

Kinnow Processing Plant



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Summary

Kinnow is one of the best varieties of fresh mandarins. It is a rich source of vitamin C having high juice content with special flavor. The soil and climatic conditions in Pakistan have given it a unique flavor which distinguishes it from other comparable mandarins grown in the world. Winter in the plains of Punjab province provides an excellent atmosphere for this fruit and the resulting fruit is sweet and has a very distinct taste.

Citrus is one of the main fruit crops which contribute substantially to the national income. Pakistan is the tenth largest producer of Kinnow in the world (FAO STAT). Due to the inherent good quality of taste, foreign fruit vendors generally prefer Kinnow from Pakistan.

The problems associated with Kinnow export include low produce quality, lack of storage facilities, non-availability of quality packing, poor transportation facilities, high freight charges, weak role of export promoting agencies and inconsistent government policies.

The Kinnow processing project of 10 tons of Kinnow per hour on area of 2 acres needs a capital investment estimated at Rs. 19.81 million for construction, purchasing machinery and equipments. In addition to this, a sum of Rs. 50.40 million is required as working capital, which would be used for purchasing of raw material. The total project cost is estimated at Rs. 70.21 million. This project suggests a plant with capacity of processing 10 tons of Kinnow per hour. This means, that for a total season of 135 days, a total of 10,800 tons of Kinnow can be processed, if the plant runs at 8 hours per day.

The estimated income varies from 24 million to 44 million per annum from first to tenth year of the project. This is a profitable business enterprise due to continuous increasing demand of Pakistani Kinnow in the international market.

1. Introduction

Pakistan is blessed with an ideal climate for growing a wide range of fruits. Horticulture is an important sub-sector of agriculture and plays a vital role not only in renaissance of rural economy but also in improving human nutrition which is often deficient in ingredients such as vitamins and minerals. Kinnow is the most delicious variety of citrus and was first developed by H. B. Frost at the Citrus Research Centre of the University of California, Riverside, USA. It is a hybrid of two citrus cultivars "King" (*Citrus nobilis*) x "Willow Leaf" (*Citrus deliciosa*). In 1940, Punjab Agriculture College and Research Institute, Faisalabad Pakistan, introduced the kinnow. Citrus is a prized fruit of Pakistan and holds number one position among all fruits both in area and production in the country. Its cultivation is spread throughout the world on both sides of equator. The quality of the citrus fruit varies in different regions.

The kinnow fruit is large, with 12 to 25 seeds and a globular shape. It matures in January or February. This "easy peel" citrus has assumed special economic importance and export demand due to its high juice content, special flavor, and as a rich source of vitamin C. The factors which have contributed to the success of this fruit are its beautiful golden-orange color, its abundant juice, and its excellent aroma and taste. The soil and climatic conditions in Pakistan have given the Kinnow a unique flavor which distinguishes it from other comparable mandarins grown in the world. Kinnow is one of the best varieties of fresh mandarins. Ideal conditions for growing kinnow include abundance of water, rich nitrogen content in the soil and relatively cool weather. Winter in the plains of Punjab province provides an excellent atmosphere for this fruit and the resulting fruit is sweet and has a very distinct taste.

Citrus is one of the main fruit crops which contribute substantially to the national income. Pakistan is the tenth largest producer of Kinnow (mandarin) in the world (FAO STAT). Due to the inherent good quality of taste, foreign fruit vendors generally prefer Kinnow from Pakistan. It has become an important variety in the Punjab province occupying a major part of the area under cultivation for fruit crops i.e. 465 thousand acres in 2009-10. Its production has increased overtime. Overall production of citrus in Pakistan was 1898 thousand tons in 2001 and has increased to 2150 thousand tons in 2010 (Agricultural Statistics of Pakistan 2009-10). According to an estimate proximately 95 percent of the total Kinnow produced all over the world is grown in Pakistan. At this point Sargodha is the main citrus producing district, with about 23 per cent of Pakistan's total citrus plantings.

The high seed content of Kinnow is a major hindrance in out-of-hand eating. Some researchers have made efforts to select seedless kinnows by survey or by the use of mutants. The seeds of kinnow are naturally diploid or tetraploid. Seedless triploid varieties have been developed, but these are still undergoing testing to ascertain whether the fruit is healthy for consumption.

Table 1: Citrus Area under cultivation for last 10 Years

(Area '000' Acres)

YEAR	Punjab	Sindh	Khyber Pakhtoonkhaw	Balochistan	PAKISTAN
2000-01	463.58	9.64	11.86	5.93	491.01
2001-02	452.75	10.18	11.1	5.95	479.97
2002-03	421.99	10.09	10.59	5.97	448.65
2003-04	411.64	10.24	10.87	3.3	436.06
2004-05	429.82	10.38	10.76	3.31	454.26
2005-06	449.96	10.87	10.99	3.31	475.13
2006-07	452.83	11.05	10.25	3.31	477.45
2007-08	467.46	11.13	10.76	3.31	492.66
2008-09	468.98	11.12	10.47	3.5	494.07
2009-10	465.06	11.12	10.63	3.46	490.27

Source: Agricultural Statistics of Pakistan.

Table 2: Province Wise Citrus Production for Last 10 Years

(Production '000' Tonnes.)

YEAR	Punjab	Sindh	Khyber Pakhtoonkhaw	Balochistan	PAKISTAN
2000-01	1813	30.9	40.2	13.6	1897.7
2001-02	1751.04	28.08	37.5	13.7	1830.32
2002-03	1623.56	27.73	38	13.06	1702.35
2003-04	1688.66	28.56	37.23	5.89	1760.34
2004-05	1872.25	28.56	36.82	6.04	1943.67
2005-06	2385.15	29.47	37.65	6.12	2458.39
2006-07	1400.75	31.48	34.44	5.81	1472.48
2007-08	2219.32	30.86	35.87	8.42	2294.47
2008-09	2059.51	30.53	33.83	8.41	2132.28
2009-10	2077.5	30.5	35.1	6.9	2150

Source: Agricultural Statistics of Pakistan.

2. Project Cost

This project suggests a plant with capacity of processing 10 tons of Kinnow per hour. This means, that for a total season of 135 days, a total of 10,800 tons of Kinnow can be processed, if the plant runs at 8 hours per day.

The Kinnow processing project of 10 tons of Kinnow per hour on area of 2 acres needs a capital investment estimated at Rs. 19.81 million for construction, purchasing machinery and equipments. In addition to this, a sum of Rs. 50.40 million is required as working capital, which would be used for purchasing of raw material. The total project cost is estimated at Rs. 70.21 million.

3. Export Prospects

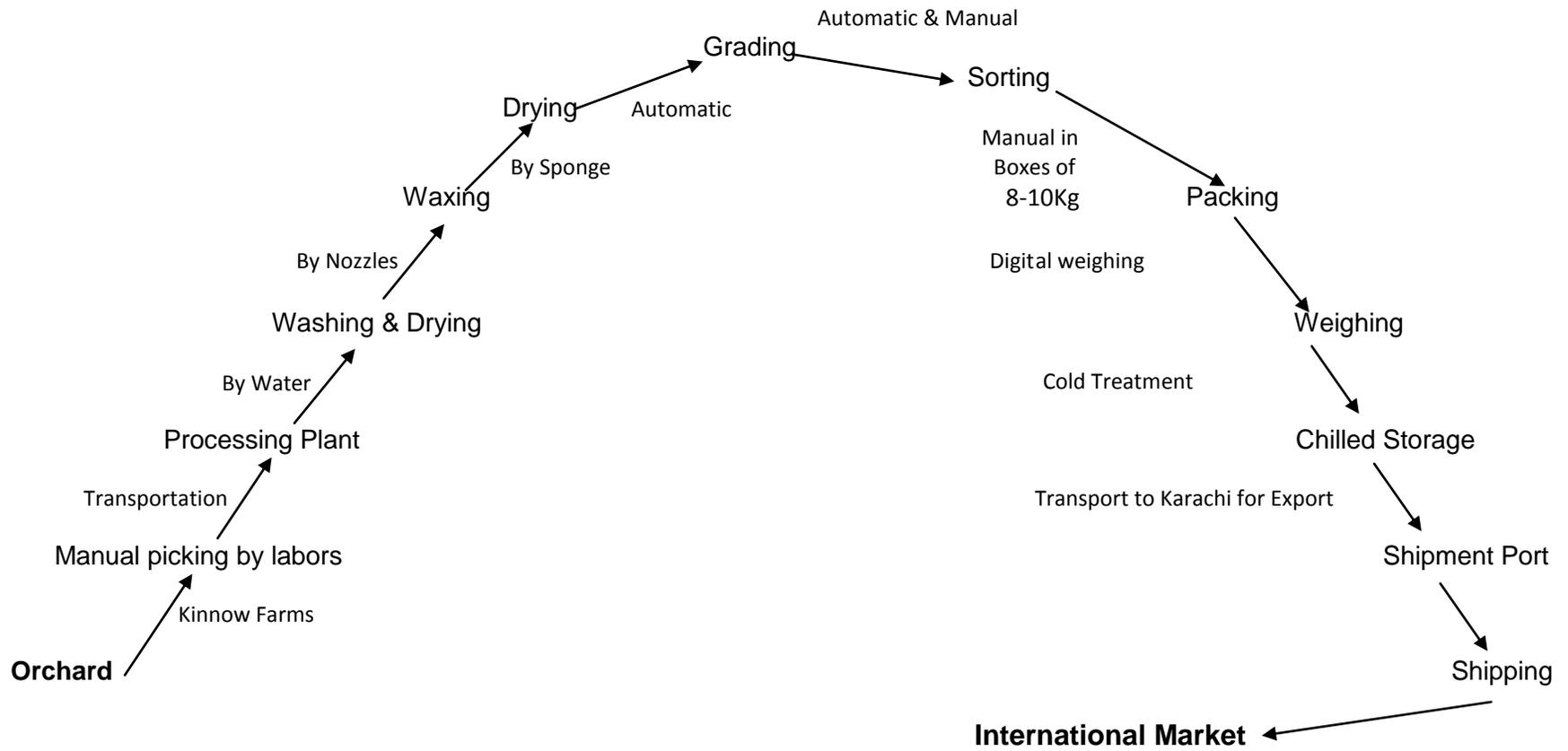
Pakistani kinnow has enormous demand in the international markets. Most of the target export markets of the Pakistani kinnow are those of developing countries. Only 2.6 percent of kinnow exports target the markets of developed countries, which is due to the emerging demand for seedless kinnow by the developed countries. About 61 percent of total world exports of oranges and mandarins are of seedless varieties. Some important export markets for kinnow are: Bahrain, Dubai, Kuwait, Oman, Qatar, Saudi Arabia, Indonesia, Malaysia, Afghanistan, Netherlands, Philippines, Singapore, the United Kingdom and Vietnam.

Importance of exports in the development of an economy cannot be denied. This is particularly true in case of a developing economy like Pakistan. Export of fruits is mainly concentrated in citrus. The commodity concentration and the supply side fluctuations in fruit exports are known to have serious consequences for overall export earnings. Horticulture is 5% of Pakistan's agriculture GDP. Citrus fruit is 14% of the horticulture. Pakistan is exporting Kinnow to various countries. In 2008-09 Pakistan was the fifth largest exporter of citrus.

4. Harvesting

Kinnow harvesting starts when the fruit's external color becomes orange, from December to February. The best harvesting time is mid-January to mid-February, when the fruit attains a TSS/acid ratio of 12:1 to 14:1. The fruit quality declines in later pickings. Fruits are harvested by clipping the stem with the help of sharp clippers (secateurs). The stem is cut as short as possible to avoid mechanical injury to the fruit in packing and transits. As it is a comparatively loose rind fruit, harvesting by pulling fruits with one's hands is avoided.

5. Flow of Kinnow Processing Plant



6. *Quality and Standards*

Pakistani exporters have a keen eye on the fruit coming from the farms. They recognize blemish and fruit fly free fruit with shiny appearance after processing as the primary parameters of quality assessment thus ignoring the interior of fruit. They also describe high grain weight (means high juice content), and strong fruit as quality parameters. In the same way importers also determine these parameters. Another key thing is the packing. Currently the exporters are concentrating on using card board boxes instead of wooden boxes as demanded by the importers. Exporters try hard to maintain quality. In fact they make serious attempts to raise quality by hiring of skilled manpower and making occasional improvements in picking, washing, waxing and grading practices. Some have purchased new blast chillers and processing line. Few exporters have established new control atmosphere (CA) store in addition to increasing cool storage facility. Some processors who have their personal farms have improved farm management and also have got Global-GAP certifications for their farms. Another important measure taken by the exporters is the informative lectures to the farmers on farm management to maintain the fruit quality.

7. *Problems of Citrus Processing Industry*

The industry is currently facing following inherent problems:

1. Yield fluctuations, commonly known as alternate bearing phenomenon (low yield in alternate year).
2. The citrus industry as a whole is still underdeveloped with lack of competitiveness.
3. Poor management during harvesting, transportation, packaging, and storage are major causes to the small export market.
4. Pakistani kinnow has a great demand in international market but a higher number of seeds are one of big constraint.
5. Moreover kinnow has the longest growing period and is a late maturing variety with short crushing and processing period.
6. The growers suffer from poor quality and low producing seedlings purchased from the unspecified nurseries.
7. Inadequate research and development facilitates and unavailability of internationally accredited labs is a major drawback to the fruit export market of Pakistan.
8. The Citrus Processing Industry is labor intensive and facing critical labor shortage of skilled workers.

9. Increasing attacks of various fruit diseases and imbalanced fertilization also hinder the production of quality fruit.
10. Load shedding and high tariff of electricity is also a major obstacle in citrus fruit processing.

8. Raw Material

Table 3: Raw Material

Description	Price Rs.
Kinnow average price per season (per kg)	20
Medicated Wax (per litre)	470
Diesel (per Litre)	94
Cardboard carton for packaging (each)	70
Dividers – 3 ply water proof for packing (each)	2.50

9. Cold Treatment

Cold Treatment is the part of kinnow processing. In context of WTO regime, the exporters/processors have to comply with the sanitary or phyto-sanitary standards for fruit export. However at least 72 hrs is mandatory or recommended under the temperature of 2C^o to 4C^o to increase the shelf life of kinnow or to sustain the quality of kinnow for a stipulated period. All the exporters do not have the cold storage facility in their premises so they need to avail the rental facility for cold treatment.

10. Human Resource Requirements

Table 4: Production Staff for 5 Months

		Salary/Month	Annual Salary
Positions	Number	(Rs)	(Rs)
Processing Plant Operator	1	5,000	125,000
Helper	5	10,000	250,000
Direct Labour (skilled)	40	8,500	1,700,000
Supervisor	1	20,000	100,000
Total Payroll (Production Staff)	47		2,175,000

Table 5: Permanent Staff

Skilled machine mechanic	1	10,000	120,000
Accounts/store clerk	1	15,000	180,000
Security Guards	2	8,500	204,000
Total Payroll (Admin Staff)	4		504,000

The Kinnow processing plant requires production staff for five months only consisting mostly labour for manual sorting, loading and packing jobs etc.

11. Equipments and Machinery Requirements

Table 6: Equipments and Machinery

Processing Machinery	Quantity	Cost/Machine	Total
Kinnow Washing, Waxing & Grading Plant	1	3,000,000	3,000,000
Plastic Baskets	3,800	450	1,710,000
Generator 50 KVA	1	850,000	850,000
Machine installation cost			30,000
Electric Wiring			25,000
Total Cost of Processing Machinery			5,615,000

The Kinnow processing units/plants are locally manufactured at village Hujjan, Tehsil Kotmoman District Sargodha.

12. Land & Building

Table 7: Land Requirement

Land	Per Acre Cost	Total Cost Rs.
2 Acre	1,800,000	3,600,000

Table 8: Building Requirement

	Area (Sq. Ft)	Construction Cost	Total Cost
Production Hall (150*65)	9,750	900	8,775,000
Stores (15*16)	240	500	120,000
Labour living Rooms 6 (15*14)	1,140	650	741,000
Store cum Generator Room	100	500	50,000
Management Office (15*12)	180	1,200	216,000
Wash Rooms	240	500	120,000
Total Construction Cost of Building			10,022,000

13. Project Detail

Account Head	Total Cost (Rs)
Land	3,600,000
Building and Civil Works	10,022,000
Plant and Machinery	5,615,000
Furniture/Fixture & Equipment	70,000
Pre-operational Expenses	500,000
Total Fixed Cost	19,807,000
Cash	1,000,000
Raw Material Inventory	600,000
Accounts Receivable	48,000,000
Up-Front Insurance Payment (year 1)	800,000
Total Working Capital	50,400,000

Total Investment	70,207,000
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Financing		Rs.
Equity	40%	28,082,800
Debt	60%	42,124,200

14. Projected Income Statement

	Rs.									
	Year-1	Year-2	Year-3	Year-4	Year-5	Year-6	Year-7	Year-8	Year-9	Year-10
Revenue	661,500,000	694,575,000	729,303,750	765,768,938	804,057,384	844,260,254	886,473,266	930,796,930	977,336,776	1,026,203,615
Cost of Goods Sold										
Kinnow Cost	216,000,000	226,800,000	238,140,000	250,047,000	262,549,350	275,676,818	289,460,658	303,933,691	319,130,376	335,086,895
Waxing Cost	9,450,000	9,922,500	10,418,625	10,939,556	11,486,534	12,060,861	12,663,904	13,297,099	13,961,954	14,660,052
Packing Cost	66,150,000	69,457,500	72,930,375	76,576,894	80,405,738	84,426,025	88,647,327	93,079,693	97,733,678	102,620,361
Picking & Transport Cost	28,350,000	29,767,500	31,255,875	32,818,669	34,459,602	36,182,582	37,991,711	39,891,297	41,885,862	43,980,155
Export & Freight Charges	283,500,000	297,675,000	312,558,750	328,186,688	344,596,022	361,825,823	379,917,114	398,912,970	418,858,618	439,801,549
Payroll (Production Staff)	2,175,000	2,283,750	2,397,938	2,517,834	2,643,726	2,775,912	2,914,708	3,060,443	3,213,466	3,374,139
Machine Maintenance	111,200	116,760	122,598	128,728	135,164	141,923	149,019	156,470	164,293	172,508
Direct Electricity	450,000	495,000	544,500	598,950	658,845	724,730	797,202	876,923	964,615	1,061,076
Diesel Cost	350,000	385,000	423,500	465,850	512,435	563,679	620,046	682,051	750,256	825,282
Total cost of sales	606,536,200	636,903,010	668,792,161	702,280,169	737,447,417	774,378,352	813,161,690	853,890,637	896,663,117	941,582,017
Gross Profit	54,963,800	57,671,990	60,511,590	63,488,769	66,609,967	69,881,902	73,311,576	76,906,293	80,673,659	84,621,598
Operating Expense										
Payroll (Admin)	504,000	529,200	555,660	583,443	612,615	643,246	675,408	709,179	744,638	781,869
Fixed electricity	50,000	55,000	60,500	66,550	73,205	80,526	88,578	97,436	107,179	117,897
Administrative Overheads	6,615,000	6,945,750	7,293,038	7,657,689	8,040,574	8,442,603	8,864,733	9,307,969	9,773,368	10,262,036
Amortization (Pre-operational Expenses)	100,000	100,000	100,000	100,000	100,000	-	-	-	-	-
Insurance Expense	850,000	754,820	690,001	650,123	605,312	598,031	512,053	485,231	450,325	425,315
Depreciation	1,069,600	1,069,600	1,069,600	1,069,600	1,069,600	1,069,600	1,069,600	1,069,600	1,069,600	1,069,600
Total	9,188,600	9,454,370	9,768,799	10,127,405	10,501,306	10,834,005	11,210,372	11,669,415	12,145,110	12,656,718
Operating Profit	45,775,200	48,217,620	50,742,791	53,361,364	56,108,661	59,047,897	62,101,205	65,236,878	68,528,549	71,964,880
Non-Operating Expense										
Interest expense on long term debt	1,534,567	1,159,804	959,783	792,356	469,872					
Interest expense on Running Finance	3,659,795	3,597,811								
Export Development Fund/WHT (1.3%)	8,599,500	9,029,475	9,480,949	9,954,996	10,452,746	10,975,383	11,524,152	12,100,360	12,705,378	13,340,647
Total	13,793,862	13,787,090	10,440,732	10,747,352	10,922,618	10,975,383	11,524,152	12,100,360	12,705,378	13,340,647
Earnings Before Tax	31,981,338	34,430,530	40,302,059	42,614,011	45,186,043	48,072,514	50,577,052	53,136,518	55,823,171	58,624,233
Tax	7,995,335	8,607,633	10,075,515	10,653,503	11,296,511	12,018,128	12,644,263	13,284,130	13,955,793	14,656,058
PROFIT AFTER TAX	23,986,004	25,822,898	30,226,544	31,960,509	33,889,533	36,054,385	37,932,789	39,852,389	41,867,378	43,968,175

15. Key Assumptions

Table 9: Production Assumptions

Capacity of processing plant (Tons/Hour)	10
Waste production (% of production)	12.5
Seasonal production capacity (100%)	10,800
Hours operational per day	8
Days operational per month	27
Day operational per season	135

Table 10: Expense Assumptions

Administrative Overhead (% of Total Revenue)	1
Electricity per Month for 5 Months (Rs)	90,000
Diesel per Month for 5 Months (Rs)	70,000
Transport & Picking Cost per kg (Rs)	3
Packing Cost per kg (Rs)	7
Machine maintenance cost (% of machine cost)	2

Table 11: Growth Related Assumptions

Electricity growth rate	10%
Wage growth rate	10%
Kinnow purchase price growth rate	5%
Machine maintenance growth rate	5%
Sales price growth rate per annum	5%

Table 12: Depreciation Assumption

Depreciation Method	Straight Line Method
Building depreciation rate	5%
Machinery & Equipment depreciation rate	10%
Office Equipment depreciation rate	10%
Furniture & Fixtures depreciation rate	10%

16. Disclaimer

The content of the information memorandum does not bind NBP in any legal or other form as the purpose of this report is to provide a general idea and information to NBP staff to assist them evaluate the feasibility reports submitted by the clients, and for the farmers and organizations interested to establish Kinnow Processing Plant. The data and info reported in this document is gathered from various sources and is based on certain assumptions. In spite of taking due diligence in compiling this report, the contained information may vary due to any change in any of the relevant factors e.g. agro-climatic conditions, plant management, market prices, inflation, export policies, energy crisis etc. and the actual results may differ substantially from the presented information. NBP does not assume any liability for any financial or other loss resulting from this document in consequence of undertaking this Project.