination in order to ripen satisfactorily.

(ii) Bananas must be presented in hands and clusters (parts of hands) of atleast four fingers. Bananas may also be presented as single finger.

(iii) Clusters with no more than two missing fingers are allowed, provided the stalk is not torn but clearly cut, without damage to the neighbouring fingers.

(iv) Not more than one cluster of three fingers with the same characteristics as the other fruit in the package may be present per row.

5. **PROVISIONS CONCERNING SIZING**

(i) For the purposes of sizing bananas, the length of the fingers is determined along the outside curve from the blossom end to the base of the pedicel where the edible pulp ends and the diameter is defined as the thickness of a transverse section between the lateral faces. The reference fruit for measurement of the length and grade is:

- for hands, the median finger on the outer row of the hand,
- for clusters, the finger next to the cut section of the hand, on the outer row of the cluster.

(ii) The minimum length should not be less than 14.0 cm and the minimum grade not less than 2.7 cm.

(iii) For all classes, 10% by number or weight of bananas not satisfying the sizing characteristics, upto a limit of 1 cm for the minimum length of 14 cm.

SCHEDULE - XVII

GRADE DESIGNATION AND QUALITY OF PAPAYAS

1. Papayas shall be the fruit obtained from varieties of Carica Papaya L. of the Caricaceae family;

2. **MINIMUM REQUIREMENTS**

(i) Papaya shall be

(a) whole,

(b) fresh in appearance,

(c) firm,

(d) sound, produce affected by rotting or deterioration, such as to make it unfit for consumption is excluded,

(e) clean, free of any visible foreign matter,

(f) free of pests affecting the general appearance of the produce,

(g) free of damage caused by low and/or high temperature,

(h) free of abnormal external moisture, excluding condensation following removal from cold storage,

(i) free of any foreign smell and/or taste,

(j) the peduncle, if present, should not exceed a length of 1 cm.

(ii) Papaya shall comply with the residue levels of heavy metals, pesticides and other food safety parameters as laid down by the Codex Alimentarius Commission for exports.

3. **CRITERIA FOR GRADE DESIGNATION**

Grade Designation	Grade Requirements	Grade Tolerances
1	2	3
Extra class	Papayas in this class must be of superior quality. They must be characteristic of the variety and /or commercial type. They must be free of defects, with the exception of very slight superficial defects, provided these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package.	5% by number or weight of Papayas not satisfying the requirements of the grade, but meeting those of Class I or, exceptionally, coming within the tolerances of that grade.
Class I	Papayas in this class must be of good quality. They must be characteristics of	10% by number or weight of Papayas not satisfying the

Grade Designation	Grade Requirements	Grade Tolerances
	the variety and/or commercial type. The following slight defects may be there, provided these do not affect the general appearance of the produce, the quality and presentation in the package: ▪ a slight defect in shape, ▪ slight skin defects (i.e. mechanical bruising, sun spots and/or latex burns). The total area affected shall not exceed 10% of the total surface. The defects, must not, in any case, affect the pulp of the fruit.	requirements of the grade, but meeting those of Class II or, exceptionally, coming within the tolerances of that grade.
Class II	This class includes papayas which do not qualify for inclusion in the higher grades, but satisfy the minimum requirements. The following defects may be there, provided the papayas retain their essential characteristics as regards the general appearance, the quality, the keeping quality and presentation. ▪ defects in shape, ▪ defects in colouring, ▪ skin defects (i.e. mechanical bruising, sunspots and latex burns). The total area affected should not exceed 15% of the total surface. ▪ Slight marks caused by pests. The defects must not affect the pulp of the fruit.	10% by number or weight of Papayas not satisfying the requirements of the grade but meeting the minimum requirements.

4. **OTHER REQUIREMENTS**

(i) The papayas must have been carefully picked and have reached an appropriate degree of development and ripeness, account being taken of the characteristics of the variety and/or commercial type and to the area in which they are grown.

(ii) The development and condition of the papayas must be such as to enable them;

- to withstand transport and handling, and
- to arrive in satisfactory condition at the place of destination.

5. **PROVISIONS CONCERNING SIZING**

Size is determined by the weight of the fruit with a minimum weight of 200 gm. in accordance with the following table.

Size Code	Weight (in grams)
A	200 - 300
B	301 - 400
C	401 - 500
D	501 - 600
E	601 - 700
F	701 - 800
G	801 - 1100
H	1101 - 1500
I	1501 - 2000
J	>2001

6. **SIZE TOLERANCE**

For all grades, 10% by number or weight of papayas corresponding to the size immediately above and/or below that indicated on the package, with a minimum of 190 gm. for those papayas packed in the smallest size range.

SCHEDULE - XVIII
GRADE DESIGNATION AND QUALITY OF GARLIC

1. Garlic shall be obtained from Varieties (cultivars) Allium sativum L. They may be (1) fresh, (2) semidry or (3) dry.

2. **MINIMUM REQUIREMENTS**

(i) Garlic bulbs shall be

(a) sound, fresh in appearance;
(b) clean, free of any visible foreign matter;
(c) firm;
(d) free from damage caused by pests;
(e) free from damage caused by frost or sun;
(f) free from externally visible sprouts;
(g) free of abnormal external moisture;
(h) free of any foreign smell and/or taste

(ii) They shall comply with the residue level of heavy metals, pesticides and other food safety parameters as laid down by the Codex Alimentarius Commission for exports.[1][2][3]

3. **CRITERIA FOR GRADE DESIGNATION**

Grade Designation	Grade Requirements	Grade Tolerances
1	2	3
Extra class	Garlic shall be of superior quality. They shall be characteristic of the variety and /or commercial type. The bulbs shall be : ▪ intact; ▪ regular in shape; ▪ Properly cleaned. They must be free of defects, with the exception of very slight superficial blemishes, provided these do not	5% by weight of Garlic not satisfying the requirements of the grade, but meeting those of Class I grade or, exceptionally, coming within the tolerances of that grade.

[1] Fresh garlic' means produce with a `green' stem and with the outer skin of the bulb still fresh.
[2] Semi-dry garlic' means produce with the stem and the outer skin of the bulb not completely dry.
[3] Dry garlic' means produce in which the stem, the outer skin of the bulb and the skin surrounding each clove are completely dry.

Grade Designation	Grade Requirements	Grade Tolerances
	affect the general appearance of the produce, the quality, the keeping quality and presentation the package. The cloves must be compact; The roots of dry garlic must be cut off flush with the bulb.	
Class I	Garlic shall be of good quality. They shall be characteristics of the variety and/or commercial type. The bulbs shall be : ▪ intact; ▪ of fairly regular shape The following slight defects, however, may beallowed provided these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package. ▪ slight tears in the outer skin of the bulb; cloves must be reasonably compact.	10% by weight of Garlic not satisfying the requirements of the grade, but meeting those of Class II or, exceptionally, coming within the tolerances of that grade.
Class II	Garlic which do not qualify for inclusion in the higher grade, but satisfy the minimum requirements. The following defects may be allowed, provided the garlic retains its essential characteristics as regards the quality, the keeping quality and presentation. ▪ tears in the outer skin or missing parts of the outer skin of the bulb; ▪ healed injuries; ▪ slight bruises; ▪ irregular shape; ▪ upto three cloves missing.	10% by weight of Garlic not satisfying the requirements of the grade but meeting the minimum requirements.

4. **OTHER REQUIREMENTS**

(i) The development and condition of the garlic must be such as to enable it to:

- withstand transport and handling, and
- arrive in satisfactory condition at the place of destination.

(ii) Garlic must be presented as follows:

- loose in the package, with cut stems, the length of the stem not to exceed:

- 10 cm. in the case of fresh and semi-dry garlic,
- 3 cm. in the case of dry garlic;

▪ in bunches by:

- number of bulbs;
- net weight.

The stems must be evened off;

▪ in the case of dry and semi-dry garlic only, in strings by:

- number of bulbs, there being at lest six bulbs per string;
- net weight.

In the case of presentation in bunches or strings, each package must have uniform characteristics (number of bulbs or net weight).

Irrespective of the type of presentation, the stems must be cut cleanly, as must roots in the case of dry garlic classified in the `Extra' class.

(iii) Package shall be marked `fresh garlic', `semi-dry garlic' or `dry garlic'.

5. **PROVISIONS CONCERNING SIZING**

(i) Size is determined by the maximum diameter of the equatorial section.

(ii) The minimum diameter shall be at 45 mm for garlic classified in the `Extra' Class and 30 mm for garlic classified in Classes I and II.

(iii) For garlic presented loosee - with cut stems - or in bunches, the difference in diameter between the smallest and the largest bulb in the same package may notexceeed:

- 5 mm where the diameter of the smallest bulb is less than 40 mm;
- 20 mm where the diameter of the smallest bulb is 40 mm or more.

(iv) Size tolerances: For all grades: 10% by weight of bulbs not satisfying the requirements as regards sizing and the size indicated but conforming to the size immediately above and/or below that specifieed. Within this tolerances, not more than 3% of bulbs may have a diameter smaller than the specified minimum but not less than 25 mm.

(v) Garlic bulb without clove may have minimum diameter of 20 mm for Extra class and 15 mm for Class I and Class II.

SCHEDULE - XIX

GRADE DESIGNATION AND QUALITY OF ONIONS

1. Onions shall be obtained from Varieties (cultivars) Allium Cepa L.

2. MINIMUM REQUIREMENTS

(i) Onion shall be

(a) intact,

(b) sound, produce affected by rotting or deterioration such as to make it unfit for consumption is excluded,

(c) clean, free from any visible foreign matter,

(d) free from damage caused by frost;

(e) sufficiently dry for the intended use(in the case of onions for storing, at least the two first outer skins and the stem must be fully dried)

(f) without hollow or tough stems;

(g) practically free from pests;

(h) practically free from damage caused by pests;

(i) free of all abnormal external moisture;

(j) free of any foreign smell and/or taste.

The stems must be twisted or clean cut and must not exceed 6 cm in length (except for stringed onions).

(ii) They shall comply with the residue level of heavy metals, pesticides and other food safety parameters as laid down by the Codex Alimentarius Commission for exports.

3. CRITERIA FOR GRADE DESIGNATION

Grade Designation	Grade Requirements	Grade Tolerances
1	2	3
Extra class	Onion shall be of superior quality. They shall be characteristic of the variety and /or commercial type. The bulbs shall be : ▪ firm and compact; ▪ unsprouted;(free from externally visible shoots) ▪ properly cleaned; ▪ free from swelling caused by abnormal development; ▪ free of root tufts, however, onions harvested before complete	5% by number or weight of onion but not satisfying the requirements of the grade, but meeting those of Class I grade or, exceptionally, coming within the tolerances of that grade.

Grade Designation	Grade Requirements	Grade Tolerances
	maturity, root tufts are allowed. They shall be free of defects, with the exception of very slight superficial blemishes, provided these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package.	
Class I	Onion shall be of good quality. They shall be characteristics of the variety and/or commercial type. The bulbs shall be : ▪ firm and compact; ▪ unsprouted (free from externally visible shoots); ▪ free from swelling caused by abnormal development; ▪ free of root tufts, however, onions harvested before complete maturity, root tufts are allowed. The following slight defects, however, may beallowed provided, these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package. ▪ a slight defect in shape; ▪ a slight defect in colouring; ▪ light staining which does not affect the last dried skin protecting the flesh, provided it does not cover more than one-fifth of the bulb's surface. ▪ Superficial cracks in and absence of part of the outer skins, provided the flesh is protected.	10% by number or weight of onion not satisfying the requirements of the grade, but meeting those of Class II grade or, exceptionally, coming within the tolerances of that grade.

Grade Designation	Grade Requirements	Grade Tolerances
Class II	Onion which do not qualify for inclusion in the higher grade, but satisfy the minimum requirements. They shall be reasonably firm. The following defects may be allowed, provided the onion retains their essential characteristics as regards the quality, the keeping quality and presentation. ▪ defects in shape; ▪ defects in colouring; ▪ early signs of shoot growth visible from outside (not more than 10% by number or weight per unit of presentation); ▪ traces of rubbing; ▪ slight marking caused by parasites or disease; ▪ small healed cracks; ▪ slight bruising, healed, unlikely to impair keeping qualities; ▪ root tufts; ▪ stains which do not affect the last dried skin protecting the flesh provided they do not cover more than half the bulb's surface; ▪ cracks in the outer skins and the absence of a part of the outerskins from not more than half of the bulbs's surface; ▪ cracks in the outer skins and the absence of a part of the outerskins from not more than one-third of the bulb's surface, provided the flesh is not damaged.	10% by number or weight of onion not satisfying the requirements for the grade but meeting the minimum requirements.

4. OTHER REQUIREMENTS:

(i) The development and condition of the onion must be such as to enable them to:

- withstand transport and handling, and
- arrive in satisfactory condition at the place of destination.

(ii) Onions must be presented as follows:

- arranged in layers;
- loose in the package (including in bulk bins);
- in strings:

Either of a certain number of bulbs, in which case the strings must contain at least six onions(with fully dried stems); or of a certain net weight.

For stringed onions, the characteristics of the strings in any one package(number of bulbs or net weight) must be uniform.

5. PROVISIONS CONCERNING SIZING:

(i) Size is determined by the maximum diameter of the equatorial section in accordance with the following table.

Size Code	Diameter (in mm)	Difference between the diameter of the smallest and largest onion in same package (in mm)
A	10-20	5
B	21-40	15
C	41-70	20
D	71 and above	30

* **The minimum diameter is 10mm**

(ii) **Size tolerances**: For all grades, 10% by weight of onions not satisfying the size identified, but with a diameter of no more than 20% below or above it.

Annexure 4: Quotation for Grading Sorting lines

JUPITER TRADECON
Manufacturers, Engineers & Representatives
311, M. P. J. Chambers, Wakadewadi, Mumbai-Pune Road, Pune-411003 (India)
Tel - 020 - 2581 5657 Tel/Fax - 020 - 2581 7528 / 2553 7764,
E-mail: jupitertradecon@gmail.com Mobile: 9822447499

Ref: JTC/GA/BC/12-13/01 **Date: 06/12/2012**

M/s GLOBAL AGRI
NEW DELHI
Email - drsaswatibose@globalagri.com/ anil@globalagri.com

Kind Attn: Mr. Anil/Dr. Ms Saswati Bose

SUB: Your requirement of Conveyors and Crates Handling System for Vegetables

Dear Sir,

We refer to the discussions you had with our Mr. Mandar Joshi, as well as our email correspondence dated 23.11.2012 and 27.11.2012.

We are suggesting going in for 25 M Long Belt Conveyors to accommodate more Crates as Vegetable Sorting will require more time and space.

We are also offering Gravity Discharge Roller Conveyors for Unloading Filled/Empty Crates, Lorry Loader/Unloader and Sorting Tables with SS Top.

We hope you find our offer in line with your requirement and place your valued order on us,

In case you have any queries, feel free to contact us.

Assuring you of the best service at all times.

For Jupiter TradeCon

Mandar Joshi

Encl.: Tech. Spec. & Offer

TECHNICAL SPECIFICATION

(A) Specifications –Belt Conveyor 25 M (82 feet) Long.

1)	Application	Conveying Vegetable Crates
2)	Speed	5 M/Min - Fixed Speed
3)	Length/Height	**Pulley C/C Dist - 25 Mtrs.(82 Feet)/ 800 mm Ht**
4)	Conveyer Type	**Horizontal Belt Conveyer**
5)	Belt Type	Belt 500 mm width – Hygienic Food Grade PVC (315) Belt With 315 Kg Breaking Strength
6)	Head Pulley	Dia 168 mm Or 220 mm X 570 L ~ 600 L Rubber Lined/PP (Poly Propylene) Lined 3 mm
7)	Tail Pulley	Dia 168 mm Or 220 mm X 570 L ~ 600 L Rubber Lined/PP (Poly Propylene) Lined 3 mm
8)	Snub Pulley	N.A
9)	Drive With Suitable Gearbox/Geared Motor	3.0 HP Geared Motor - Make – Rotomotive/ Bonfiglioli With suitable base plate if required Chain with Sprocket (If required)
10)	Carrying Idlers	STD 50 OD - MS Pipe – ERW “C” Class Pipe
11)	Return Idlers	STD 50 OD - MS Pipe – ERW “C” Class Pipe
12)	Supporting Structure	MS Fabricated from Proper Quality Material (Sheet/Pipe/Channels/Angles/Beams) MS Sheet Top + Sq. Pipe 50 X 50 and having requisite strength and rigidity. Structure provided with adequate supports/base plates for support with Gussets.
13)	Bearing With Plummer Block	Self Aligning Ball Bearings With Suitable Housing.
14)	Belt Tensioning	Screw Type Take-up.
15)	Electricals	DOL Starter Mounted on Conveyer with Forward/Reverse Switch
16)	Foundation Plate/Height Adjustment Screws	If Foundation is required with base plates – We will provide Foundation Drawing alternatively we will provide rigid support structure with Height Adjustment Screws
17)	Paint	2 Coats of Primer followed by 2 Coats of Good Quality Paint to ensure aesthetic finish and proper protection
18)	**Quantity**	**2 No.**

(B) Specifications – Gravity Type Roller Conveyor – 1.5 M Long X 0.8 M Width.

1)	Application	Conveying Grape Crates
2)	Speed	Gravity Discharge
3)	Gravity Rollers	STD 50 OD MS Pipe – ERW "C" Class Pipe @ 200 mm Pitch
4)	Supporting Structure	MS Fabricated from Proper Quality Structural Material (Channels/Angles/Beams) and having requisite strength and rigidity. Height Sloping from 900 mm to 600 mm ~ 500 mm
5)	Length	C/C 1.5 Mtrs. Approx
6)	Painting	2 Coats Red Oxide As A Primer & Final Two Coats Of Oil Paint
7)	Quantity	**2 No.**

(C) Specifications Loading table - <u>Qty - 12 Nos</u>

- SS 304 Top + MS Support - Bolted with Conveyor Structure

(D) Specifications - Truck Loader Conveyor

Sr No.	Particulars / Details	CONVEYOR NO. 1
1	Qty	01
2	Type	**Inclined Conveyor with Hydraulic Discharge Height Adjustment**
3	Duty	Continuous
4	Installation	Outdoor
5	Mounting	On the Ground
6	Construction	Mild Steel
7	Process Data	
	Material to be handled	Crates/Cartons / Bags
	Bulk Density	-
	Max Operating Temp	-
	Feed Height from Ground	300 mm
	Discharge height from Ground	Upto 2000 mm
8	**Belt Details**	
	Specification	3 ~ 5 mm thick PVC coated polyester reinforced supergrip belt 600 mm Width
9.	**Dimension of Conveyor**	700 mm Wide x 4000 mm
10.	Side Guard / Skirt/Top Cover	If required can be provided at additional cost
11	Support	Hydraulic Height Adjustment with 1 HP Power Pack 60 Ø Piston with 500 mm Stroke Length
12	Area Classification	Non- Hazardous

13	**Drive Unit**	
	Drive Feature & control	N/A
	Motor	1.5 HP
	Gear Box Ratio	24 : 1
	Output RPM	58
	Roller Bed Speed	16 Mtrs/Min
	Type of Gear Box	Worm
	Make	Rotomotive or Bonfiglioli

For Jupiter TradeCon

Mandar Joshi

****

COMMERCIAL TERMS

Price: Item (A): Rs. 6,47,000/- (Rs. Six Lacs Forty Seven Thousand Only) **Each**
Item (B): Rs. 2,24,000/- (Rs. Two Lacs Twenty Four Thousand Only) **Each**
Item (C): Rs. 71,000/- (Rs. Seventy One Thousand Only) **Each**
Item (D): Rs. 3,05,000/- (Rs. Three Lakh Five Thousand Only) **Each**
Prices are Ex-works.
Packing, forwarding, insurance, octroi etc. extra at actuals at the time of dispatch.

Taxes & Duties: MVAT 12.5 % Extra, ED - Nil

Validity: This offer shall be valid for 30 days from the date of offer and thereafter subject to confirmation from our end.

Payment: 40% advance along with order.

60% after successful try outs at our works in presence of your inspector prior to delivery.

Guarantee: The above materials will be guaranteed for 18 Calendar months from the date of dispatch of final consignment or 12 Calendar months from the date of commissioning whichever is earliest for any manufacturing defect. Rectification and repairs, if any during this period, will be carried out at our works, free of cost. This however, does not cover equipment mishandling and damage caused by your personnel and in transit.
Any variable cost including visit to Site, is not included in this Guarantee. Such cost will be intimated to you on request and to be paid by you in advance only

Delivery: 3-4 Weeks from the date of receipt of order along with advance.

In case the material is not lifted by you within 15 days from raising a proforma invoice after due confirmation by you, you will have to bear interest at 24% per annum & warehousing charges at actuals for delayed period.

Erection & commissioning: Services of our commissioning engineer shall be available for site erection and commissioning of following basis:-

1. Tools & tackles and manpower shall be supplied by you to him free of costs.
2. In addition to the to & fro traveling charges by Air/Ist class/AC II class from our place to place of commissioning, you will have to pay a per day commissioning charges of Rs. 5,000/- (Rs. Five Thousand Only)
3. Also, charges for local stay and local conveyance shall be paid by you at actuals on presentation of bills.

Force majeure: The above delivery period is subject to the standard force majeure clause applicable to Industry.

For Jupiter TradeCon

Mandar Joshi

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Annexure 5: Quotation for Plant and Machinery for Dehydration Plant

MECH-AIR INDUSTRIES

An ISO 9001:2008 Certified Company

Integrated Turnkey Solutions

- Cold Chain Management
- Fruit Ripening System
- Food Processing Projects & Process Automation

Contact us : 3/16-A, BIDC Industrial Estate, Gorwa, Vadodara – 390016. Gujarat, India
Tel: 0265-2285751, 2290728 Fax: 0265-2291613, Email: info@mechair.in; mechair@gmail.com
Web-site: www.mechair.in, www.mechair.co.in

Capsicum

Capsicum is a genus of flowering plants in the nightshade family Solanaceae.
Capsicum fruits and peppers can be eaten raw or cooked. They are also frequently used both chopped and raw in salads, or cooked in stir-fries or other mixed dishes. They can be sliced into strips and fried, roasted whole or in pieces, or chopped and incorporated into salsas or other sauces, of which they are often a main ingredient. They are a rich source of vitamin A and C. They can be preserved in the form of a jam or by drying, pickling or freezing. Dried peppers may be reconstituted whole, or processed into flakes or powders. Pickled or marinated peppers are frequently added to sandwiches or salads. Frozen peppers are used in stews, soups, and salsas. Extracts can be made and incorporated into hot sauces.

Availability of Capsicum in India

In India it is cultivated commercially in Tamil Nadu, Karnataka, Himachal Pradesh and in some parts of Uttar Pradesh. In Karnataka, it is estimated to be grown in Dharwar, Belgaum, Mysore, Bangalore, and Chitradurga which comprise more than 80% of the total area under its cultivation. In North India, it is known as "Simla Mirch" and is an important summer crop grown extensively in the mild hills of Himachal Pradesh to supply to the plains. The agro-climatic condition of the Kalimpong in Darjeeling district, West Bengal is also found suitable for its cultivation and commercial exploitation.

The sweet pepper is generally sown in August for the autumn-winter crop and in November for the spring -summer crop. In the hills of North Bengal sowing of seeds in the months of March- April (under cover) and September - October is very successful for getting high yield. Plants sown in September and October take the longest period for development because of poor availability of light in winter.

CAPSICUM/ TOMATO DRYING PLANT

Overview

Capacity of plant: 2 Ton per day dry Tomato

Required plant area/ land with utility section: 150’ ft * 60’ ft

Size of civil plant building (approx.): 100’ ft * 38’ ft

Raw Capsicum/ Tomato requirement: 20 Ton/ day

Finished Product Approx.: 2000 Kg/ day – Tomato
1500 Kg/day - Capsicum

Plant & Machinery

The list of machinery is attached as Annexure I

Utilities

Electricity Requirement (approx.): 325 HP

Heat Source & capacity: Boiler – 20 lakh Kcal/hr

Plant & Machinery Cost:

Budgetary (Basic) Cost of Plant & Machinery: Rs 5.90 crore
Taxes (additional): VAT @ 15%
Transportation cost (additional)

Project Execution

Project Execution Time: 6 Months

Tomato

The tomato is consumed in diverse ways, including raw, as an ingredient in many dishes and sauces, and in drinks. While it is botanically a fruit, it is considered a vegetable for culinary purposes. There are around 7500 tomato varieties grown for various purposes. They contain the carotene lycopene, one of the most powerful natural antioxidants. In some studies, lycopene, especially in cooked tomatoes, has been found to help prevent prostate cancer. Lycopene has also been shown to improve the skin's ability to protect against harmful UV rays. A study done by researchers at Manchester and Newcastle universities revealed that tomato can protect against sunburn and help keeping the skin looking youthful.

Lycopene has also been shown to protect against oxidative damage in many epidemiological and experimental studies. In addition to its antioxidant activity, other metabolic effects of lycopene have also been demonstrated. The richest source of lycopene in the diet is tomato and tomato derived products.Tomato consumption has been associated with decreased risk of breast cancer, head and neck cancers and might be strongly protective against neurodegenerative diseases. Tomatoes, tomato sauces and puree are said to help lower urinary tract symptoms (BPH) and may have anticancer properties. Tomato consumption might be beneficial for reducing cardiovascular risk associated with type 2 diabetes.

Tomato is a warm season crop, it requires warm and cool climate. The plants cannot withstand frost and high humidity. Also light intensity affects pigmentation, fruit colour, fruit set. The plant is highly affected by adverse climatic conditions. It requires different climatic range for seed germination, seedling growth, flower and fruit set, and fruit quality.

The major tomato growing tracts in India are:

State	**Major tomato growing districts**
Uttar Pradesh	Varanasi, Mirzapur
Himachal Pradesh	Shimla, Kullu, Solan
Punjab	Amritsar, Ropar, Jalandhar, Hoshiarpur
Haryana	Rohtak, Sonepat, Jhajjarr, Faridabad, Karnal
Rajasthan	Jaipur, Dholpur, Alwar, Tonk, Bharatpur
Bihar	Vaishali, Sitamarhi, Bhagalpur, Patna, Aurangabad, Nalanda, Bhojpur, W&E Champaran
Jharkhand	Ranchi, Lohardaga , Hazaribagh, Godda
Maharashtra	Nashik, Ahmednagar, Pune, Nagpur
Gujarat	Surat, Valsad, Baroda, Ahmednagar, Gandhinagar, Kedha, Jamnagar
Madhya Pradesh	Satna, Sagar, Jabalpur,
Chhatisgarh	Raipur, Durg, Bastar, Bilaspur, Raigarh, Surguja
Orissa	Bolangir, Kendrapada, Dhenkanal, Ganjam, Mayurbhanj, Keonjhar
Andhra Pradesh	Rangareddy, Mehabubnagar, Prakasam, Vishakapattanam, Chittor
Karnataka	Kolar, Bangalore, Bellary, Dharwad, Belgaum
Tamil Nadu	Thiruvannamalai, Salem, Dharmapuri, Coimbatore, Erode,, Trichy, Madurai, Dindigul

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Tel: 0265-2285751, 2290728 Fax: 0265-2291613, Email: info@mechair.in; mechair@gmail.com
Web-site: www.mechair.in, www.mechair.co.in

Onion

The **onion** (*Allium cepa*), which is also known as the bulb onion, common onion is the most widely cultivated species of the genus *Allium.* Common onions are normally available in three colours: yellow, red, and white.

Onions are often chopped and used as an ingredient in various hearty warm dishes, and may also used as a main ingredient in their own right. Onions are effective against conditions ranging from the common cold to heart disease, diabetes, osteoporosis, and other diseases. They contain chemical compounds believed to have anti-inflammatory, anticholesterol, anticancer and antioxidant properties, such as quercetin.

Round the year availability of onion in India

July, August: Tamilnadu, Karnataka, Andhra Pradesh.
September: Karnataka, Andhra Pradesh, Tamilnadu and Maharashtra.
October: Maharashtra, Gujarat, Tamilnadu, Karnataka, Andhra Pradesh, Rajasthan and Madhya Pradesh.
November: Maharashtra, Gujarat, Tamilnadu, Karnataka, Andhra Pradesh, Rajasthan, Haryana, Punjab, Uttar Pradesh, Bihar, Madhya Pradesh.
December: Maharashtra, Gujarat, Rajasthan, Madhya Pradesh, Haryana, Uttar Pradesh ,Punjab, Bihar.
January: Maharashtra, Gujarat, Madhya Pradesh, Karnataka, Orissa.
February: Maharashtra, Gujarat, West Bengal, Madhya Pradesh.
March: Maharashtra, Madhya Pradesh Gujarat, Tamilnadu, Karnataka, Andhra Pradesh, West Bengal, Orissa.
April: Maharashtra, Madhya Pradesh Gujarat, Tamilnadu, Karnataka, Andhra Pradesh Rajasthan, West Bengal, Orissa.
May: Maharashtra, Gujarat, Rajasthan, Haryana, Punjab, Uttar Pradesh, Bihar
June: Haryana, Punjab, Uttar Pradesh, Bihar, Himachal, Uttarakhand.

ONION / GINGER/ GARLIC/ CABBAGE/ CAULIFLOWER PLANT

Overview

Capacity of plant: 4000 Kg/ day – Dry products

Required plant area/ land with utility section: 200’ ft * 200’ ft

Size of civil plant building (approx.): 150’ ft * 120’ ft

Raw Onion/ Ginger/ Garlic/ Cabbage/ Cauliflower requirement: 40 Ton/ day

Finished Product Approx.: 4000 Kg/ day

Plant & Machinery

The list of Machinery is attached as Annexure II

Utilities

Electricity Requirement (approx.): 300 HP

Thermic Fluid Boiler – 20 lakh K cal/ hr

Plant & Machinery Cost:

Budgetary (Basic) Cost of Plant & Machinery: Rs 5.25 crore
Taxes (additional): VAT @ 15%
Transportation cost (additional)

Project Execution

Project Execution Time: 6 Months

Ginger

Ginger (*Zingiber officinale* Rosc.) is an important commercial crop grown for its aromatic rhizomes which is used both as a spice and a medicine. Ginger of commerce is the dried rhizome. It is marketed in different forms such as raw ginger, dry ginger, bleached dry ginger, ginger powder, ginger oil, ginger oleoresin, gingerale, ginger candy, ginger beer, brined ginger, ginger wine, ginger squash, ginger flakes etc

Ginger produced in India, goes for domestic consumption and only a small quantity is exported. But in other producing countries domestic consumption is less and export is more. The global demand for Indian ginger is high on account of its lemony flavour.

Ginger's ability to combat a variety of diseases and conditions is due in part to its impact on excessive inflammation, which is a significant underlying cause of many illnesses.

Ginger's ability to combat a variety of diseases and conditions is due in part to its impact on excessive inflammation, which is a significant underlying cause of many illnesses.

Garlic

Allium sativum, commonly known as garlic, is a species in the onion genus. Garlic is a perennial that originally came from central Asia, and is now grown throughout the world. Garlic is easy to grow and can be grown year-round in mild climates. Garlic is widely used around the world for its pungent flavor as a seasoning or condiment.

Garlic is a fundamental component in many or most dishes of various regions, including eastern Asia, South Asia, Southeast Asia, the Middle East, and the flavor varies in intensity and aroma with the different cooking methods. Oils can be flavored with garlic cloves. These infused oils are used to season all categories of vegetables, meats, breads and pasta.

Garlic is used to help prevent heart disease, including atherosclerosis or hardening of the arteries (plaque buildup in the arteries that can block the flow of blood and may lead to heart attack or stroke), high cholesterol, high blood pressure, and to boost the immune system. Garlic may also help protect against cancer.

Garlic supplements are made from whole fresh garlic, dried, or freeze-dried garlic, garlic oil, and aged garlic extracts.

Cabbage

Cabbage (Brassica oleracea or variants) is a leafy green biennial, grown as an annual vegetable for its densely-leaved heads. Cabbage is generally grown for its densely leaved heads, produced during the first year of its biennial cycle. Plants perform best when grown in well-drained soil in a location that receives full sun. Due to its high level of nutrient requirements, cabbage is prone to nutrient deficiencies, including boron, calcium, phosphorus and potassium.

Cabbage is used in many ways, ranging from eating raw and simple steaming to pickling, stewing, sautéing or braising. Cabbage is a good source of beta-carotene, vitamin C and fiber. It is a cruciferous vegetable, and has been shown to reduce the risk of some cancers. Cabbage is one of the most popular winter vegetables grown in India. The major cabbage producing states are Uttar Pradesh, Orissa, Bihar, Assam, West Bengal, Maharashtra and Karnataka. Among these states West Bengal contributes 1.929 M mt of cabbage from 65,000 ha area with an average productivity of 29.6 mt/ha. Cabbage is used as salad, boiled vegetable and dehydrated vegetable as well as in cooked curries and pickles.

Cauliflower

The cauliflower (Brassica oleracea L. var. botrytis) plant belongs to the family Cruciferae. Its varieties are very responsive to temperature and photoperiod. It is therefore, very important to sow the appropriate variety at right time. Early varieties if sown late produce “button” head and late varieties if sown early will go on giving leafy growth and will produce curds very late.Cauliflower is one of the most important winter vegetables of India. The major cauliflower producing states are Bihar, Uttar Pradesh, Orissa, West Bengal, Assam, Haryana and Maharashtra. Advance technology for cauliflowers cultivation is use of Hybrid seeds and drip irrigation. In the plains, it is available from September to May. It is consumed as a vegetable in curries, soups and pickles.

Cauliflower contains several anti-cancer phyto-chemicals like sulforaphane and plant sterols such asindole-3-carbinol, which appears to function as an anti-estrogen agent. Together these compounds have proven benefits against prostate, breast, cervical, colon, ovarian cancers by virtue of their cancer-cell growth inhibition, cytotoxic effects on cancer cells.

Annexure I

Machinery List for Capsicum/ Tomato Drying Plant:

- Sorting Conveyor
- Washers
- Slicers/ Cutting machine
- Tray dryers with trays – Each 1 Ton capacity of row * 20 nos.
- Air conditioned Room
- Metal detector
- Boiler with Thermic Fluid - 20 lakh Kcal/hr
- Grinding machine – 150 Kg/hr
- Gyro Machine
- Digital weighing machine
- Box strapping machine or continuous sealer
- Packing Machine
- Electrical control panels
- Machine wiring & lighting
- Fluid heater to main dryer interconnecting piping
- Fire fighting equipments
- Erection & Commissioning
- Raw material storage – by you
- Finished product Cold storage (Optional at additional cost)

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Tel: 0265-2285751, 2290728 Fax: 0265-2291613, Email: info@mechair.in; mechair@gmail.com
Web-site: www.mechair.in, www.mechair.co.in

Annexure II

Machinery List for Onion/ Ginger/ Garlic/ Cabbage/ Cauliflower Drying Plant:

- Sorting Conveyor
- Top & Tail cutting table
- Peeling machine
- Inclined Transfer conveyors
- Washing machine
- Effluent Treatment Plant
- Slicer machine
- 5 Belt Imperial Dryer – 2 nos.
- Bin dryer – 10 nos.
- Air conditioned Room
- Metal Detector
- Thermic Fluid boiler with tank – 20 lakh K Cal/hr
- Flakes Grader
- Flakes sorting table
- Grinding Machine
- Vibro sifter (gyro screen)
- Digital weighing machine
- Paddle bag sealing machine
- Box strapping machine
- Electrical control panels
- Machine wiring & lighting
- Fluid heater to main dryer interconnecting piping
- Fire fighting equipments
- Air compressor
- Erection & Commissioning
- Raw material storage – by you
- Finished product Cold storage (Optional at additional cost)

Annexure 6: Quotation for Plant and Machinery for Multi fruit Processing Plant

Ref.: ALIL/BVF/EXP/INPOHTE-78

Registered & Head Office:
Mumbai – Pune Road, Dapodi,
Pune – 411012, India
Tel: (020) 66116100/ 27107100
Fax: (020) 27147711
www.alfalaval.com

M/s Global Agri System Limited,
Delhi.,

Kind Attn Mr. Anil Sharma.

Our Ref BVF/Global/09082011
Dated 16th November 2012

Dear Sirs,

Subject : ***Offer for Multi-Fruit Processing Unit***

This is with reference to discussion I had with Mr. Nagraj.

We are pleased to submit herewith our revised final offer for **Multi Fruits Processing** with battery limits and payment terms agreed.

Our Offer comprises

Section I	:	Design Criteria, Assumption & Utility requirement
Section II	:	Equipment (Technical) Specification of the plant
Section III	:	Price sheet
Section IV	:	Exclusion from the scope
Section V	:	Scope of Installation and commissioning services
Section VI	:	General Terms & Conditions

We trust our offer is in line with your requirement. Kindly contact us for any further information/ clarifications.

Thanking you and assuring you of our best attention at all times, we remain,

Yours faithfully
for **Alfa Laval [India] Limited**

Subodh Raina
Regional Manager

D.S.Shukla
Addl. General Manager
Business Unit - BVF

SECTION I

DESIGN CRITERIA, ASSUMPTION & UTILITY REQUIREMENT

for

MULTI-FRUIT PROCESSING PLANT BASED ON 5TPH OF MANGOES & 6 TPH of TOMATOES

DESIGN CRITERIA AND ASSUMPTIONS

Introduction

We confirm that the Juice and puree processing line supplied by us conforms with the EU hygiene regulations and the AIJN code of practice limits.

Our offer includes,

Design, Engineering, Fabrication/ Construction, installation supervision and commissioning of an Integrated Multi Fruit Processing Line based on modular plants.

MULTI FRUIT PROCESSING PLANT MAINLY.

Feed stock Fresh fruit	Input Fresh Fruit Feed Capacity t/hr	End product**	
MANGO	5	Puree /Concentrate	Puree :14-16^0 Bx Conc.: 28/30 ^{0} Bx
TOMATO	6	Puree /Concentrate	Conc.: 28/30 ^{0} Bx
PAPAYA	4	Puree /Concentrate	Puree :10-11^0 Bx Conc.: 20/22 ^{0} Bx
GUAVA	4	Puree /Concentrate	Puree :8/9^0 Bx Conc.: 18/20 ^{0} Bx

** Final product output is according to the fruit variety, size of the seeds, ripeness, storage conditions, and the selected Enzymes, which are conditions beyond seller's control.

Plant Design

Process units are developed on MODULAR concepts and are built as much as possible as pre-erected skids and pre-tested in the workshop.

Modular Concept based skid always helps to minimise installation lead time and ensures efficient commissioning of the processing module.

Every skid mounted technological unit equipped with individual process controller which can ensure the easy and safe operation of the unit.

Manually operated process units such like fruit preparation, tank farm, etc. foreseen to be operated through push buttons placed on the motor starter cabinets.

Project Organization

The Plant foreseen to be executed by Alfa Laval India Ltd. in close collaboration with Alfa Laval Food Technology Segment, Denmark. The main components of the line for extraction, clarification, concentration and heat treatment are the core products of Alfa Laval, however in some cases it is necessary to acquire external components.

SECTION II

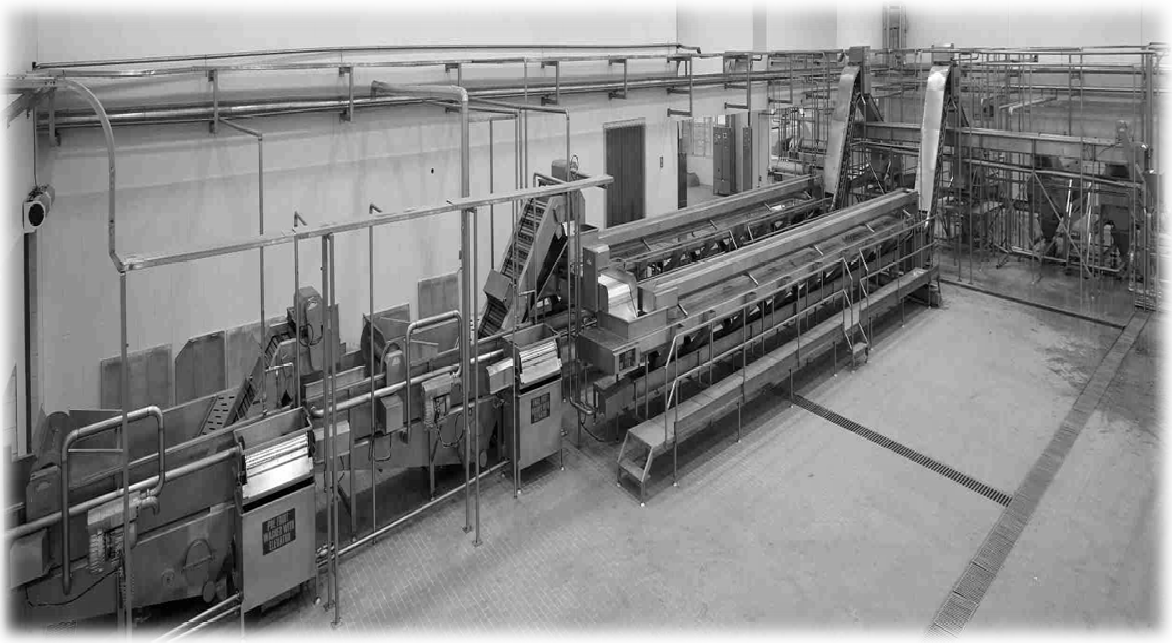
EQUIPMENT SPECIFICATIONS

for

MULTI-FRUIT PROCESSING PLANT BASED ON 5TPH OF MANGOES & 6 TPH OF TOMATOES

SECTION - A

FRUIT PREPARATION AND PUREE/JUICE EXTRACTION SECTION



A 01 1 pc **FRUIT WASHER DOUBLE STAGE**

Function: The fruit washer is made of SS 304 tank with the pick up conveyor. The water in the tank is agitated with the help of air pipes installed at the bottom of the tank. The air is generated with the help of air blower, which is an integral part of washer.

An SS grid is provided to avoid any kind of settling of the fruits at the bottom of the tank and it also helps in settling down the dirt and mud of heavier size, which is removed at the end of the production day.

A centrifugal pump with a filtration unit is installed to circulate the water in the tank. This water is even used to push the fruit from the feeding area to the pickup conveyor.

The pickup conveyor is with mechanical speed variable drive system to adjust the speed when the product is changed to adjust the feeding capacity because of variable capacity of the fruits processed. A fresh water spray is sprayed on the fruits before it falls on the inspection conveyor. A sufficient length of the pickup conveyor is provided to drain the water before dropping to inspection/ cutting conveyor. The sprayed water adds the volume of the washer which keeps replacing the water in the washing tank. Which overflows with the help of over flow pipe provided at the end of the washing tank.

The equipment consist of -

- SS304 fabricated tank with legs and cross support. The feed tank will be provided with bottom drain connection, man hole, overflow connection, feed end screen.
- PP belt with flights mounted on PP chain wheel. The belt will be guided on SS angle tracks.
- Water collection tank with circulation pump and inter connecting piping and fittings.

- Stationary filter assembly.
- Air Blower and Air piping in the tank for agitation of fruit at the feed end.
- Top SS304 spray pipes for spraying fresh water from top.
- Drive for pick up conveyor with geared motor.
- Total installed power :11.5 kW
- Water consumption : 4000 / 6000LPH

A 02 1 pc 3-TIER TIP CUTTING CONVEYOR

Function: The sanitary Food grade belt conveyor suitable for inspection, preparation, cutting of the fruits.

Size : 1000 mm (W) x 18.000mm (L)

- Fruit conveyor Flat belt conveyor 1000 mm with partition for feeding and prepared fruit transportation,
- Waste discharge chutes
- Waste screw conveyor
- Material of construction : SS304
- Total Installed power 6.6 kW

A 03 1pc Bucket Elevator

Function: *To elevate the cut / inspected fruits to Suitable height of the Destoner.*

The equipment consist off -

- SS304 framework with SS304 supporting stays and brackets.
- PP perforated modular belt assembly
- PP belt support drive and driven pulley.
- SS304 feed hopper and discharge chute.
- SS feed stand to hold the pod bag.
- Fixed speed drive for elevator with Geared motor and set of sprockets.
- Capacity: - Up to 6 MTPH of Mangoes.
- Discharge height – Suitable to feed the distribution conveyor.
- Working width – 500 mm.
- Electric Power Requirement: - 2,2 kW

A 04 1 PC MANGO DESTONER

The fruits are fed through hopper, while entering the fruit into the destoner the paddles/brushes provided in the machine first tears the skin of the fruit and breaks in to few pieces and the pulp adhered to the skin and the stone is scooped of with the help of the gentle centrifugal force and is collected in to the hopper which is an integrated part of the machine and then discharged through the chute to the bin.

Suitable to extract the pulp from stoned fruits like mango and other.

Equipment Consist of -

- SS304 Feed Hopper and Discharge chute.
- SS304 Body with end flanges & supporting rings for pulping Screen.
- Suitable pulping screen fitted with Ø 10 mm hole.
- Waste chute for the discharge of waste.
- SS304 shaft with scrapper assembly.
- SS304 rigid Framework.
- Fixed speed drive with Electric motor and set of pulleys.
- Total installed Power: 18 kW

Scaffolding

- AISI 304 scaffolding to support the Destoner

A 05 1pc POSITIVE DISPLACEMENT PUMP WITH HOPPER

Function: A positive displacement pump of sanitary design to transfer pulp to Preheater.

Capacity: 4.000 kg/h, 4 bar

- 100l Hopper with level transmitter
- Single-stage Screw Type positive Displacement Pump
- SS 316 rotor with food grade rubber stator
- Total installed power : 2.2 kW

A 06 1pc Fruit Chopper with hopper pump

Function: For chopping of tomato for better extraction of the juice.

Capacity: upto 6000 kg/hr of tomatoes.

The unit consists of,

- SS304 housing with perforated plate at bottom from inside.

- SS304 rotor with serrated blades for crushing of products mounted on SS304 shaft.
- CI rigid bearing Housing with set of bearings.
- SS supporting structure for mounting of bearing housing and chamber.
- Fixed speed drive complete with Electric motor and couplings, guards etc. ..
- SS 304 Discharge chute.
- Power consumption 11 KW
- Single-stage Mono pump with hopper
- Level switch
- SS 316 rotor with food grade rubber stator
- Pressure of 6 bar
- Capacity: UPTO 6000 kg/h
- Motor 3 kW

A 07 1 pc HOT BREAK/ PREHEATER

Function:

Forced recirculation Viscoline VLM™ hot break designed to treat Tomato Juice to 95℃ and designed for Mango/Guava/Papaya Puree from 25℃ to max. 60℃.

The tomato juice is quick heated in the H.B. plant at the temperature of 90/95℃ blocking in this way the enzymes activity.

The AlfaTherm Viscoline Module is an heat treatment system to Mango Puree/Tomato Juice. The modular unit is pre-assembled on skids for easy, rapid transportation and installation.

Heart of this module is the special Alfa Laval Viscoline™ tubular heat exchanger that is ideal for use with fruit juice/puree products, providing efficient heat transfer and uniform heating as well as considerable versatility in terms of both products and capacity. The design ensures gentle treatment of the product and is very reliable in operation.

The module is automatic in operation. Precise control of operating parameters provides reliable, consistent product treatment. The system can be CIP cleaned using detergents dosed into the inlet feed (optional equipment) or from a central CIP station.

DESIGN DATA

AlfaTherm™ VLM	
Product	**Fruit Puree**
Capacity, max	6,000 Kg/hr Max.
Density	1060 Kg/m^3
Inlet Temperature	25-30 ^oC
Heat treatment temperature	60/95 ^oC

Utility Requirement	
Steam	
Inlet Pressure	4 Bar (g), dry & Saturated
Total Consumption	850Kg/hr Max.
Electric Power	
Voltage	3Φ, 400V, 50Hz
Approx. Installed Power	~22 kW (Operational load 20-30% lower)
Instrument Air	Dry and free of oil
Inlet Pressure	6 Bar (g)
Nominal Consumption	1 Nm^3/hr
Process Water for CIP	
Inlet Pressure	1 Bar (g)
Peak Consumption	20m^3/h
Seal Water	
Inlet Pressure	2 Bar (g)
Consumption	0.6 m^3/h

Overall Size	
Dimensions, mm	8,000 L x 3,000 W x 3,000 H
Weight	3500 Kg (approx)

SCOPE OF SUPPLY

A 07.1 **1pc Feed/Storage Tank**

Capacity	2000 L
MOC	Stainless steel
Quantity:	1 Set

The tank will be vertical in design with conical bottom. The tank will be equipped with feed inlet, product outlet connection, process water inlet. The tank will be mounted on adjustable ball feet.

The feed/Storage tank will be equipped with Level switches to monitor the tomato Juice/ Mango Puree Flow rate through the system.

A 07.2

Power: 7.5 kW
This pump will be used for RECIRCULATION OF crushed tomatoes.
Alfa Laval make Stainless steel centrifugal pump will be of sanitary design. The pump will be equipped with Stainless steel SMS connection. Pump will be complete with TEFC drive motor with SS shroud & louvers for air cooling.

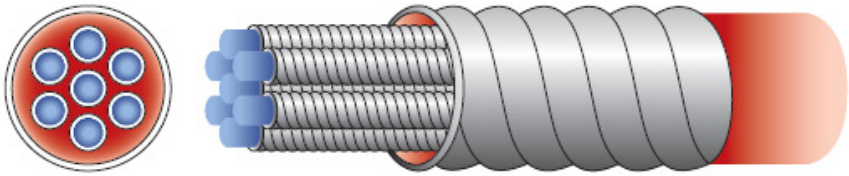
A 07.3 1pc Positive Displacement Pump

Function: A positive displacement pump of sanitary design to transfer mango pulp to system during Mango Pulp preheating and extract hot Tomato mash for further processing.

- Capacity: 8.000 kg/h
- Single- stage Screw Pump
- SS 316 rotor with food grade rubber stator
- VFD

A 07.4 1pc Alfa Laval Viscoline™ VLM tubular heat exchanger

Type:	VLM
Application:	Heating
MOC:	SS 316,
Quantity:	1 Set



All the product tubes are connected in parallel and the flow is counter-current in relation to the service medium.

ViscoLine Annular is a highly efficient tubular heat exchanger that incorporates corrugated tubes or other advanced profiles designed to increase turbulence in the flow of the fluid. This substantially increases the overall

A 07.5 1pc SUPER HEATED WATER GENERATOR

It comprises of :
1 Expansion vessel

1 Alfa Laval Plate heat exchanger
1 Hot Water re-circulation centrifugal pump
1 Pressure relief valve
1 set Water Piping
1 safety valve
1 Set Valves & equipment for steam and condensate

A 07.6 1 lot Pipes and fittings

One set of sanitary stainless steel pipes and fittings Product pipes are in AISI 304 stainless steel, product connections are SMS type.

A 07.7 1pc Instrumentation & Control Panel

The electrical control panel will be integrated on the skid unit

The electrical control panel is delivered in stainless steel, and equipped with the following components:

- Main switch
- Instrument Control panel will be relay logic PID based controller
- Alarm Annunciator to display various operation in the system
- Motor starters for product feed, CIP and hot water recirculation pump
- Emergency stop circuit with safety relay

Control Panel will be equipped with start/stop push buttons for pumps, alarms, etc. Air filter-regulator is provided on the panel to ensure clean air supply to instruments and solenoid valves.

A 07.8 1pc Skid for Pre-heater

All the equipments will be mounted on skid. The skid will be made out of SS square pipe with adjustable ball feet.

A 08 1PC TURBO REFINER

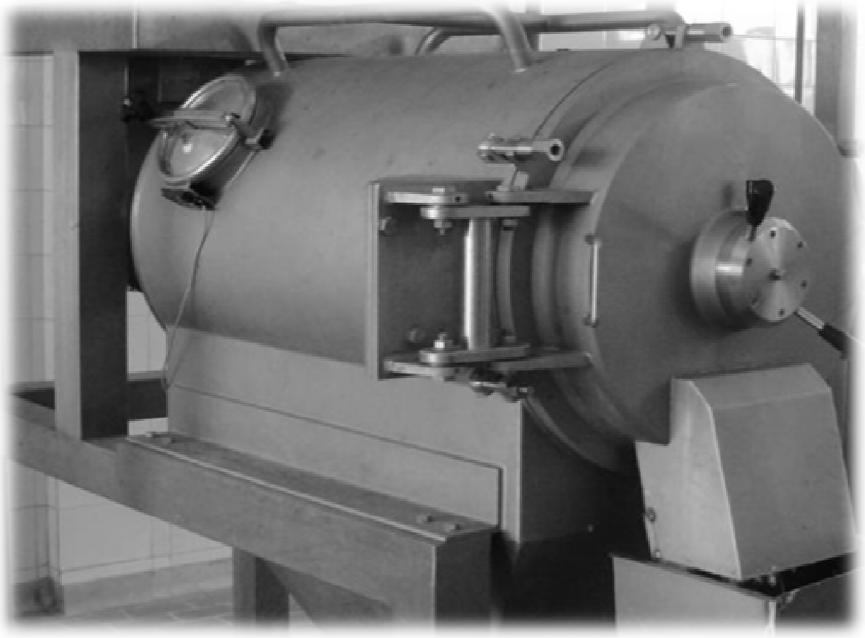
Advantages:

The turbo extractor is installed with SS paddles does not require brushes.

- This gives an added advantage of no consumables unlike in finisher the brushes are to be replaced.
- No product loss because of the paddles unlike in finisher the nylon bristles folds after few hours of operation responsible for loss of pulp.
- Installed with 8 beating paddles for better extraction
- High RPM hence better extraction due to centrifugal force and friction.
- Can even operate with product temperature upto 90/950C, conventional pulper cannot operate above 40-45^{0}C

Function: The Turbo Refiner is used for extracting/refining of juices/puree from chopped hot tomatoes and for refining of the purees from the destoned purees from Mango/papaya/guava.

The rpm of the machine can be regulated depending on the requirement, making the machine multi functional and multipurpose depending on fruit to be processed.



The Angle and the gap between the sieve with the paddle can be adjusted as per the requirement and the application of the machine. This adjustment allows the versatile use of the machine for different products and different application. The residential time of the product in the machine can be adjusted as per the requirement and the nature of the product to avoid the damage of the product to be treated.

Turbo Refiner Consist of –

- 8 beaters with adjustable angle
- Installed sieve with perforation Ø 0.8mm.
- All parts in contact with the product are in stainless steel AISI 304.
- Installed Power : 18.5 kW with speed variator

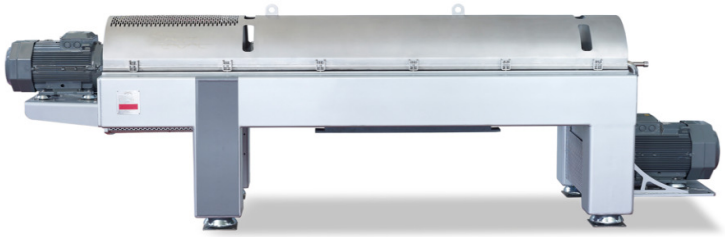
A 09 1pc POSITIVE DISPLACEMENT PUMP WITH HOPPER

Function: A positive displacement pump of sanitary design to transfer pulp to Preheater.

Capacity: 6.000 kg/h, 4 bar

- 500l Hopper with level transmitter
- Single-stage Screw Type positive Displacement Pump
- SS 316 rotor with food grade rubber stator
- Total installed power : 4 kW

A 010 1 pc DECANTER Model MANX 3661 BCC



Alfa Laval Decanter centrifuge Model MANX 3661 BCC

Machine

- Bowl assembly
- Conveyor assembly
- Frame & cover
- Gear Box: 2.5 KNm
- AC Main drive motor: 18.5 kW
- Back drive motor : 5.5 KW

Controls (per centrifuge)

- 7" color touch screen on panel front
- 24 DC control voltage
- Basic Decanter controller with I/O modules
- ABB ACS 800 vfd's for main and back drive motor
- Potential free control outputs for high and low flushing valves, warning signals , decanter ready , decanter running, feed permissive
- Digital inputs for remote start and stop

Spares and Tools (one set per centrifuge)

- Special tools
- Spares - Conveyor and main bearing intermediate kit
- Lubricants

GENERAL DESCRIPTION

Basic Centrifuge

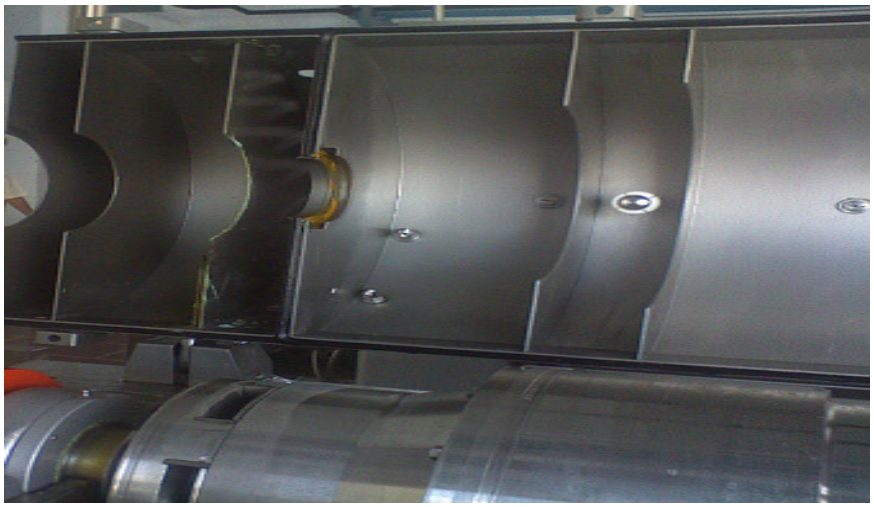
The MANX 3661BCC is an open, non-pressured horizontal decanter. It features a solid horizontal bowl and scroll type conveyor, with counter current flow design. The centrifuge is designed and built to operate continuously at a standard operating bowl speed of max 4200 rpm . All parts of the centrifuge in contact with the process material are made of type SS 316 except O-rings, seals, feed tube and abrasion resistant materials. Process seals and other O-rings and seals are made of food grade nitrile rubber, unless otherwise specified. The feed tube is of stainless steel.

Gearbox

The gearbox is equipped with a planetary gear reducer unit which controls the maximum differential speed between the centrifuge bowl and conveyor. The gear unit has a torque capacity of 2.5 kNm .

Frame and Casing Assembly

The frame and casing is a box beam profile type with integral casing. The material of the casing and cover is AISI 316 stainless steel and SS cladding in the neutral compartment. Casing gaskets are of nitrile rubber.



Conveyor Assembly

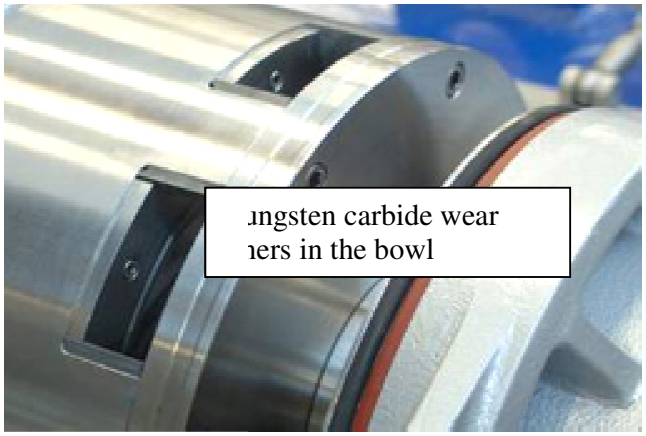
The conveyor is fabricated from 316 SS and is polished for better hygiene. It is concentrically suspended within the centrifuge bowl.

Bowl Assembly

The bowl assembly is manufactured from centrifugal castings of stainless steel. Prior to final machining, all surfaces are examined for cracks, shrinkage, porosity or other defects. The pool depth in the centrifuge bowl is adjustable through the use of plate dams at the large diameter end of the bowl where the liquid is discharged. The centrifuge bowl is 1512 mm long (from hub to hub) with an inside diameter of 360 mm in the cylindrical section

Wear Protection

The conveyor flights are protected with flame sprayed stellite.
The solids discharge area of bowl is protected with a wear liner of tungsten carbide.



Technical Specifications MANX 3661 BCC Decanter centrifuge

Capacity : upto 4 TPH

Bowl Assembly

Centrifugal Force:	3550 G (max)
Bowl diameter:	360
Material - hubs:	Lean Duplex steel
Material - bowl shell:	AISI 316 Stainless steel
Material – gaskets and seals:	NBR (food grade)

Conveyor Assembly

Material - flights:	AISI 316 Stainless Steel
Material - hub:	AISI 316 Stainless Steel

Wear protection

Bowl solids discharge:	Wear liner in Tungsten Carbide
Conveyor flights:	Flame sprayed Stellite
Bowl inside	Grooves

Frame and Casing

Material – casing / cover:	AISI 316 Stainless steel
Material frame:	Mild Steel
Paint colour:	Aluminium Grey

Drive Assembly

Gearbox, torque rating:	2.5 KNm
Backdrive:	Countershaft transmission
Main drive/back drive motor with	18.5/5.5 KW, Included.

VFD:

Main drive motor, protection:	Thermister

Control System

Control Panel	Included
Controller type	Basic Core Controller

A 011 1pc **POSITIVE DISPLACEMENT PUMP WITH HOPPER**

Function: A positive displacement pump of sanitary design to transfer pulp to Preheater.

Capacity: 4.000 kg/h, 4 bar

- 100l Hopper with level transmitter
- Single-stage Screw Type positive Displacement Pump
- SS 316 rotor with food grade rubber stator
- Total installed power : 2.2 kW

A 012 2 pc **STANDARDISATION TANK**

Function: For storage and mixing of the pulp for standardization.

Capacity : 2000L

The Drink blending tank will be made of SS304 sheet. The tank bottom will be in conical in shape with outlet valve. The tank will be supplied with agitator assembly and will be mounted on Stainless Steel legs with support plate. The tank will be complete with following accessories:

- SS Manhole
- SS No Foam inlet
- Sight & Light glass
- CIP spray inlet.

A 013 1 pc **POSITIVE DISPLACEMENT PUMP**

Function: A positive displacement pump of sanitary design for transfer of the product to sterilizer. The pump will operate in automatic mode as per demand of product call from the system.

- Single-stage Mono pump
- SS 316 rotor with food grade white rubber stator
- Pressure of 4 bar
- Capacity: 4,000 kg/h
- Motor 4kW

A 014 1pc **CIP PUMP MOUNTED ON TROLLEY**

Power : 1.11 kW

This pump will be used for CIP.

Alfa Laval make Stainless steel centrifugal pump will be of sanitary design, suitable for CIP. The pump will be equipped with Stainless steel SMS connection. Pump will be complete with TEFC drive motor with SS shroud & louvers for air cooling.

A 015 1 Set Piping and valves

Piping 2”- 3” – 4”

Bends, Tee junctions 2”- 3” – 4”

Unions SMS 2”- 3” – 4”

Pneumatic Valves LKM

Manual Valves LKM

Sight Glasses

Supports, Material stainless steel AISI 304

A 016 1 pc Control Panel & wiring connections

Material of Construction	: SS 304
Protection	: IP55
Busbars	: Aluminum
Components	: Main switch, FSU, DOL starters, on/off switches, warning lights, automatic overload cutout to protect the motors relays.

B. WASTE HANDLING SECTION

B01 1 pc Waste Screw Conveyor

Function: Suitable for carry the waste generated from the Cutting Conveyor, Destoner, Decanter, Pulper & Turbo Extractor to the waste bucket elevator. .

- Capacity suitable for above
- Screw conveyor Ø200 mm
- Construction steel material: SS304
- Conveyor Length: 10.000 mm
- Installed power 2.2 Kw

B02 1pc Bucket Elevator

Function: *To elevate* waste generated by above machine and to discharge the same out of the process hall, in waste collection bin provided by customer
The equipment consist off -

- SS304 framework with SS304 supporting stays and brackets.
- PP perforated modular belt assembly
- PP belt support drive and driven pulley.
- SS304 feed hopper and discharge chute.
- SS feed stand to hold the pod bag.
- Fixed speed drive for elevator with Geared motor and set of sprockets.
- Discharge height – 4m
- Working width – 400 mm.
- Electric Power Requirement: - 2.2 kW

C. CONCENTRATION SECTION

- **The Evaporator is designed on the basis of Tomato/Mango Puree concentration for production of Mango Concentrate with 28/30°Bx**
- Viscovap forced recirculation evaporation to evaporate 5000 kg/h of water. It is designed to concentrate Mango/Tomato from 14°Bx to 28/30°Bx.

- The product coming from the extractor/Preheater at 60/85°C fed to the evaporator. The product is heated in the Calendria and flashed in the vapour separator and the product is concentrated; the vapour after been separated from the product in highly efficient cyclone separator. The vapours from first effect are used for heating the product in the second effect and finally the vapours from the second effect is condensed in the AlfaCond plate condenser.

- As the plant is working under vacuum conditions, the boiling temperatures are low and the stress of the product is reduced to a minimum. Low boiling temperatures also mean low fouling.

- The whole plant is the CIP-able. Under normal running conditions all part in contact with the product are cleanable without dismantling any parts of the plant. All separators are equipped with C.I.P. spray balls .The necessary cleaning intervals are depending from the products treated and the temperatures applied.

- Control panel will be equipped with HMI and Push buttons.

- VFDS will be installed for feed pump, product transfer pump from 1st effect to 2nd effect and final product extraction pump.

Technical data:

- Product (Inlet):

    1. Mango Puree : 4,000Kg/hr @ 14°Bx
    2. Tomato Juice : 5,700 kg/hr @ 4/4.5°Bx

- Total evaporation rate for Mango : 2,000 Kg/h
- Total evaporation rate for Tomato : 5,000 kgh

- Product (Outlet):

    1. Mango Concentrate : 28/30°Bx
    2. Tomato paste : 28/30°Bx

- **Temperatures:**
- Feeding : 60/90°c
- Live steam : 110/120°c
- Evaporation temperature : 52-55/74-76°c

- **Utilities:**
- Live steam 4 bar/g : 2550 kg/h (During Tomato)
- Tower water circulation at 30°c : 150 m^3/h

- Fresh water : 1.5 m3/h
- Electric energy consumption : 170 kW
- Compressed air with 6 bar : 100 nl/min

- **Plant dimensions:**
- Length : 7 m
- Width : 4 m
- Height : 12 m

Two Effect Evaporator

Scope of supply:

- 2 Nos Complete ViscoVap Tubular evaporator's effects.
- 2 Nos Centrifugal separators
- 1 No AlfaCond plate type Vapour condenser
- 2 Nos. Product Recirculation pump
- 1 No Concentrate Extraction pumps
- 1 Set Vacuum pump PPI make
- 1 Lot Set of prefabricated vapour ducts
- 1 Lot Set of fittings and valves Alfa Laval make
- 1 Lot Set of pressure gauges and thermometers
- 1 Set Measuring and control system with panel
- 1 No. Electronic Refractometer for final concentrate Brix control E&H make
- 2 Nos Positive displacement pump
- 1 No. Control panel (dust & moisture proof) in stainless steel, with start/stop, motor contactors, PLC Allen Bradley / Siemens with HMI and push buttons.

- 2 Nos Level transmitter installed in Vapour separator E&H make

All parts in contact with the product SS304

D. ASEPTIC STERILZATION & FILLING SECTION

D01 1 pc Tube in tube Sterilizer Steritherm™ – VLA Mod. 3000

INTRODUCTION

This quotation comprise one Aseptic heat treatment module **SteriTherm™ VLA Mod. 3,000**

The SteriTherm VLA is an aseptic heat treatment system (“sterilizer”) intended for combining with aseptic fillers and/or tanks. The modular unit is pre-assembled on skids for easy, rapid transportation and installation.

Heart of this module is the special Alfa Laval Viscoline™ VLA annular space tubular heat exchanger that is ideal for use with highly viscous food products, providing efficient heat transfer and uniform heating as well as considerable versatility in terms of both products and capacity. The design ensures gentle treatment of the product and is very reliable in operation.

The module is fully automatic in operation with Siemens PLC and operators interface. Precise control of operating parameters provides reliable, consistent product treatment. The system can be CIP cleaned using detergents dosed into the inlet feed (optional equipment) or from a central CIP station.

To help ensure hygiene levels, the sterile product loop is equipped with valves incorporating steam barriers, and the operating mode makes sure the pressure in the sterile product loop is always higher than in the ambient air.

DESIGN DATA

Product:	**Mango Puree/ Concentrate**	**Units**
Capacity, Max	3000/1500	kg/h
Capacity, Min (Tomato Paste)	9,00	kg/h
Particle size, max:	8	Mm
Density:	1060	Kg/m3
Inlet temperature:	55-60	℃
De-aeration temperature:	55-60	℃
Heat treatment temperature:	108-115	℃
Holding time at max capacity:	60	sec.
Outlet/filling temp:	30/35	℃
Outlet pressure to filler:	2	Bar

Steam:		
Inlet pressure:	4	bar(g) dry, saturated
Nominal consumption:	550	kg/h (approx 25% higher during start-up)

Tower water:		
Inlet temperature:	30	℃
Return temperature:	36	℃
Approximate flow rate:	30	m^3/h
Pressure drop:	2.5	Bar

Chilled water:		
Inlet temperature:	+4	℃
Return temperature:	+10	℃
Approximate flow rate:	15	m^3/h
Pressure drop:	2	Bar

GENERAL SERVICES

Electric Power:		
Voltage:	3x400	V
Frequency:	50	Hz
Approx. Installed power:	~32	kW, (operational load 20-30% lower)
Instrument air		Dry and free of oil
Inlet pressure:	6	bar(g)
Nominal consumption:	1	Nm3/h
Process water for CIP/SIP:		
Inlet pressure:	1	bar(g)
Consumption during CIP	30	m^3/h
Seal water:		Clean, free of solids
Inlet pressure:	2	bar(g)
Consumption:	1.2	m^3/h

AMBIENT CONDITIONS

Temperature :	+5 to +40	℃
Humidity:	30 – 90	%
Altitude max:	1000	m

APPROXIMATE WEIGHT & DIMENSIONS

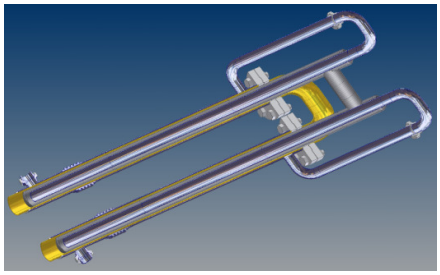
Length:	7	M
Width:	4	M
Height:	3	M
Weight:	4000	Kg

TECHNICAL DESCRIPTION STERITHERM™

General

SteriTherm™ is a pre-assembled skid mounted process module for aseptic heat treatment and cooling of viscous products, capable of matching variation in filler demand. The purpose of the SteriTherm™ is to destroy or reduce the number of harmful microorganisms in order to increase the products microbiological stability. The desired effect is achieved through a combination of temperature and holding time. A vacuum deaerator is included for deaeration of the product prior to heat treatment.

The Steritherm VLA module features the Viscoline™ VLA-4 annular tube heat exchangers. In this type of heat exchanger, the product flows through the annular space between two concentric pipes, surrounded by heating or cooling media on each side. The media flows counter-currently to the product through similar annular gaps between the outer product pipe and the shell pipe, as well as between the inner product pipe and the pipe in the centre.



Process flow and function blocks

De-aeration Balance tank

Product enters via the balance tank and is pumped through the module by means of a positive pump of the eccentric screw type, a separate centrifugal

pump is used during SIP and CIP. The level in the balance tank is controlled by the feeding pump.

In order to preserve the product and increase its stability the content of entrapped air should be reduced as much as possible before heat treatment and storage. This is normally done by means of vacuum de-aeration. Incoming product is fed into the centre of a vacuum vessel where it is expanded under vacuum and the air released. Vacuum in the vessel is maintained by a liquid ring vacuum pump controlled by a regulating valve. The vacuum vessel also acts as balance tank for the incoming product, product level is controlled by means of the feeding pump (not included).

The de-aerated product is discharged through the bottom outlet to the positive pump that will pump the product through the heat treatment steps.

Heating
The un-treated product is heated to the specified treatment temperature by circulating hot water, which is heated by steam in a separate heat exchanger.

The product is held at the specified heat treatment temperature in the holding tube for a specified time.

Cooling
The product is cooled down to filling temperature in three two stages:

- ✓ The first stage by tower water.
- ✓ Subsequently by chilled water – before being led to the filler/aseptic tank.

If there should be an interruption in the filling, the outgoing product is returned to the pasteurizer inlet.

Flow Diversion
Should the heat treatment temperature drop below the specified value e.g. during a power failure, a special diversion function will be initiated that ensures that the aseptic part of the module, including the filler, is isolated with treated (“sterile”) product and the non-treated product led back to the balance tank via a special return cooler. Once the correct temperature has been re-established, the volume of treated product is released to the filler and production reverts to normal. This system avoids the otherwise mandatory need for time-consuming re-sterilization procedures.

Pre-sterilisation SIP
Before any product is admitted, the module is sterilised by circulation of hot water at 125℃ for 30 minutes, this sequence is called SIP. During SIP the connecting pipe from the sterilizer to the aseptic filler as well as the filler itself are also sterilized.

Cleaning in place CIP

The module is designed for cleaning in place CIP, under normal running conditions all surfaces in contact with the product are cleanable without dismantling any parts of the module. The necessary cleaning intervals depend on the products treated and the temperatures applied.

The SteriTherm™ is cleaned as a separate object by addition of detergents into the balance tank and the circulating the cleaning solution over the module.

Control system*:*

The SteriTherm™ is fully automatic with a local PLC and touch screen MMI. Start and stop functions, set point and PID control parameters can be inspected and set. Relevant process data are also displayed e.g. plant status, actual temperatures and flow rate, alarm status etc.

SCOPE OF SUPPLY
STERITHERM STERILIZER

Equipment

- ☞ Alrox de-aerator Balance tank type DR-650 with top cover and CIP spray device, Comprising:
  - ✓ Vacuum pump with seal water group
- ☞ Viscoline VLA annular space heat exchangers
- ☞ Eccentric screw pump for pumping the product from the balance tank to the high pressure piston pump to Sterilizer.
- ☞ High pressure piston pump.
- ☞ Centrifugal Pump for CIP/ SIP.
- ☞ Hot water set for heating, comprising:
  - ✓ Brazed heat exchanger/VLC Heat Exchanger
  - ✓ Hot water circulation pump, centrifugal type.
  - ✓ Hot water expansion vessel
  - ✓ Valves and piping
- ☞ Steam / condensate group for heating hot water set, comprising:
  - ✓ Heat exchanger for heating the circulating water by steam
  - ✓ Modulating Steam control valve

- ✓ Steam shut-off valve and filter
- ✓ Condensate trap

☞ Hygienic product valves.

☞ Tower water group for product cooler, comprising:
- ✓ Automatic Shut off valve
- ✓ Pipe connections

☞ Tower water group for return / SIP cooler, comprising:
- ✓ Automatic Shut off valve
- ✓ Pipe connections

☞ Chilled water group for product cooler, comprising:
- ✓ Automatic Shut off valve
- ✓ Flow control valve
- ✓ Pipe connections

☞ Air purging group for draining of water in the cooling section, comprising :
- ✓ Automatic Shut off valve
- ✓ Pipe connections
- ✓ Valve arrangement for draining water by compressed air

☞ Instruments, comprising:
- ✓ Temperature transmitters
- ✓ Thermometers
- ✓ Hygienic pressure gauges

☞ Pipes and fittings

☞ Control panel and MCC in SS cabinet.

☞ Cables and conduits.

The module is complete pre-assembled and cabled in our workshop before delivery.

Automation

Automation is based on a PLC. This PLC consists of a touch screen operating panel. The PLC has some internal input and outputs, and can easily be extended with additional I/O. When requested, the PLC can be equipped with communication cards for external communication.

Materials of construction

Where not otherwise stated:

Product wetted surfaces in heat exchangers:	Stainless steel AISI 316 or equiv.
Product wetted surfaces other:	Stainless steel AISI 304 or equiv.
Product wetted gaskets:	NBR

Norms and standards

Where not otherwise stated:

Connection standards sanitary:	SMS/ Flange
Connection standards sanitary at interface:	SMS / Flange
Connection standards utility:	SMS
Motors protection class:	IP54
Control cabinet incl. MCC	EN, IP54 protection class

D02 1PC ASEPTIC DOUBLE HEAD FILLER

TECHNICAL DESCRIPTION

The Double head aseptic filler is a well tested and universal machine which is able to fill a range of bags and products, which recently has been designed to give greater satisfaction of the requests from the food industry, to be able to operate with denser products, different bag sizes and to reduce time needed for the change of format and maintenance.

BAGS

☞ Aseptic bags from 3 to 200 lt.

CAPS

Flat, rigid or pressure caps, thermo-resistant with long/ short neck

PRODUCTS

- Fruit juices and concentrates
- Tomato concentrate and pulp
- Sauces and vegetable conserves

FEATURES

- Compact design built on a skid which can be shipped in a container totally Pre-assemble
- Continuous and automatic filling process
- Reliable operation
- Interfaced with a Profibus network
- Possibility for connection to a modem for long-distance assistance with a printer for personalized labels
- C.I.P. washing system
- All in stainless steel

COMPOSITION

- Tubular AISI 304 stainless steel supporting frame for the filling heads, monoblock construction which can be shipped in a container.
- 2 Aseptic filling heads supplied in the 1" version for working with 1" spouts/bags for treating liquid products, very viscous products such as purées and concentrates and also diced fruit up to 14mm.
- Stainless steel AISI 316 pipeline; the pipeline consists of joints (patented) protected by steam barriers to follow the movement of the heads and to resist high temperatures.
- Operator platform with access stairway, frame and handrail in stainless steel AISI 304.
- 2 sets of load cells. Precision of batch is referred to pasty homogenous products in 200 lt. containers: ± 0,5%
- Aseptic two-way valve for product recycling complete with steam barrier on the rod (this valve is not included in the case of the supply of an aseptic tank).
- Cod. 211 Accessories for the filling of 200 litre bags in drums and equipped with a couple of clamps for supporting the bag during filling and a couple of pneumatic cylinders for the filling heads which go up/down by 400mm at an adjustable speed (in relation to the instantaneous capacity), to guarantee an even filling, reduce labour and to avoid stretching of the bag.
- 2 Motorized roller conveyors for loading, positioning and unloading of full drums (total length 4 mt.). AISI 304 stainless steel frame and FE.OO zinc-coated steel rollers.
- Steam in-feed group composed of interception and discharge valve, pre-filter, filter, pressure reducers for barriers, jets and sterilization; Max inlet pressure 16 Bar.
- Group for the steam sanitization of the filling head and suction and discharge system for any eventual impurities in the head with a steam ejector.
- Air reducer group with condensation separator and micro-filter.
- Modem SIEMENS MPI profibus for remote diagnostic
- The filler is managed by a PLC interfaced with an operator interface terminal,

- ☞ Touch Screen type or on request with an industrial type PC., equipped with:
  - ✓ AUTODIAGNOSTICS: This is necessary for the individuation of eventual breakdowns. Alarms, numbered and described, are automatically printed The operator can intervene quickly to solve the problem. Possibility to monitor/intervene with long-distance systems, based on PC, by means of Profibus (or Modibus) communication protocol, also by modem.
  - ✓ FAIL SAFE SYSTEM: This is for the continuous controlling of the sterile conditions of the plant. In the case of an unexpected risk to the loss of sterility the machine defends itself by leaving production and notifying the operator of the problem. The PLC will give consent to return to production only after all the parameters necessary for sterility have been reset successfully.
- ☞ AISI 304 IP 55 stainless steel cupboard containing:
  - ✓ Electric power
  - ✓ Electronic and electro-pneumatic elements.
- ☞ Label printer.

THE MACHINE IS CONSTRUCTED IN STAINLESS STEEL AISI 304, THE PARTS IN CONTACT WITH THE PRODUCT ARE IN AISI 316.

SECTION – III

PRICE SHEET

PRICE SHEET

Sr. No.	Description	Price INR Ex-Works
1	Complete plant & Machinery as offered in SECTION – II	
2	Spares for 2 years operation	
3	Supervision of Installation & Commissioning of the Equipment supplied, as per Section -II	
		Rs. 9,50,00,000/-
	Total: Ten Crore Ten Lakhs only.	

1. Price Basis

The above price excludes all taxes, duties, freight, insurance, unloading, octroi, etc. The same shall be charged extra at actual at the time of dispatch. The Price does not include any Customs Duty on Imported components. It is assumed that necessary documents will be provided by you for availing NIL customs duty for imported components under EOU/ EPCG scheme.

✓ Packing Charges shall be extra	Extra @ 3%
✓ Excise Duty shall be extra	12.36%
✓ Sales Tax	Extra CST @2% against form 'C or MVAT @ 12.5%
✓ Service Tax on Erection & Commissioning	12.36%
✓ Freight charges	Extra at Actual, to pay basis
✓ Transit Insurance	Extra @ 0.75%

DELIVERY TIME
6-7 Months from the date of technically and commercially clear order along with advance.

2. Delivery Time

7-8 Months from the date of technically and commercially clear order along with advance.

3. Payment Terms

30% Advance payment along with the order and balance
And Balance 70% through an Irrevocable Letter of Credit at sight by a First class Bank and advised through Standard Chartered Bank, Pune, India, payable against presentation of shipping documents.

4. Validity of Offer

30 days from the date hereof, unless confirmed in writing.

5. Reservation

We reserve our right to change technical specifications or makes of equipment in order to incorporate the latest development or modifications in the plant without affecting the overall performance. All such modifications/changes shall be informed to the Purchaser from time to time whenever to be incorporated or implemented.

The enclosed General Terms and Conditions of Sale of Goods also form part of our offer.

for **Alfa Laval [India] Limited**

Subodh Raina
Regional Manager

D.S.Shukla
Addl. General Manager
Business Unit – Food Solution

SECTION – IV

BATTERY LIMITS & EXCLUSIONS

A) *BATTERY LIMITS*

The following battery limits are applicable to the scope of work

1 Utilities

We consider that your plant will provide all utility requirements of our equipment to be supplied.

The performance may be valid on condition that the buyer supplies all fluids, energy, and the requested amounts of personnel

1) Compressed Air:
- ☞ Dried compressed air, condensation temperature lower than –10°C, without oil, dustless, and at a pressure constantly above 7 bar.

2) Steam
- ☞ Dry saturated steam with pressure constant 4 barg and higher than the values indicated for each individual machine. The culinary steam, when required, can't contain substances unaccepted in foods and has to be distributed with stainless steel pipes.

3) Industrial/ Process/ drinking water/ Tower water:
- ☞ Industrial water at a temperature of approximately 20°C, maximum hardness of 50ppm of $CaCO_3$ and a constant pressure of approximately 3 bar.
- ☞ Drinking water at a temperature of approximately 20°C, maximum hardness of 80ppm of $CaCO_3$ and a constant pressure of approximately 3 bar.
- ☞ Tower water at a temperature of 30°C.

The amount of chlorides or chlorine dissolved in the water can't be greater than 50 ppm. This is valid for all the types of water

Steam, process water, soft water, Compressed air to be provided through a proper size and pressure as mentioned in technical scope of supply at various points required to individual machines/equipment.

2. Electrical Power

Customer will provide following elements to Panel

1. Independent earth to new panel.
2. Instrument air supply to new panel
3. Power & neutral Supply to panel
4. UPS Supply to New Panel.

5. Electrical cables, cable trays, its laying from control panel to individual motor.
6. Supply of Instrument cables and its laying, support etc.

3. Effluents

Effluents will be left by Alfa Laval at the outlets of process/service equipment/in the drains provided in rooms.

4. Fruits for trial

Required sound and ripe fruits for conducting of trials and commercial production.

5. Packing materials & consumables

Aseptic bags, Polythene lines, thermocole sheets, caustic soda etc

6. Aseptic sample bags

Sample bags for collection of samples.

7. Laboratory instruments

For checking of quality and microbiology of the packed products. Brix meter, pH meter, necessary physio/organoleptic testing equipment. Laminar flow and required media, incubators etc.

B) *EXCLUSIONS*

The following items are excluded from the scope of Alfa Laval work:

1. Site development, excavation, leveling and filling of land, building of road, service bridges, boundary walls etc.

2. All civil and structural work like construction of plant and office buildings, RCC water storage tanks, foundations, slabs, slab cut-outs, platforms, buildings, staircases, passenger lifts, drainage facilities for storm water and process effluents and civil work for effluent treatment plant. Architectural/structural services excluded

3. Furniture, fittings and furnishings, plant and office lightings, sanitation fittings and facilities, drinking water supply, paneling work, communication equipment, time office equipment, etc.

4. Cold rooms, it's insulation including coolers, piping &electrical for the same

5. Platform weigh bridge, platform weigh scale and lift for material transportation required separately other than considered in offer format.

6. System for collection, supply & storage of raw water to raw water storage tanks.

7. Tanks for storage of raw water, soft water and demineralised water.

8. All raw materials, chemicals and consumables like citric acid, sugar, caustic soda, laboratory chemicals, etc.

9. All transportation, material handling and storage equipment like trucks, fork lifts, trolleys, gunny bags, wooden pallets, storage cupboards, etc.

10. Electrical transmission and distribution equipment required for building and street lighting.

11. Rubber hoses for product, water and CIP supply & return

12. All equipments of bottling hall and utility sections viz. refrigeration plant, compressed air plant, steam generation & distribution section, water treatment plant, F.O & diesel storage, effluent treatment plant, HT/LT electrical & distribution etc.

13. All statutory clearances required. ALIL shall however provide all the technical help required in terms of drawings, utility and electrical loads etc. for obtaining these clearances.

14. Any other equipment not specifically mentioned in Annexure II.

SECTION - V

SCOPE OF INSTALLATION AND COMMISSIONING SERVICES

1. **Mechanical and electrical installation of equipment covered under ALIL scope of supply.**

- Deputing of Project Manager / Engineer, posting of Site Supervisor etc.
- Supervision of aligning, leveling, assembling, and connecting to pipelines, pipeline installation, Electrical, instrumentation and automation work completion.
- Assembly of Equipment

2. **Commissioning services for equipment covered under ALIL scope of supply:**

- Start-up and running trials of individual equipment.
- Vacuum tests wherever required.
- Running trial of complete equipment.
- On the job training of your personnel during erection and commissioning.

3. **Pre-requisites to be provided by the customer before start-up of installation work**

- Building ready in all respects with structures and foundations made as per our requirement.
- All floor drainage constructed.
- Lockable safe storage space.
- Office room with furniture and telephone access.
- Utilities like water for cleaning & LT power for welding (3 phase, 440 Volts, 50 Hz)
- Watch and ward arrangement for the security of the materials at site.
- Access road to the building near the site.

    - ☞ Civil foundations, structural platforms, Utility piping, electrical cabling
    - ☞ Skilled, Semi skilled land Unskilled labour for Installation of the Plant
    - ☞ Erection tools and tackles, High purity argon gas , oxygen and DA
    - ☞ Unloading and erection of equipment in position is in Customer scope of supply.

- All platforms, stair cases, ladders to give access to the plant or anywhere else including materials, work and design

- All high/Low voltage cables and their supports up to consumption point (each station control panel), Internal cabling and termination from panel to equipment

- Pipe Insulation & cladding, unless specified

- Lockable office room for the duration of the project

- Utilities

- All other equipment and services not expressively specified in this quotation as forming part of the contract

SECTION –IV

GENERAL TERMS & CONDITIONS

01 Extension of Delivery Period

The delivery period committed by us is subject to receipt of all payments in time as per agreed Terms of Payments. The delivery period shall get automatically extended by TREBLE the days of delay in receipt of payments. However the delay can be longer in case it affects the ordering of the long lead items and in such case, the extension of delivery shall be separately communicated.

In case approval required from Customer/Customer's Consultant for drawings takes more than one week after first submission and/or requires resubmission for various reasons not attributable to Alfa Laval to get the final approval and to go ahead with manufacturing, the delivery date shall get directly extended by the no. of days of delay.

The delivery period shall also get extended due to the delay by Customer of his obligations. Alfa Laval shall communicate the resultant delay in delivery separately.

Our Warranties and Guarantees on completion dates for: supply/ commissioning/ performance - trials, shall also be revalidated as mentioned above. Consequently the agreed deadlines for penalties and/or liquidated damages shall deemed to have been extended by the days as mentioned above.

02 Holding Charges

Holding of finished goods at our/sub-suppliers' factory shall be charged at 1.5% of the value of goods per month or part thereof, awaiting despatch for reasons not attributable to us. Such charges shall be added to our bill and to be paid before delivery shall be effected.

03 Interest

An Interest of 18% shall be charged on the value of Goods ready for despatch, which are duly inspected by you or otherwise, awaiting payments. Interest will be charged after one week from the date of intimation by Fax/ Letter of our advice for payment. Interest charged will be payable by you before despatch of goods from our/our sub-suppliers' works.

04 Extra Claim due to Delays

In case of delay in project implementation resulting on account of delay in activities in customer's scope and if Alfa Laval incurs extra cost due to increase in prices, maintenance cost of site, de-mobilization / re-mobilisation of the site, customer shall have to pay Alfa Laval all such extra costs prior to the commencement of implementation.

05 Reservation of Technical Specifications

We reserve the right to make changes in the design of components or material which in our/ our principals' judgement are necessary. Such changes, however, shall not affect the performance of the plant adversely. The information given in the specification of this quotation or in any of our publications, drawings, literature, etc., is intended to present a general idea of goods and equipment offered. We reserve the right to make such alterations in designs, materials or manufacturing process as may be deemed necessary for adapting to availability of similar suitable materials and for improvement of the equipment offered.

06 Plant Takeover

In the event, you are not able to provide necessary inputs / utilities etc., for commissioning / performance trials to be conducted by us for a period of 60 days from the time of mechanical completion of the plant as informed by us, then the plant shall be deemed to have been taken over and all payments due to us shall be released forthwith as per the commercial terms agreed to. The commissioning of the plant / taking performance test runs after the deemed takeover of the plant shall be upon payment of the extra expenses incurred / to be incurred for this purpose.

07 Surplus Material

After completion of the project, all material supplied but lying at site shall always belong to us and will be taken back by us.

08 Reconditioning of Equipment

For equipment which have remained undelivered for more than one month due to no fault of ours, we shall recover the cost of reconditioning, if any, and the same shall be payable to us before despatch of equipment.

09 Order Cancellation

In case, due to extraordinary circumstances, you need to cancel the order then the order cancellation will be subject to agreement by Alfa Laval. If agreed to by Alfa Laval then order can be cancelled only upon payment to us for all commitments or expenses which we have incurred or have become liable for, prior to the date of notice of cancellation, less the reasonable resale value of material and equipment which have been bought or ordered for the project. Alfa Laval shall also be paid a sum as profit that we would have earned upon completing the work on a pro-rata basis based on the work done as the total work under the contract, provided that the total payment so made shall not exceed the contract price. We reserve our right to recover such expenses, commitments and pro-rata profits from the advance amount paid to us.

010 General

a) Consequential Damages

We shall not be liable for any consequential damages, loss of profit, costs and/or expenses if any incurred by you or by any other person employed by you or representing you directly or indirectly, any third party obligations entered into by you or any statutory / legal obligation, awards, damages, statutory or legal action, costs or expenses in relation to the performance or any other feature of the plant supplied and / or erected and / or commissioned by us. Our obligation in this contract including all causes and any representations made by us to you shall not exceed the value of the performance bank guarantee / corporate guarantee or any other compensation agreed by us in the contract and shall be applicable only to faults noticed and not corrected in the performance of the equipment during the warranty period. All the obligations under the warranty period given by us shall be subject to your operating the plant and equipment as per the agreed method of operation as normally understood / specifically mentioned by us. The performance warranty obligations are strictly subject to the battery limits, exclusions and output parameters mentioned in the contract.

b) Secondary Liability

Secondary liability such as indemnification for any loss caused by stoppage of the plant or due to any other reasons concerning this contract will under no circumstances be acceptable to us and we shall not be responsible for such losses.

c) Force Majeure and Delays

c.1 'Force Majeure' shall mean any circumstances beyond the reasonable control of a party which prevent or impede the due performance of the Contract including but not limited to, the following maters :-

war or hostilities or war like conditions; riot or civil commotion or riot like conditions; epidemic or famine; earthquake, flood, fire or other natural physical disaster; denial of use of any railway, port, airport, shipping services or other means of transport; strike, lockout or other industrial action by workers or employees; Central, Federal, State, Local, Municipal Legislation, Ruling Ordinance, Notice order, or the like affecting the Contract but not due to interpretation of any statutory provisions or due to delays in any completion of the formalities by any authority.

The mere shortage of labour, materials or utilities shall not constitute force majeure unless caused by circumstances which are themselves force majeure.

c.2 If either party to the contract is prevented from or delayed in performing any of his obligations under the Contract by force majeure, which affect the programme of work; that party may notify the other party in writing forthwith of the circumstances constituting the cause of delay and specify the obligations, the performance of which is thereby delayed or prevented and shall thereupon become entitled to such extension of any date or period as shall in all the circumstances be fair and reasonable, and the Contract shall be amended accordingly.

c.3 Notification under sub-clause c.2 shall be made within Thirty (30) days of the commencement of the relevant event constituting the cause of the delay.

c.4 If the performance of the Works is substantially prevented for a continuous period of one hundred and eighty days by virtue of any event falling within the provisions of sub-clause c.2, then either party may terminate the Contract by written notice to the other provided Notice under clause c.3 has been given within the prescribed period.

d) Bank Charges

All bank charges including those for bank and / or insurance guarantee concerning the order against this quotation will be to your account.

e) Statutory Obligations

You shall be responsible for obtaining all statutory clearances / completion of legal formalities and other paper work necessary for installation and commissioning of plant. In the event, we are unable to complete our obligations under the Contract due to non-fulfilment of any statutory obligations from your side, then the completion period of the plant for all purposes shall be extended pro-rata to the delay in clearances and you shall reimburse to us any extra expenses incurred in maintaining the site or expenses incurred on re-mobilization of site.

f) Arbitration

All disputes, questions or differences whatever which may at any time arise between the parties hereto relating to the contract and whether as to construction or otherwise shall be referred to arbitration in accordance with the provisions of Arbitration and Conciliation Act 1996 or such other enactment relating to Arbitration as may be in force for the time being. The venue for arbitration shall be Mumbai/ Pune.

g) General Terms

Our offer is subject to the enclosed General Terms and Conditions of Sale of Goods and of Erection and Commissioning of Equipment.

h) Order of Precedence

Wherever any clauses as mentioned in this Contract are partly or fully at variance with the General Terms and Conditions of Sale, the printed form of which is enclosed, then clauses specifically entered into as part of this Contract shall have precedence and shall override the corresponding clauses in the General Terms and Conditions of Sale.

011 RESERVATION

We reserve the right to replace items specified by others with the understanding that such replacement will not change the overall performance of the plant.

Rated throughput and consumption figures indicated above are not in any way or form to be regarded as guarantees but as indicative figures only for initial planning purposes.

All necessary instructions for operation and maintenance will be transmitted in time for commissioning

Yours faithfully
for Alfa Laval [India] Limited

D.S.Shukla
Addl General Manager
Business Unit – BVP

Subodh Raina
Regional Manager

This report is prepared and submitted by Project Consultants:

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