10.0 THE PROPOSED BUSINESS

10.1 Purpose of the Business

The proposed business is of manufacturing Frozen Concentrated Kinnow Juice (FCKJ) from the locally grown Kinnow. The manufactured FCKJ will be sold in export and local markets. The project will directly contribute towards adding value to the agriculture sector of Punjab by reducing post-harvest losses and converting surplus farm produce into high value added products. Local farmers will benefit by availing the opportunity to sell their lower grade Kinnow which does not have value as table fruit and it will be wasted if such processing facilities are not available.

10.2 Product Line

The product line of the proposed business has one main product FCKJ and three byproducts obtained during Kinnow processing. Product line is shown in Table 11.

Product Type	Product Name
Main Product	1. Frozen Concentrate Kinnow Juice (FCKJ)
Byproducts	1. Peel Oil 2. Kinnow Pulp 3. Waste Peel & Fiber

The other product that may be produced from the same process is Frozen Concentrated Orange Juice (FCOJ); in case orange is used as raw material. The financial calculations of this feasibility study have been based on FCKJ since Kinnow is the main raw material which is available abundantly. In case, orange is used for processing, the three byproducts will also change accordingly; along with the main product.

Other byproducts that may be obtained during FCKJ manufacturing are oil phase aroma, water phase aroma and citrus juice sacs. However, for the purpose of this feasibility study, these products have not been considered since producing these products in finished form entail additional capital and operating costs.

10.3 Suggested Location

Kinnow fruit, being very soft, needs to be processed earliest possible after harvesting because it starts deteriorating quickly. Due to unaffordable packaging cost, Kinnow fruit for processing is transported from orchards to processing facilities in loose form loaded on trollies or trucks. The unpacked delicate fruit cannot withstand longer distances and longer time once picked from the trees. This is the key reason that the existing Kinnow processing facilities are located in the vicinity of the fruit growing area. Keeping these factors in view, the proposed FCKJ manufacturing facility should ideally be located at a place closer to Kinnow production clusters. This makes District Sargodha as the obvious choice to establish this facility.

In 2016-17, Sargodha district held 56% share of the Punjab's total Kinnow production. The distribution is shown in Figure 95. The district produced 1,077,139 tons of Kinnow from a total cultivated area of 205,400 acres. Such a concentrated production in a small area becomes a strong competitive edge over any manufacturing facility that is not located within this raw material area. Therefore, it is recommended to establish this facility within district Sargodha.

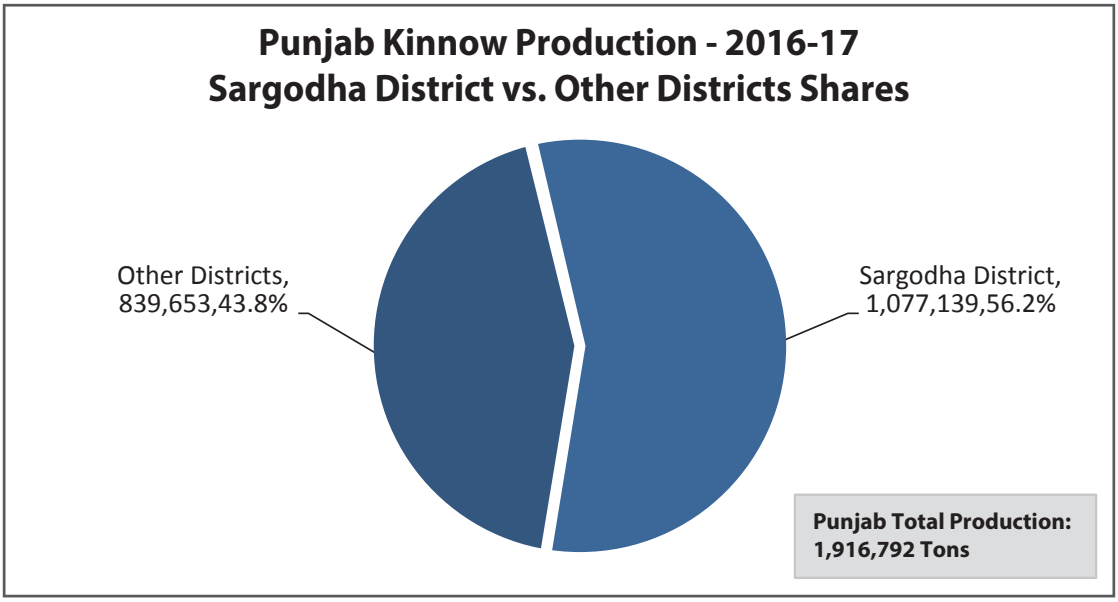


Figure 95 – Punjab's Kinnow Production

Rank	District	Area (Acres)	Production (Tons)	Share in Production
1	Sargodha	205,400	1,077,139	56.2%
2	Toba Tek Singh	30,350	215,232	11.2%
3	Mandi Bahauddin	21,800	116,356	6.1%
4	Khanewal	14,750	87,535	4.6%
5	Sahiwal	12,300	62,437	3.3%
6	Vehari	13,165	62,405	3.3%
7	Bahawalpur	13,395	48,596	2.5%
8	Layyah	8,970	36,159	1.9%
9	Multan	6,890	29,831	1.6%
10	Okara	6,375	28,791	1.5%
	Other Districts	37,962	152,311	7.9%
	Total	**371,357**	**1,916,792**	**100.0%**

Table 12 – Kinnow Area and Production of Top Ten Districts of Punjab

After Sargodha, the possible location can be Toba Tek Singh which accounted for 11% share of the total provincial production.In addition to raw material production concentration, the other factor for selecting location is being close to the main highways. It is important both from the perspective of receiving raw material supplies conveniently and also for easier transportation of the final product for export.

10.3.1 Suggested Location within District Sargodha

Within district Sargodha, the location should be decided looking at the concentration of Kinnow orchards and the locations of the existing units. This is important since each manufacturing facility has a certain catchment area to source raw material for processing. Establishing a facility in close vicinity of an existing facility will lead to causing raw material sourcing issues for both the existing and the new facility. Looking at the locations of the existing units, it is observed that this consideration has been taken into account while selecting their locations. Using the distances measured through Google maps, it was observed that the Unit 1 of CitroPak (previously Cargill) is located at Sargodha-Lahore road at a distance of about 15 km before entering Sargodha city. The unit 2 of CitroPak (previously Sunflo) is located at Sargodha-Gujrat road at around 15 km out of Sargodha city in the other direction. The distance between the two units is around 30 km. Similarly, Oriental Foods is the third processing unit in Sargodha. Previously, it was located in Shahpur, at a distance of about 40 km from CitroPak unit 1 and 60 km from unit 2. The distance of its present location from both the CitroPak units is around 40 km. Shakarganj Foods is located in district Chiniot at a distance of about 55 km from CitroPak Unit 1. The locations of the existing facilities and the proposed location of the new facility are shown in Figure 96. Satellite images of the existing processing facilities showing the main access roads are shown in Annex II.

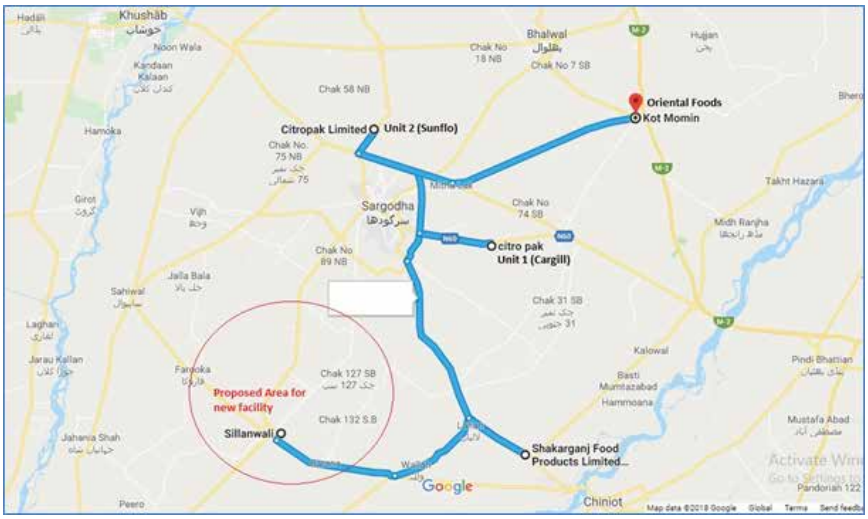


Figure 96 – Location Map Showing Existing Facilities and Proposed Location

Looking at the locations of the existing units and getting the feedback from sector stakeholders, Tehsil Sillanwali was suggested as a suitable location for establishing a new FCKJ manufacturing facility. The town of Sillanwali is situated at a distance of 40 km from CitroPak Unit 1 and 48 km from CitroPak Unit 2. Shakarganj Foods is located at a distance of about 40 km from the Sillanwali town. There are large Kinnow orchards in this Tehsil which can supply fruit even in the last weeks of the season. The facility may be located close either to Sillanwali-Sargodha road or Sillanwali-Chenabnagar road. Sillanwali-Sargodha road appears to be better in terms of raw material access due to being closer to Bhalwal which is the largest Kinnow producing Tehsil in the district. Being closer to Bhalwal will also be better in terms of access by being closer to Lahore-Islamabad motorway. Exact location of the facility should be decided after conducting a thorough survey of the area with reference to concentration of Kinnow orchards. The location of Sillanwali town with reference to two main roads is shown in Figure 97.

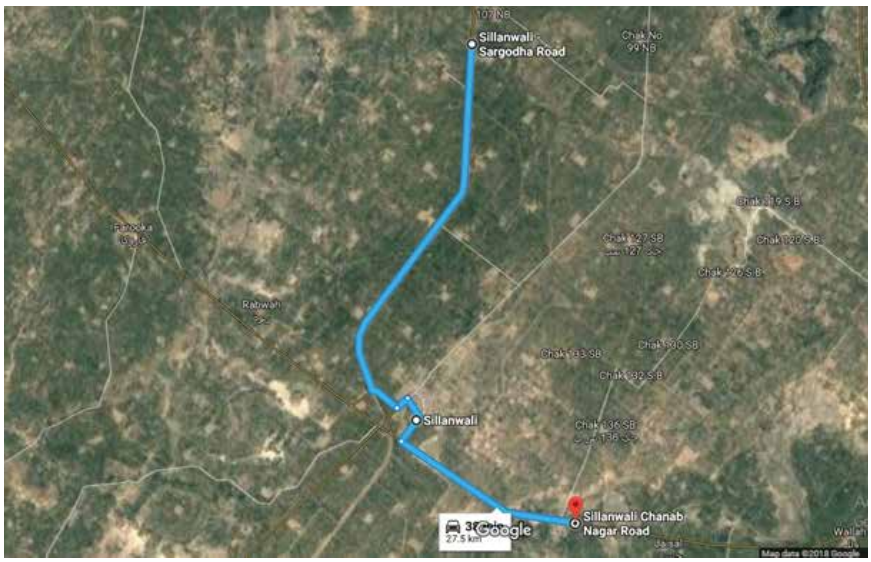


Figure 97 – Sillanwali – The Proposed Location for New Facility

10.3.1.1 Inclusion of Other Fruits

Another factor that may have to be considered in selecting the location is the decision to include processing of other fruits and vegetables as part of the business plan. Mango is the other most relevant fruit that is processed to produce mango pulp, another important raw material for the local and international ready-to-drink juice sector. In case mango has to be processed, the location should also consider sourcing of mangoes as an important factor while deciding on plant location. Similarly, guava is another fruit from Punjab that is processed to produce guava pulp. Sourcing of other fruits like apple and peach which are not grown in Punjab will not have any major impact on location selection since these have to be sourced from other provinces anyway.

10.4 Plant Capacity

The capacity of FCKJ manufacturing plants is defined in terms of quantity of fruit processed per unit time. Plants of varied capacities are available in the market. The investor can select a plant on the basis of market demand and the technical considerations of the target products. Overall plant capacity depends upon the processing capacity of an individual extractor and the total number of extractors installed. Thus overall capacity can be increased by increasing the number of extractors and adding corresponding capacities in the downstream processes. Increasing capacity of such units is not complicated since most of the components of the plant come as standalone units with defined capacities. For the purpose of this pre-feasibility study, the processing capacity of the plant has been proposed to be 30 tons Kinnow per hour. In a normal three-shift day, the average number of hours the plant is operational is consideredto be 20 hours. Remaining hours are used for shift change operations and for carrying out sterilization of the plant; known as Cleaning-in-Place (CIP). CIP is carried out once in every twenty four hours and fruit processing remains stopped during this time. With these constraints, the average processing capacity of the proposed unit comes out to be 600 tons Kinnow per day.

Kinnow processing season starts in the latter half of December and may go up to the first week of April; depending upon the performance of Kinnow crop during any particular year. The processing plants are

operational for about 100 to 110 days. During the initial weeks, the availability of fruit is limited. Therefore, the plant cannot be operated on full capacity. During the first few days, processing is carried out only in single shift, which is the increased to two shifts in the coming days and finally full capacity, three-shift operations are carried out. Generally, plants operate at full capacity for around 90 to 100 days; depending upon the fruit availability.

The capacity proposed for this feasibility study can be rated as being in the higher range; same as the capacities of the existing larger units in the industry. Higher capacity projects require a higher investment and are usually expected to be more profitable and attractive for the investors. Installing a new plant of higher capacity is also relevant from the fact that Pakistan's current performance in the international export market is below its true potential. A larger project will be able to tap that opportunity with a more aggressive approach.

10.4.1 Increasing the Number of Processing Days

With only citrus fruit being processed, the number of operational days in a year remains around 100 to 110. The plant remains idle during the remaining days which actually constitute a bigger chunk of the total available time during a year. During this time, the project's fixed costs continue to be incurred without bringing in any revenues. It is therefore important to increase the number of operational days by processing other fruits and vegetables grown in other seasons during the year. This processing can be carried out using part of the same processing line. However some specific machinery and equipment at certain process steps will have to be added; or some machinery components may have to be substituted in some existing machines to handle other fruits and vegetables. In order to reduce new investment on machinery and equipment, some initial fruit preparation processes may also be carried out using manual labor.

Mango is the most popular fruit for processing to produce mango pulp which has a large local and international market. Mango juices and drinks are very popular in local market. Other fruits that may be processed include peach, guava, strawberry, apricot and apple. Pulps, purees and concentrates of these fruits have markets both locally and internationally. In vegetables, tomato is most commonly processed to produce tomato paste which has large local and international markets.

In addition to industrial products, the other available opportunity to increase the number of operational days is diversifying into ready-to-drink juices and drinks having a large local high growing market. These products may be launched in TetraPak, glass bottles, PET bottles or cans. Corresponding investment in the relevant machinery and equipment will have to be made to manufacture these products. The venture has to be supported with an aggressive marketing strategy.

The above-mentioned product diversification initiatives will entail additional investment and will bring in additional revenue streams. This will increase the number of operational days and distribute the fixed costs over increased number of units sold. Overall impact will be the lowering of project's breakeven point; and an increased financial viability.

10.5 Project Cost

The project has a total cost of PKR 992.37 million This includes capital investment of PKR 733.25 million and working capital of PKR 259.07 million. Working capital is 26.1% of the total project cost. Details of different cost components are shown in Table 13 and discussed in the following pages:

Cost Item	Cost (PKR)	Percent
Land	48,000,000	4.8%
Building & Civil Works	82,850,000	8.3%
Processing Machinery	417,217,533	42.0%
Utility Machinery	66,500,000	6.7%
Freezing St ore	56,642,033	5.7%
Laboratory Equipment	2,974,000	0.3%
Office Equipment & Furniture	7,390,000	0.7%
Vehicles	6,700,000	0.7%
Pre-operating expenses	44,975,000	4.5%
Capital Investment	**733,248,565**	**73.9%**
Working Capital	**259,068,979**	**26.1%**
Total Project Cost	**992,317,544**	**100.0%**

Table 13 - Project Cost Details

Detailed calculations of the project cost components are shown in Annex III.

10.5.1 Land and Building

The project will have two locations. Head office will be located in Lahore and the processing facility will be located in Sargodha.

10.5.1.1 Processing Facility

10.5.1.1.1 Land

Total land requirement for the proposed processing facility has been estimated to be 8 acres. Of the total land requirement, the requirement of land for buildings is only around one acre. Other seven acres will be as open areas to allow for easy movement of the vehicles bringing in raw material (Kinnow) and the vehicles transporting finished goods. Land cost for this project has been estimated at the prevailing commercial rates in Sargodha. The cost will vary with the actual location. Incorporating the requirement of being close to main road, the land cost has been averaged out to be PKR 6.0 million per acre. Total cost for 8 acres of the required land for the proposed FCKJ manufacturing project was calculated to be PKR 48.0 million. Table 14 shows the details.

Total Land requirement (Acre)	8.0
Land Cost (PKR per acre)	6,000,000
Total Land cost (PKR)	**48,000,000**

Table 14 – Land Cost

In case there is the option of establishing the unit in some industrial estate or special economic zone in Sargodha, the land cost may be lower than the quoted figure that will lead to lowering the capital cost and increasing the financial viability of the project.

10.5.1.1.2 Civil Construction of Buildings

The buildings required in the plant include processing hall, utility machinery halls, workshops, freezing store, blast freezer, general stores, office space, laboratory, canteen and residences. Total covered area of the proposed building was calculated to be 40,900 square feet. Space requirement and the associated civil construction cost are presented in Table 15.

Building	Space (Sq. ft.)	Construction Cost (Rs/sq.)	Building & Civil Works Cost
Processing hall	15,000	2,000	30,000,000
Utilities Hall & Workshop	4,000	1,800	7,200,000
Freezing Store & Ante Room	12,000	1,500	18,000,000
Blast Freezer	900	1,500	1,350,000
Office space	1,500	2,500	3,750,000
Laboratory	1,000	2,500	2,500,000
Spare parts & General Items Store	1,500	1,800	2,700,000
Shed for Empty Drums	1,500	1,500	2,250,000
Toilets & Change Rooms	1,000	2,000	2,000,000
Canteen	1,500	2,000	3,000,000
Residence for Security Guards	1,000	2,000	2,000,000
Total Covered Buildings	**40,900**		**74,750,000**

Table 15 – Civil Construction Cost of Buildings

10.5.1.1.3 Civil Construction in Open Spaces

In addition to the enclosed buildings, civil construction will also be required in open areas in the facility. Major cost items in this regard will include the roads inside the factory premises for movement of vehicles, walking pavements, boundary wall, entry/exit gates and landscaping of the open areas. Roads and pavements have been assumed to be constructed from Tuff Tiles. Asphalt roads have been avoided to reduce capital cost. Per unit construction cost of roads will be higher than that of per unit cost of pavements since they have to sustain the heavy weight of loaded vehicles carrying fruit or finished goods. Civil construction details in the open spaces of the processing facility are shown in Table 16.

Construction	Requirement	Unit Construction Cost (PKR/unit)	Cost (PKR)
Inside roads (sq.)	25,000	100	2,500,000
Pavements (sq. ft.)	7,500	80	600,000
Boundary wall (R.ft.)	2,500	800	2,000,000
Landscaping (sq. ft.)	50,000	50	2,500,000
Factory Gates (no.)	2	250,000	500,000
Total			**8,100,000**

Table 16 – Civil Construction Cost of Items in Open Spaces

Civil Construction Cost Head	Cost (PKR)
Buildings Construction Cost	74,750,000
Open Areas Construction Cost	8,100,000
Total Civil Construction Cost	**82,850,000**

Table 17 – Total Civil Construction Cost

The total civil construction cost in the project is PKR 82.85 million. 90% of this cost is accounted by the cost of buildings and the balance 10% by construction requirements in the plant's open spaces.

10.5.1.2 Head Office

Head office will be established in a rented building in Lahore. There will be no civil construction costs involved for that. Rent of the head office has been assumed as PKR 100,000 per month; growing at 8% per annum.

10.5.2 Machinery & Equipment

The machinery package suggested in the feasibility study consists of both imported and local machinery Processing machinery is more sophisticated and is not available from local suppliers. Thus, the processing machinery and equipment of imported origin have been suggested. In order to reduce the capital cost, the project has been based on Chinese machinery. The cost of the processing machinery offered by the European suppliers is about 50-60% costlier than that of the Chinese machinery. For more common needs like utility machinery, quotes obtained from the local suppliers have been used for calculations. The plant has three main types of machinery and equipment, process machinery, utility/allied machinery and freezing room. Machinery cost of these three categories is provided in Table 18.

Machinery Category	Cost (PKR)
Process Machinery & Equipment	417,217,533
Utility/Allied Machinery & Equipment	66,500,000
Freezing Store	56,642,033
Total	**540,359,565**

Table 18 - Machinery & Equipment Cost

Sr.no	Name of the Machine	No.	Total Cost (PKR)
1	Bubble Washing Machine	1	2,097,900
2	Roller Sorting Machine	1	1,923,075
3	One Stage Brush Washing Machine	1	2,797,200
4	Two-Stage Brush Washing Machine	1	2,855,475
5	Paddle Elevator	1	2,331,000
6	Material Spreading-Machine	1	8,741,250
7	Size Grading Machine	1	8,508,150
8	Incline Feeding Machine	1	3,263,400
9	Return Fruit Conveyor	1	2,680,650
10	Juice Extraction System	1	120,279,600
11	Juice Tank 2000 L	1	617,715
12	Centrifugal Pump	1	314,685
13	Hydroclone	1	489,510
14	Finisher	2	8,624,700
15	Pulp Tank 2000L	1	617,715
16	Pulp Washing System	1	28,868,270
17	Screw Pump 5000L/H	1	874,125
18	Juice Tank 2000L	1	617,715
19	Centrifugal Pump15000 L/H	1	314,685
20	Disc Separator	1	17,482,500
21	Juice Tank 5000L	1	1,013,985
22	Tri - Effect Falling Film Evaporator	1	52,913,700
23	Buffer Tank 1000 L	1	314,685
24	Screw Pump 3000 L	1	617,715
25	Pomace Long Screw Pump	1	3,333,330
26	Pomace Short Screw Conveyor	1	1,317,015
27	CIP Cleaning Center System	1	13,170,150
28	Return Pump	1	1,398,600
29	Plate Exchanger 16000 L/H	1	6,177,150
30	Condensate Recovery/Utilization Unit	1	1,000,000
31	De-Bittering Unit	1	75,013,911
32	Cold Press Peel Oil Recovering Unit	1	33,361,272
33	Batch Tank (Jacketed) 25000 Liter With Stirrer	2	4,895,100
34	Electrical Control Cabinet	1	8,391,600
	Total		**417,217,533**

Table 19 – Process Machinery Cost Details

The freezing store will comprise of four rooms each with the dimensions of 37 feet by 69 feet. In addition, there will be a corridor (ante room) measuring 75 feet by 16 feet and a blast freezer of 30 feet by 30 feet.

10.5.2.1.2 Utility/Allied Machinery and Equipment

Sr.no	Name of the machine	No.	Unit Price (PKR)	Total Price (PKR)
1	Air compressor	2	450,000	900,000
2	Boiler (10 tons/Hr)	1	15,000,000	15,000,000
3	Cooling tower (250 cu. M per hr)	1	3,200,000	3,200,000
4	Chiller	1	25,000,000	25,000,000
5	Water Reservoir and Delivery System	1	1,000,000	1,000,000
6	RO Plant	1	700,000	700,000
7	Ge nerator (650 KVA)	1	10,500,000	10,500,000
8	Weigh bridge (100 tons)	1	2,000,000	2,000,000
9	Fork lifter 2.5 tons (battery operated)	1	4,000,000	4,000,000
10	Transformer (1500 KVA)	1	3,000,000	3,000,000
11	Workshop Machinery	1	1,000,000	1,000,000
12	Fi re Fighting Equipment	1	200,000	200,000
	Total			**66,500,000**

Table 20 – Utility Machinery Cost Details

10.5.2.1.3 Freezing Store

Sr. No.	Equipment	No.	Total Cost
1	Freezing Room (2500 tons storage capacity)	1	42,722,033
2	Blast Freezer	1	13,920,000
	Total	**1**	**56,642,033**

Table 21 – Freezing Store Cost Details

10.5.3 Laboratory Equipment

Quality assurance is a very important function of the proposed FCKJ manufacturing unit. Implementing effective quality assurance requires maintaining a modern laboratory for conducting the required quality checks at raw material, in-process and finished goods stages. List of the required the laboratory equipment is shown in Table 22.

Sr. No.	Items description	Unit	Quantity	Cost (PKR)
1	HPLC	No.	1	1,800,000
2	Spectrophotometer	No.	1	29,500
3	Analytical balance 0.01 to 300g	No.	1	3,500
4	Viscometer	No.	1	70,000
5	Lab centrifuge machine	No.	1	138,000
6	Magnetic stirrer	No.	2	2,500
7	pH meter	No.	1	22,500

Table 22 – Laboratory Equipment Cost

8	Auto burette	No.	2	88,000
9	Distillation apparatus	No.	1	9,800
10	Abbe Refractometer	No.	1	24,000
11	Hand Refractometer (0-32)	No.	2	7,600
12	Hand Refractometer (20-80) or (32 -80)	No.	2	7,600
13	Glass Thermometer	No.	10	500
14	Digital Thermometer	No.	2	1,300
15	Laminar Flow Cabinet	No.	1	20,000
16	Autoclave	No.	1	30,000
17	Microscope 1	No.	1	200,000
18	Incubator	No.	2	200,000
19	Hot Air Oven	No.	1	100,000
20	Flame Photometer	No.	1	65,000
21	Colony Counter	No.	1	12,000
22	Viscosity Meter	No.	1	70,000
23	Hot Plate	No .	1	14,000
24	Stop Watch	No.	1	1,400
25	Colorimeter	No.	1	11,500
26	Desiccator	No.	1	6,000
27	Distillery	No.	1	6,300
28	Water Bath	No.	1	25,000
29	Digital Caliper	No.	1	8,000
	Total			**2,974,000**

Table 22 – Laboratory Equipment Cost

Along with the above-mentioned capital items, laboratory operations also require consumable apparatus. List of the minimum requirement of consumable apparatus is shown in Annex III-B.

10.5.4 Office Equipment and Furniture

Office equipment and furniture is required both at the plant site and at the head office. It includes furniture, interior decoration, air conditioners and IT and communication equipment. Total cost of office equipment and furniture is PKR 7.39 million. Details are presented in Table 23.

Item	Requirement (No.)		Total Requirement (No.)	Unit Cost (PKR)	Total Cost (PKR)
	Plant Site	Head Office			
Office Furniture	1	1	2	1,500,000	3,000,000
Office Interior	1	1	2	1,000,000	2,000,000
Air Conditioners	6	6	12	60,000	720,000
Laptop Computers	6	6	12	70,000	840,000
Desktop Computers	6	6	12	40,000	480,000
Printers	5	5	10	20,000	200,000
Telephone sets	30	20	50	3,000	150,000
Total					**7,390,000**

Table 23 - Office Equipment and Furniture Cost

Type	No.	Unit cost (PKR)	Total cost (PKR)
Small Truck	1	2,500,000	2,500,000
Salon car	1	2,000,000	2,000,000
Carry Van	1	1,200,000	1,200,000
Tractor & Trolley	1	1,0 00,000	01,200,000
Total	**4**		**6,700,000**

Table 24 – Vehicles Cost

10.5.6 Pre-Operating Expenses

Pre-operating expenses are the expenses what have to be incurred before the start of the routine operations. These include the cost of utility connections, machinery installation, registration and licenses, salaries of the personnel that have to be hired before the plant operations start and their operational expenses, such as travelling, office expenses, etc. Total pre-operating expenses for the proposed business are PKR 44.975 million. Summary costs of different heads of pre-operating costs are provided in Table 25.

Pre-Operating Costs	Cost (PKR)
Consultancies, Registrations, etc.	3,405,000
Utility Connections/Installations	19,800 ,000
Freight	8,460,000
Erection and Commissioning	6,215,000
Salaries	4,020,000
Admin. Expenses	675,000
Promotional cost	2,400,000
Total	**44,975,000**

Table 25 - Pre-Operating Costs

Brief description of the categories included under pre-operating costs is provided in the following paragraphs:

- Registration and licenses cost includes the cost paid to different government departments for registration of the business. Associated operational expenses are also covered under this cost.
- Utility connections and installations include the cost of electrical connection, transmission line and installation cost of water tube well.
- Freight includes the cost of transporting the machinery from China to Karachi port and the inland freight to transport it from Karachi to plant site in Sargodha. The machinery will be delivered in twelve 40 feet containers.
- Erection and commissioning includes the costs of Chinese technical personnel that will come to Pakistan to install the processing machinery. 10 persons will be required for 50 days at a rate of USD 100 per day. The other component of this cost will be for installing the locally procured machinery. The cost has been considered as 1% of the total local machinery cost.
- The human resource cost includes the salaries of the persons who will have to be hired before the start of the operations. Key positions include CEO, Finance Manager, Accounts officer, Procurement Officer, Plant Manager, Engineering Manager, Admin Officer Plant, fitters/welders, driver, office boy and security guards. It has been assumed that these people will be hired three months before the start of plant operations.
- The admin expenses under the pre-operations costs include the rental cost of head office, travelling and office expenses for three months.
- Marketing expenses include the cost of marketing trips to international markets, cost of promotional materials and website development cost.

Detailed calculations of pre-operating costs are shown in Annex III-C.

10.5.7 Working Capital

Initial working capital requirement has been worked out with the approach that marketing efforts will be required to penetrate the export markets followed by sustained sales. The biggest component of working capital is Kinnow which has to be procured on daily basis since it is not available on credit. Kinnow payment has to be made either on the same day or maximum within one week. In line with this, the fruit requirement for working capital calculations has been assumed for the entire season.

A similar approach has been adopted for other processing costs. Three month operating costs of chemicals, furnace oil and packing material have been included in the working capital. For utility costs and salaries as well, a time period of three months has been considered. An allocation of 1% of the machinery cost has been made for spare parts. Upfront insurance payment has also been included in the working capital. Insurance cost has been calculated at 1% of machinery and 3% of vehicles cost. Initial working capital requirements have been calculated for 70% capacity utilization as per the assumed capacity utilization schedule. Table 26 shows the working capital requirement.

Cost Head	Cost (PKR)
Fruit	147,000,000
Packing Material	33,034,389
Chemicals & Lab Consumables	1,470,000
Electricity bills	21,585,848
Furnace Oil	19,756,800
Salaries	15,213,750
Spares	5,403,596
Upfront Insurance Payment	5,604,596
Starting Cash Balance	10,000,000
Total Working Capital	**259,068,979**

Table 26 - Working Capital Details

Details of the working capital calculations are presented in Annex III-D.

10.6 Operating Assumptions

10.6.1 Revenue Assumptions

10.6.1.1 Capacity Utilization

The project's revenue will be obtained by selling FCKJ and the three byproducts. Major share of FCKJ and Peel Oil will be sold in export market and smaller share in the local market. The byproducts of Kinnow pulp and waste Kinnow peel will be sold only in the local market. Processing of these products will be carried out during five months starting from December to April for 110 days. However the fruit processing will depend upon the fruit availability. Based on the information obtained from the industry, it has been assumed that the plant will become operational in third week of December and processing will be carried out during the last ten days of the month. However, due to limited availability of Kinnow, the plant will be operational only for single shift or one third of the installed capacity. As the fruit supply will increase, second shift will be started. During the first 10 days of January, processing will be carried out during two shifts or two third of the installed capacity. After that, the plant will run for three shifts for the remaining days of January and the whole of February and March. By that time, the fruit availability will decrease and plant cannot be run on full capacity. Therefore, for the 10 days operations in April, processing will be carried out only in single shift. Incorporating these constraints, the effective number of days for which the plant will be operational at full capacity is 93.3. Proposed processing calendar is shown in Table 27.

	Month	No. of Operational days	Assumption	Effective Operational days
Season Start	Dec	10	Single shift	3.3
	Jan	31	10 days on 2 shifts 21 days at 3 shifts	27.7
	Feb	28	3 shifts	28
	Mar	31	3 shifts	31
Season End	Apr	10	Single shift	3.3
	Total	**110**		93.3

Table 27 – Processing Calendar

At 100% capacity, operating 93.3 days a year, the plant will process 56,000 tons of Kinnow during the season of 93.3 days. However, the plant will not start running at full capacity from the first year. It is assumed that during the first year, the plant will attain 70% capacity utilization that will increase to 80% in the second year, 90% in the third year and 95% in the following years. A conservative approach has been adopted in assuming capacity utilization. Table 28 shows the proposed schedule.

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
70%	80%	90%	95%	95%	95%	95%	95%	95%	95%

Table 28 - Capacity Utilization Schedule

10.6.1.2 Production Yields

The plant will process Kinnow fruit to produce FCKJ, the main product and three byproducts; peel oil, Kinnow pulp and waste peel & fiber in different yields. Production yields and production per day from 600 tons of Kinnow processed per day (100% capacity) are shown in Table 29.

Product	Yield	Production per day (Ton)
FCKJ	8.50%	51.0
Peel Oil	0.03%	0.2
Kinnow Pulp	3.00%	18.0
Waste Peel & Fiber	40.00%	240.0

Table 29 – FCKJ and Byproducts Production Yields

10.6.1.3 Sale Prices

The study has been conducted with the assumption that FCKJ will be sold in both export and local markets. There is no major difference in price of FCKJ in the two markets. Therefore, same price has been assumed for calculating revenues in both the markets. Same approach has been adopted for the cold pressed peel oil. Export market price information has been obtained mainly from Trade Map data of ITC (International Trade Center). Average export prices have been obtained from the export value and quantities of FCKJ and peel oil exported by Pakistan in the year 2016. For the two other byproducts, the current local market price has been used. Based on this approach, the bases used for selling prices are presented in Table 30.

Product	Exports (000 USD)	Value (tons)	Export Price (USD/ton)	Price Used (USD/ton)	Price Used (PKR/Ton)[28]
FCKJ	11,421	6,743	1,694	1,700	188,700
Peel oil	27	5.325	5,070	5,100	566,100
Kinnow Pulp					20,000
Waster Peel & Fiber					500

Table 30 - Sale Prices

10.6.1.4 Share of Production Sold

The sales of different products have to be seen in terms of the available market. In case of FCKJ, the assumption is that the entire volumes of the product will be sold during the year in export and local markets. Similarly, in case of peel oil, it has been assumed that 100% share of the total peel oil production in each year will be recovered and sold in export and local markets. The entire production of waste peel and fiber will be sold in the local market. Most common use of this waste is as fuel in brick kilns. Kinnow pulp is another product which has a limited demand in the local market as an additive to produce fruit juices and drinks. It has been assumed that 20% of the total production of Kinnow pulp recovered during the process will be sold for this purpose. Since there is no more market for this product, the balance 80% Kinnow pulp will be sold as waste at the rate of waste peel.

10.6.1.5 Operating Revenues

Based on the above productions and sale prices, the project will generate revenues of PKR 648.42 million during first year of operations; while operating at 70% capacity utilization. Summary of revenue calculations are presented in Table 31. Detailed revenue calculations are presented in Annex IV-A.

Product	Production (Tons)	Sale Price (PKR per ton)	Revenues (PKR)	Share
FCKJ	3,332	188,700	628,748,400	97.0%
Peel Oil	12	566,100	6,657,336	1.0%
Kinnow Pulp as Pulp	235	20,000	4,704,000	0.7%
Kinnow Pulp as W aste	941	500	470,400	0.1%
Waste Peel & Fiber	15,680	500	7,840,000	1.2%
Total			**648,420,136**	**100.0%**

Table 31 – Revenues Calculations Summary

10.6.1.6 Sales Price Growth Rate

Sale price growth rate of FCKJ has been fixed in the light of the export price trends of the last ten years. Table 32 lists the FCKJ prices of the world's total exports and Pakistan's exports.

Year	Export Price (USD/Ton)	
	World	Pakistan
2007	1,478	1,331
2008	1,349	1,308
2009	1,163	998
2010	1,226	1,177
2011	1,405	1,192
2012	1,591	2,185
2013	1,547	2,041
2014	1,486	1,886
2015	1,463	1,742
2016	1,639	1,694

Table 32 – FCKJ Export Price Trend – World and Pakistan

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

[28]@ PKR 111 per USD

[29]There are other possible uses of this waste peel as well. It can be used as fuel to meet the entire steam requirements of FCKJ manufacturing unit. This will save the cost of fuel used in the boiler for steam generation. Another use of this peel can be producing different kinds of organic chemicals through different processes.

The trends show that the average export prices have been oscillating during the past ten years. During the five most recent years, the world price trend was downward from 2012 to 2015 and an upwards trend was seen in 2016. In case of Pakistan's exports, the average price has consistently decreased from 2012 to 2016. However, during the previous half decade, the trends have been positive and the average price of Pakistani FCKJ in international markets increased by 64% from 2007 to 2012. The world price also showed an increase during the same period.

To arrive at a value of growth rate from within these fluctuating trends, compounded annual growth rates were calculated for the two trends for different growth periods from 2007 to 2016. The results are shown in Table 33.

Growth Period	Compounded Annual Growth Rate (CAGR)	
	World Price	Pakistan Price
4 years (2012-16)	0.7%	-6.2%
5 years (2011-16)	3.1%	7.3%
6 Years (2010-16)	5.0%	6.3%
7 years (2009-16)	5.0%	7.9%
8 years (2008-16)	2.5%	3.3%
9 years (2007-16)	1.2%	2.7%

Table 33 – FCKJ Export Price Growth Rates – World and Pakistan

Looking at the tables, it can be observed that the CAGR values tend to cluster around 5%. As per the market feedback, it is expected that the FCKJ price will increase in the coming years. The orders being received by the exporters during the season of 2017-18 are higher than the average prices in the most recent years. Looking at the futures market of FCOJ, price is seen to increase sharply after the year 2016. Figure 98 shows the world market trend based on Brazilian export prices in Rotterdam market.

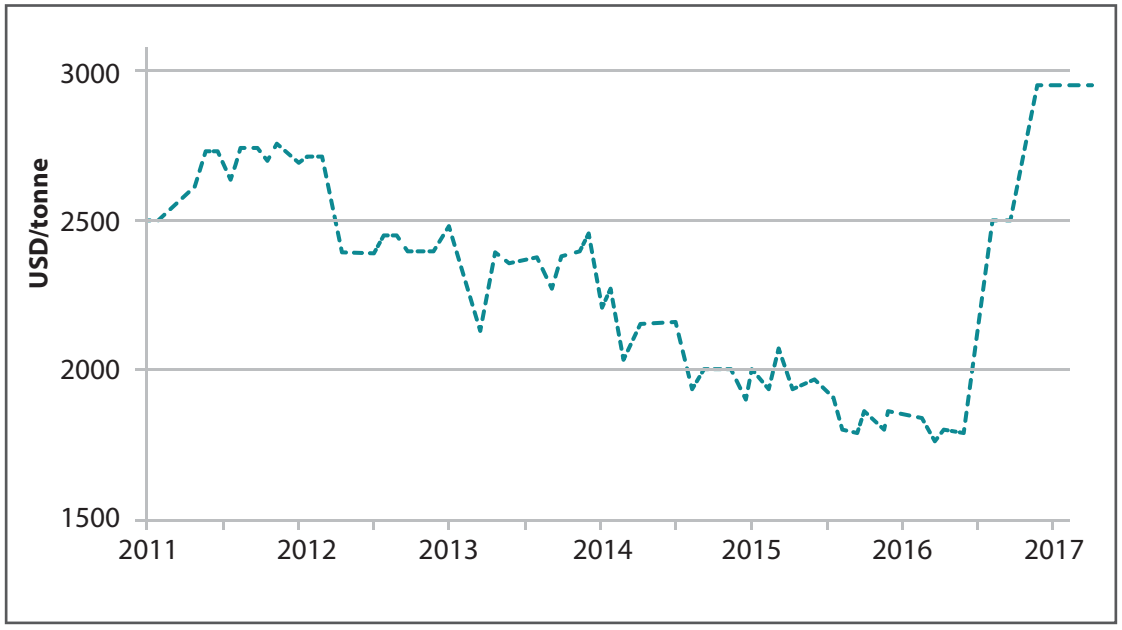


Figure 98 - World market for FCOJ (Brazilian export prices Rotterdam) (Orange Book)

In line with this, the FCKJ sale price growth rate for this feasibility study has been assumed to be 5%. Looking at the future price projections, this growth rate is a conservative assumption and actual increase is likely to be much higher than this.

10.6.2 Costs Assumptions

10.6.2.1 Fruit Cost

The cost of Kinnow is calculated on the basis of the fruit processing capacity of the selected machinery. At 100% capacity, the plant will require 600 tons of Kinnow per day. Capacity utilization for the first year of operations has been assumed as 70% and the cost of raw material will decrease accordingly.working capital requirement.

10.6.2.1.1 Kinnow Prices

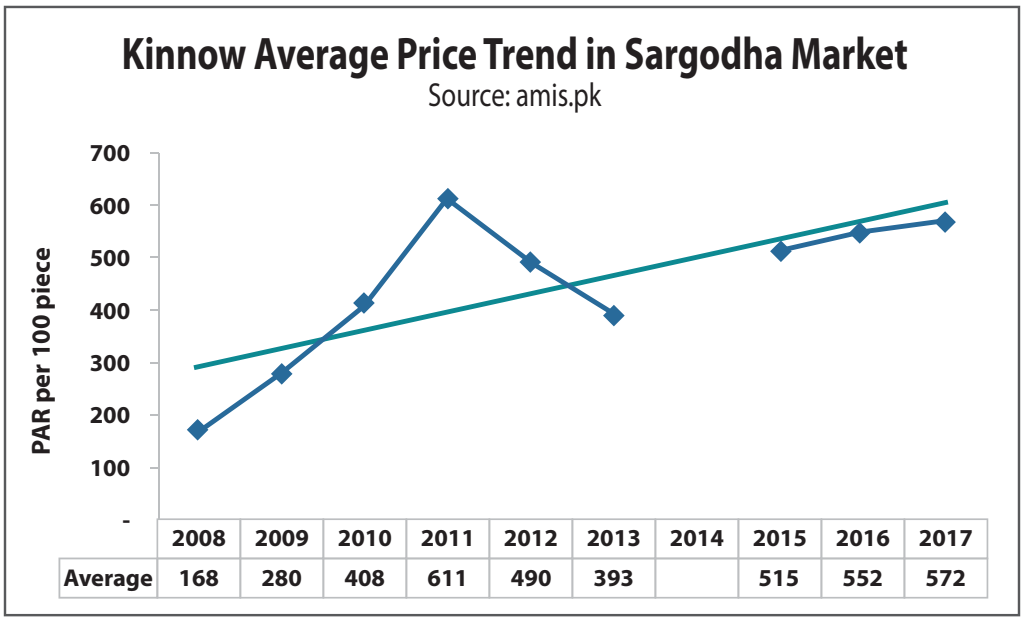
The price of Kinnow used in the feasibility calculations has been obtained directly from the field on the basis of inputs of the sector stakeholders. The price of Kinnow usually increases from December onwards. Average price of Kinnow of processing-grade for cost calculations in this feasibility study has been assumed to be PKR 150 per maund or PKR 3,750 per ton. This price is very low compared to the wholesale prices of Kinnow of table grade fruit.

10.6.2.1.2 Kinnow Cost

Total Kinnow requirement for the first year of operations is 39,200 tons. At the rate of PKR 3,750 per ton, total raw material cost for the first year comes out to be PKR 147 million. Detailed raw material cost calculations are shown in Annex IV-B.

10.6.2.2 Kinnow Price Growth Rate

Over the past years, there has been an increase in Kinnow prices. Figure 99 shows the ten year trend of wholesale price of Kinnow in Sargodha market. Since Kinnow processing is mainly carried out in three months from January to March, average values of the prices in these three months have been used in this analysis.



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Average	168	280	408	611	490	393		515	552	572

Figure 99 – Kinnow Price Trend

With some fluctuations, the overall price trend has been in an upward direction. Average price per 100 pieces of Kinnow increased from PKR 168 in 2008 to PKR 572 in 2017. This increase translates into a compounded annual growth rate of 9.8%. Therefore, an average Kinnow price growth rate of 10% has been used for financial calculations in this feasibility study.

[30]Trading of FCOJ futures began in the 1960s through the Citrus Associates of the New York Cotton Exchange (NYCE). The NYCE was integrated into the New York Board of Trade (NYBOT) in 2004. A few years later, Intercontinental Exchange acquired NYBOT and FCOJ futures and options are now traded through ICE Futures US. The physical trading floor remains in New York City. (Orange Book)

10.6.3 Chemicals and Lab Cost

Chemicals are required both for process and for laboratory. Major use of chemicals is for CIP of the plant once in every twenty four hours. Caustic soda and Nitric acid are the two major chemicals required for this purpose. Other use of caustic soda is for regenerating the de-bittering and de-acidification resins. Average consumption of caustic soda has been estimated to be 250 kg per day. Total consumption during the first processing season (at 70% capacity utilization) will be 16,333 kg which translates into a total cost of PKR 1.306 million at a rate of PKR 80 per kg. Average consumption of nitric acid is 150 kg per week. Total consumption of this chemical during the first processing season will be 1,400 kg. At a rate of PKR 100 per kg, total cost of nitric acid comes out to be PKR 0.14 million.The other input for carrying out laboratory work is the consumable apparatus. It is assumed that all the apparatus will be consumed during a year and new apparatus will be procured each year. Thus the apparatus cost of PKR 49,580 has been included as the operating cost; growing at 8% per annum. Detailed chemicals and lab cost calculations are shown in Annex IV-C. On this basis, the total cost of chemicals and lab for the first year of plant's operation at 70% capacity utilization was worked out to be PKR 1.85 million.

10.6.4 Furnace Oil

Steam is an important input in the manufacturing process of FCKJ. It is mainly used for pasteurization of the juice and concentrating it through multistage evaporation. The fuel used in boiler to generate steam is furnace oil. Average furnace oil consumption for producing FCKJ at full capacity is 6.16 tons per day. At 70% capacity utilization for the first year, total consumption of furnace oil comes will be 402.4 tons which translates into a cost of PKR 24.15 million at an average rate of PKR 60,000 per ton of furnace oil. Detailed calculations are provided in Annex IV-D.

10.6.5 Packaging Cost

Two types of packaging are required for the FCKJ, Peel oil and Kinnow pulp. The product is filled into food grade polyethylene bags which are then placed in food grade steel drums. To ensure that quality of the product is not affected, two polybags are used in each drum. This ensures that even if one bag is damaged, the product still remains safe from microbial attack. Kinnow waste peel is loaded onto the trolleys in bulk and transported to the customers. There is no packing cost for that.

Average weight of FCKJ loaded into a 210 liter drum is 270 kg. This means that for packing 1000 kg of the product the average number of drums required is 3.7. Two polybags are required per drum which means that 7.4 polybags are required per ton of FCKJ. Same factors apply to Kinnow pulp as well. However, for peel oil, these are different since the density of peel oil is lower than that of FCKJ. For peel oil, there will be requirement of 5 drums per ton and 10 polybags per ton.

The cost of steel grade drum is PKR 3,000 and that of polybags is PKR 350 per kg. With 3.7 bags per kg, the cost of one polybag comes out to be PKR 94.5. Using these values, at 70% capacity utilization during the first year of operations, total packing cost comes out to be PKR 40.38 million comprising of PKR 37.87 million for drums and PKR 2.51 million for polybags. Annual growth rate of packaging cost has been assumed to be 8%. Detailed packaging cost calculations are presented in Annex IV-E.

10.6.6 Electricity Cost

Electricity cost has been calculated on the basis of overall electricity connection of 1500 KVA as per the capacity utilization assumptions during each year. B3 industrial supply tariff has been applied to calculate the electricity bill. Total electricity load of the three sections of the plant and the number of kilowatt hours are provided in Table 34.

Plant Section	Load (KW)	Hours/day	KWH/day
Processing Section	602	20	12,044
Utility Section	349	15	5,235
Blast Freezer	90	18	1,620
Freezing Rooms	417	6	2,502
Total	**1458**		**21,401**

Table 34 – Electricity Load

Annual increase in electricity cost has been assumed to be 8%. Latest electricity tariff and electricity bill calculations are attached as Annex IV-F.

10.6.7 Depreciation/Amortization

Straight line depreciation method has been applied to calculate the associated cost. Different rates applied to different types of assets are shown in Table 35.

Asset	Depreciation Rate
Land	0%
Building & Civil Works	5%
Processing Machinery	10%
Utility Machinery	10%
Freezing Store Machinery	10%
Laboratory Equipment	10%
Office Equipment & Furniture	20%
Vehicles	20%

Table 35 - Depreciation Rates

Depreciation and amortization calculations are shown in Annex IV-G.

10.6.8 Human Resource Plan

The project will require human resource in all important functions. Staff will be placed at two locations; head office and processing facility. Overall management will be carried out by CEO who will be stationed at the head office. He will be managing the business operations through his procurement, production, quality assurance, marketing, administration, finance & accounts and engineering teams. Qualified operators will be engaged to operate the plant; whereas semiskilled labor will be engaged in fruit preparation and packaging activities. Total HR needs of the proposed business has been calculated to be 296 persons. Of these, 16 persons will be placed at head office and 280 at the plant in Sargodha. Total staff at plant consists of 180 unskilled/daily wage persons and 100 permanent staff. Some positions will be filled only for five months during the processing season. Hiring of weigh scale operators and additional security guards will be only for five months during the processing season; while the remaining employees will be retained during the whole year.

Consolidated human resource cost and split between production and non-production staff and between head office and plant staff is presented in Table 36 and Table 37.

HR Cost	Cost-Year 1 (PKR)
Production Staff Cost	42,495,000
Administration Staff Cost	18,360,000
Total	**60,855,000**

Table 36 - Human Resource Cost –Direct vs. Indirect

HR Cost	Cost-Year 1 (PKR)
Head Office Staff Cost	13,920,000
Processing Plant Staff Cost	46,935,000
Total	**60,855,000**

Table 37 - Human Resource Cost –Head Office vs. Plant

10.6.2.1.2 Kinnow Cost

Designation	No.	Salary (PKR/month)	Total (PKR/month)	No. of Months	Salary per Annum (PKR)
CEO	1	350,000	350,000	12	4,200,000
Admin & HR Manager	1	150,000	150,000	12	1,800,000
Finance & Accounts Manager	1	150,000	150,000	12	1,800,000
Admin & HR Officer	1	50,000	50,000	12	600,000
Accounts Officer	2	50,000	100,000	12	1,200,000
Marketing Manager	1	150,000	150,000	12	1,800,000
Marketing Officer	1	50,000	50,000	12	600,000
Procurement Officer	1	50,000	50,000	12	600,000
Security Guard	3	15,000	45,000	12	540,000
Driver	1	20,000	20,000	12	240,000
Office Boy	1	15,000	15,000	12	180,000
Sweeper	1	15,000	15,000	12	180,000
Gardener	1	15,000	15,000	12	180,000
Total Head Office Staff	**16**		**1,160,000**		**13,920,000**

Table 38 – Head Office Staff Details

10.6.8.2 Production Staff Cost Details

Designation	No.	Salary (PKR/month)	Total (PKR/month)	No. of Months	Salary per Annum (PKR)
Plant Manager	1	250,000	250,000	12	3,000,000
Admin Manager Plant	1	100,000	100,000	12	1,200,000
Admin Officer Plant	1	50,000	50,000	12	600,000
Accounts Officer Plant	3	50,000	150,000	12	1,800,000
Shift Incharge	3	70,000	210,000	12	2,520,000
Plant Operator	30	25,000	750,000	12	9,000,000
Quality Assurance Manager	1	150,000	150,000	12	1,800,000
Quality Assurance Officer	2	70,000	140,000	12	1,680,000
Lab Assistant	3	25,000	75,000	12	900,000
Engineering Manager	1	150,000	150,000	12	1,800,000
Electrician	3	25,000	75,000	12	900,000
Boiler Engineer	1	60,000	60,000	12	720,000
Boiler Operator	3	25,000	75,000	12	900,000
Cold Storage In charge	1	70,000	70,000	12	840,000
Cold Store Operator	3	25,000	75,000	12	900,000
Fitter/Welder	6	25,000	150,000	12	1,800,000
Unskilled Worker	180	14,000	2,520,000	3.5	8,820,000
Fruit Procurement Manager	1	100,000	100,000	12	1,200,000
Fruit Procurement Officer	2	50,000	100,000	12	1,200,000
Weigh Scale Operator	3	25,000	75,000	5	375,000
Storekeeper	1	50,000	50,000	12	600,000
Store Officer	1	25,000	25,000	12	300,000
Office boy	3	15,000	45,000	12	540,000

Table 39 – Production Staff Details

Designation	No.	Salary (PKR/month)	Total (PKR/month)	No. of Months	Salary per Annum (PKR)
Security Guard Permanent	8	15,000	120,000	12	1,440,000
Security Guard Seasonal	12	15,000	180,000	5	900,000
Driver	2	20,000	40,000	12	480,000
Sweeper	2	15,000	30,000	12	360,000
Gardener	2	15,000	30,000	12	360,000
Total Plant Staff	**280**		**5,845,000**		**46,935,000**

Table 39 – Production Staff Details

10.7 Financial Feasibility Analysis

10.7.1 Key Financial Assumptions

No. of Projection Years 10

Discount Rate used for NPV 18%

10.7.2 Financial Feasibility

The project of manufacturing FCKJ is found to be financially feasible. Financial feasibility results are summarized in Table 40.

IRR	**29.60%**
NPV (PKR)	**376,806,417**
Payback Period (years)	**3.59**

Table 40 - Financial Feasibility Results

10.7.3 Profitability Ratios

	Amount (PKR)	Percent
Sales	648,420,136	100.0%
Cost of Sales	279,855,032	43.2%
Gross Profit	368,565,104	56.8%
Operating Costs	114,636,752	17.7%
Earnings Before Interest and Taxes	253,928,352	39.2%
Net Profit	**165,053,429**	**25.5%**

Table 41 – Profitability Ratios

10.7.4 Breakeven Analysis

Breakeven capacity is calculated to know the operational capacity required to fully recover the project's fixed costs. Direct costs include all those variable costs which are directly related to the production of FCKJ. These costs are incurred only when the plant is operational. These include the costs of Kinnow, chemicals, furnace oil, packing materials, direct payroll, direct electricity and maintenance. The difference of revenues and direct costs is the gross profit of the business.

Indirect or fixed costs are the ones which are not directly related to FCKJ production. These are incurred irrespective of the fact whether plant is operational or not. These include administrative payroll, fixed electricity, depreciation, amortization, marketing, office maintenance, licensing, regulatory/legal/audit fees, insurance, vehicle fuel and maintenance and any miscellaneous costs. Subtracting indirect costs from the gross profit generates the net profit of the business. Breakeven calculations for first year of business operations are provided in Table 42.

	Year 1
Revenues (PKR)	648,420,136
Direct Costs (PKR)	279,189,032
Gross Profit (PKR)	369,231,104
No. of Units sold (Tons FCKJ)	3,332
Unit Revenue (PKR/Ton FCKJ))	194,604
Unit Variable Cost (PKR/Ton FCKJ)	83,790
Unit Contribution Margin (PKR/Ton FCKJ)	110,814
Fixed Costs (PKR)	**114,636,752**
Breakeven Capacity (Tons FCKJ)	1,035
Breakeven Capacity (Tons Kinnow)	12,171
Breakeven Capacity (Tons Kinnow/Day)	130
Total Available Capacity (Tons Kinnow/Day)	600
Breakeven Capacity %	**21.7%**

Table 42 – Breakeven Capacity

The unit contribution margin (UCM) of FCKJ is PKR 110,814 which is the difference between the unit revenue and unit variable cost. Dividing the project's fixed costs by UCM gives the breakeven volume of the business.

It is seen that in order to fully recover the project's fixed costs, at least 1035 tons of FCKJ has to be produced during the season of 93.3 days. This production in terms of Kinnow processed is 12,171 tons; obtained by dividing the FCKJ production by 8.5%, the FCKJ yield. In terms of plant's per day capacity, at least 130 tons of Kinnow have to be processed per day to fully recover the fixed costs. This capacity as a percent of the installed capacity of 600 tons Kinnow per day is 21.7%. Thus for full recovery of project's fixed costs the plant has to operate at least at 21.7% capacity utilization. Detailed breakeven calculations are shown in Annex V.

21.7% breakeven capacity falls in the lower range which indicates that the business of FCKJ manufacturing is not risky in terms of recovering its fixed costs. In case the business sales fall due to reasons like market crunch, raw material shortages, etc. the fixed costs can be recovered even at low capacity utilization.