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IDENTIFICATION OF PRIORITY PROJECTS IN THE INDUSTRIAL SECTOR

UC/PAL/87/045

OCCUPIED PALESTINIAN TERRITORIES

Terminal report*

Prepared by the
United Nations Industrial Development Organization

Based on the work of a team of experts

Backstopping officer: Gabriel Rezek, Feasibility Studies Branch

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*This document has not been edited.

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PREFACE

The industrial sector in the occupied territories is still in its infancy and no significant changes took place under occupation. Most of the industrial enterprises are small, engaged primarily in the production of textiles and clothing, wood and its products, basic metals and metal products and leather and its products. It is reported that the industrial sector's contribution to GDP has been steadily falling during the past two decades, reflecting the impact of occupation. The Palestinian people are eager to reverse this trend and, hence, are seeking UNIDO's assistance. The Industrial Development Board adopted Conclusion 1985/13 on Technical Assistance to the Palestinian People, which in its Operative paragraph 6 states: "The Board requested UNIDO to identify priority projects necessary for the development of the industrial sector in the occupied Palestinian territories."

The purpose of this Project is to identify potential industrial projects in the occupied Palestinian territories and to prepare a project opportunity study for each which will ascertain its viability and potential for domestic processing and manufacture. The data and information in each project opportunity study should be adequate for the purpose of stimulating investor/interest and response.

The project was financed by UNIDO and sub-contracted to the Birzeit University in the West Bank.

C O N T E N T S PAGE

AN OPPORTUNITY STUDY

ON

LIVESTOCK FEED PRODUCTION PLANT

Based on the work of Ziad Khalaf,
Hanna Quffa and Odeh Shehadeh, UNIDO Experts

1. General Economic Data

1.1. Product characteristics and use: The proposed plant is designed for the production of crushed feed only. Pelletizing is not included, although it may be added at a later stage. Livestock production has always played an important role in the economy of the West Bank and Gaza Strip. The proposed plant is to produce a diverse array of nutritional livestock feed that is both seasonal (i.e., summer and winter feed) and for each animal group, several feed mixes are to be produced satisfying the nutritional need of each age group. For example, the broiler chicken feed is to encompass four different basic mixes. Mix number one is for chicks from the age of 1-18 days; mix number two is for chickens from 19-35 days old, mix number three is for chickens from 36-50 days old. A broiler fattening mix (number four) is to be used prior to slaughtering. The nutritional and energy contents of each mix are adjusted according to season for optimum output. The proposed plant is to produce broiler chicken feed; laying hens feed; feed for milking cows, goats, and sheep; feed for fattening of cattle, goats, and sheep. See Table 1. The produce is to be sold in sacks of 50 kg capacity or as ordered.

1.2. Justification for selecting the product: Although a total of ten livestock feed production plants do exist in the West Bank and Gaza Strip, a study published in 1985 by the Rural Research Centre at An-Najah University shows the accumulated local production of livestock feed to cover less than 20% of the total West Bank and Gaza Strip livestock feed need. Our own market research has not only reinforced this fact but showed Israeli products to be enjoying an increasing percentage of the market. The most important reasons behind this proposal are:

a. To meet the increasing demand. Preliminary estimates show an increase in livestock of 15% in 1988 as compared to the 1987 census.

b. To reduce local dependence on similar Israeli products.

c. The proposed plant is to be established in a locality lacking such a production facility. Specifically, in Bethlehem area, it can serve the entire southern region of the West Bank.

d. To up-grade the quality of local livestock feed products.

1.3. Product Specification: Each mix is to provide the specific livestock with the proper nutritional value, vitamins need, and if needed, antibiotics and other medications according to age group. Table 1 gives the average ingredients content for the different feed types.

Table 1: Average ingredients for each feed type in Kg.

Feed Type	No. of Feed Type	Ingredients: Corn	Sorghum	Soya	Barley	Bran	Calcium	Di-Cal. Phos.	Fish meal	Min. salt	Food salt	Oil	Vitamins	Zanthufite	Ilancoban
Broilers															
Winter Aveg. (kg)		101	573	254	-	-	10	18	5	3	-	35	3.5	-	-
Summer Aveg. (kg)	4	115	564	255	-	-	10	17	5	6	-	25	3	-	-
Average (kg)		108	569	254.5	-	-	10	17.5	5	4.5	-	30	3.25	-	-
Laying hens															
Winter Aveg. (kg)		214	447	231	-	21	9	16	2	3.5	-	15	4	0.25	-
Summer Aveg. (kg)	5	215	450	227	-	25	9	15	-	3.5	-	12	4	0.25	-
Average (kg)		214.5	448.5	229	-	23	9	15.5	1	3.5	-	13.5	4	0.25	-
Milking															
Winter Aveg. (kg)		180	-	210	460	120	15	5	-	-	10	-	1	-	-
Summer Aveg. (kg)	1	180	-	210	460	120	14	5	-	-	10	-	1	-	-
Average (kg)		180	-	210	460	120	14.5	5	-	-	10	-	1	-	-
Fattening															
Winter Aveg. (kg)		148	-	105	628	91	14	2.5	-	-	10	-	0.875	-	0.125
Summer Aveg. (kg)	4	148	-	105	628	91	14	2.5	-	-	10	-	0.875	-	0.125
Average (kg)		148	-	105	628	91	14	2.5	-	-	10	-	0.875	-	0.125

2. Market and Demand for Specific Product

2.1. Current and Projected Demand: According to a study published by the Rural Research Centre/An-Najah National University local livestock dependency on Israeli processed animal feed is increasing. It was estimated at 30% in 1979, increased to 40% in 1981, 72% in 1983, and now is estimated to constitute about 85% of all animal feed sold in the West Bank and Gaza Strip. This increased dependency is attributed to the following:

a. A drastic increase in livestock in the West Bank and Gaza Strip over the past few years caused a rise in demand for animal feed.

b. Better credit terms offered by Israeli manufacturers, who also enjoy government subsidy, and lower taxation provisions.

c. Sheeps and goats are increasingly dependent on feed instead of pasture land.

d. The local manufacturing plants are working at less than 20% of their productive capacity due to stiff competition and transportation costs. This also limits their market range.

Even if the local plants operate at their full productive capacity of 10,240 tons/month*, there would still be a shortage of 48,282 tons/month in meeting the local monthly consumption of animal feed.

The following tables give animal wealth and poultry census in the West Bank for 1987 as supplied by the department of veterinarian medicine. They also include the projected increase in livestock for 1988, which agricultural experts estimate at 15-20%. A 15% increase was used in our calculations.

*Source: Rural Research Centre/An-Najah National University.

Table 2: Animal Wealth Census for 1987 - West Dank

District	Cattle										Total Cattle	Ovines		
	Local					Friesian								
	Cows	H.C.	B.C.	Bulls	Total	Cows	H.C.	B.C.	Bulls	Total	No.	Sheep	Goats	Total
Nablus	1159	387	254	48	1848	1247	271	161	48	1727	3575	59130	24765	83895
Jenin	945	334	228	46	1553	277	75	52	5	409	1962	40295	22855	63150
Tulkarm	194	65	41	1	301	228	47	15	-	290	591	6731	2196	8927
Qalqilya	190	36	29	6	261	215	40	33	5	293	554	8455	2840	11295
Salfit	141	42	40	3	226	55	11	20	-	86	312	6442	10510	16952
Ramallah	217	55	32	2	306	185	54	62	8	309	615	32057	31666	63723
Bethlehem	-	-	-	-	-	57	20	21	2	100	100	21240	17940	39180
Jericho	-	-	-	-	-	251	180	13	3	447	447	13355	12345	25700
Hebron	212	104	79	2	397	101	46	43	4	194	591	96839	49200	146039
Total	3058	1023	703	108	4892	2616	744	420	75	3855	8747	284544	174317	458861
Estimated 1988 *	3517	1176	808	124	5626	3008	856	483	86	4433	10059	327226	200465	527690

Source: Department of Agricultural Veterinary Services

* Based on a 15% projected increase

Table 3: Poultry Census for 1987 - West Bank

District	Laying No. of Farms	Broiler No. of Farms	Mixed No. of Farms	Total	No. of Laying Hens	No. of Broilers per month
Nablus	4	48	-	52	7000	42000
Jenin	6	232	4	242	28500	246150
Tulkarm	8	154	7	169	29800	538700
Qalqilya	1	32	1	34	5000	90500
Salfit	1	18	3	22	9500	33400
Ramallah	23	195	4	222	106250	241150
Bethlehem	9	13	1	23	11400	22400
Jericho	-	11	1	12	1000	39000
Hebron	9	215	1	225	18770	269100
Total	61	918	22	1001	217220	1522400
Estimated 1988*	70	1056	25	1151	249803	1750760

Source: Department of Agriculture/Veterinary Services

* Based on a 15% projected increase

Table 4: Number of Livestock in Gaza Strip

Livestock Category	1985 Census	1986/87 Census	Estimated 1988 No.*
Broiler Chickens	1,800,000	2,800,000	3,220,000
Laying Hens	50,000	100,000	115,000
Local Sheep	17,180	20,000	23,000
Goats	11,700	11,000	12,650
Friesian Mothers	1,600	1,900	2,185
Friesian Calves	1,040	1,300	1,495
Local Mothers	100	-	-
Local Calves	260	-	-

Source: Rural Research Centre/An-Najah University

* Based on a 15% projected increase

Table 5 shows the quantity needed of livestock feed per month in the West Bank and Gaza Strip.

Table 5: Quantity of Animal Feed Consumed monthly in the West Bank and Gaza Strip

Livestock Category	Feed/day (kg)	Total No. of livestock Category	Monthly Consumption (tons)	Comments
Laying Hens	0.1	364,803	1095	100% feed
Broilers	0.8	24,220,000*	48440	100% feed
Sheep & Goats	3	563,340	4560	5% depend 100% on feed 50% partly dependent on feed
Assaf Sheep	3	20,000	1800	100% feed
Friesian mothers	8	6,135	1493	100% feed
Friesian calves	5	2,303	350	100% feed
Local mothers	8	4,947	602	50% feed
Local calves	5	1,194	182	50% feed

* Annually — Total 58,522 tons/month

With relation to future demand, agriculture experts estimate a 15% annual increase due to projected decrease in pastures both in quantity and quality and an increase in livestock

2.2. Sales Programme and Sales Revenue: For the purpose of assuring sales and working at the full production capacity of 32 tons/day, we suggest the establishment of a cooperative constituted mostly of livestock growers from the Bethlehem and Hebron areas, who will serve both as manufacturers and main consumers.

For the purpose of optimizing profit, the following proportions of products distribution are suggested: 50% broiler chicken feed, 20% laying hens feed, 15% milking feed, and 15% fattening feed. To assure competitiveness of the proposed plant's products, the quality should either equal or exceed that of similar Israeli products, that is why a quality control laboratory run by a specialized nutritionist is included in the proposed plant.

It is worthwhile to note that none of the existing local plants possess such a facility. Products prices should match market prices of similar Israeli and/or local products, depending on which is less expensive. A price break of 5% is suggested for the first year of operation.

Based on present market prices of products similar to those proposed, table 6 gives the average sale prices, quantity expected to be sold and total revenue for the proposed plant.

It also gives the sales revenue if the plant works at 50% of its production capacity, which is taken as the worst possible case, and upon which our calculations are carried out.

Table 6: Sales Revenue of the Proposed Plant

Feed Type	Price/Ton U.S.$	Sales at full Production (Tons/yr)	Sales Revenue 100%	Sales Revenue 50%
Broilers	386	4800	1,852,800	926,400
Laying Hens	344	1920	660,480	330,240
Milking	293	1440	421,920	210,960
Fattening	293	1440	421,920	210,960
Total		9600	$ 3,357,120	$ 1,678,560

3. Plant Capacity

The proposed plant is designed to produce 4 tons/hr. Operating on an 8 hour shift schedule, 300 days per year, the annual full production reaches 9600 tons/year. The plant may run two shifts or more per day if required by market demand. Two dunums of land and a building space of 200 m^2 are required.

4. Supply of Raw Materials and Other Inputs

4.1. Raw Material, Availability and Source: Most raw material ingredients will be imported through Israeli agents. The main sources are the United States and Europe. Some are available locally. Table 7 gives the quantities. prices, and sources of raw materials as required annually based on 50% of production capacity.

Table 7: Quantities,* Cost and Sources of Raw Materials

Raw Material	Annual Quantity (tons)	Unit Price ($/ton)	Annual Expenditure ($)	Source
Corn	713	183	130,479	
Sorghum	1823	168	306,264	
Soya	1072	472	305,984	
Barley	795	161	127,995	
Bran	177	140	24,780	
Calcium	38	62	2,356	
Dicalcium Phosphate	62	479	29,698	
Fish meal	14	970	13,580	
Mineral Salts & Vitamins	39	303	11,817	
Food Salt	15	43	645	
Zanthofite	0.24	7906	1,897	
Oil	86	539	46,354	
Total	4834.24		$ 1,201,849	

*Based on 50% of total production capacity

4.2. Utilities: The supply of electric power in 3-phase is readily available from the Jerusalem District Electricity Company. Annual consumption cost at 50% production capacity is estimated at 6200 dollars. Water is readily available at an annual cost of 360 dollars.

5. Approximate Location and Site

As mentioned before a total of ten animal feed processing plants exist in the West Bank and Gaza Strip. They are located in Nablus (5), Ramallah (3), Hebron (1), and Gaza (1).

The Bethlehem area was selected as the appropriate site for the following reasons:

1) Transportation costs coupled with Israeli competition have limited the existing plants to their immediate markets.

2) No such plant exists in the Bethlehem area, and only one plant, in Hebron,exists in the entire southern region of the West Bank.

3) Abundance of livestock in this region, and the increasing dependence on animal feed instead of pastures due to land confiscation and pasture depletion make the Bethlehem region a viable market.

6. Project Engineering

6.1. Process and Technology: The process of producing animal feed involves two basic steps. Crushing the raw material to the desired size according to feed type and a thorough mixing of the crushed and other ingredients to obtain a uniform and homogeneous product. The process includes the following basic steps:

1) Storage of raw material.

2) Crushing mill: A hammer type mill with the proper milling capacity was selected.

3) Storage of semi-finished products and other ingredients.

4) Weighing machine: through which the proper quantities are determined prior to mixing.

5) Mixer: A horizontal type mixer of the proper size and mixing time was selected. Mixing should ensure homogeneity. It is also equipped with a dust ventilation mechanism.

6) Quality control testing facility.

7) System for proper weighing and filling.

8) Storage area for finished products leading to loading dock.

6.2. Machines and Equipment: The following set of machines and equipment are needed:

1) One raw material dumping pit of capacity 20 tons, equipped with 1 screw conveyor of 16 cm dia., length as required by final design. Driven by a 2 HP electric motor.

2) Five raw material storage silos. Each of capacity 20 tons.

3) One hammer mill. Equipped with a feeding regulator and a 25 HP electric motor.

4) Five semi-finished material silos, each of 5 ton capacity.

5) One weight balance with a range from 0-1000 kg.

6) One horizontal type mixer, capacity 2000 kg., equipped with a 5 HP motor, having a mixing time of 5 minutes.

7) One screw conveyor with a 16 cm dia., length as required by final design and equipped with a 2 HP electric motor.

8) One weighing and filling machine.

9) One conveyor, 0.5 HP electric motor with a speed of 16 m/min. and a maximum conveying capacity of 32 ton/hr. Lifting height range between 1.65-3.00 m.

6.3. Flow Sheet: Figure 1 is a flow sheet of the proposed plant

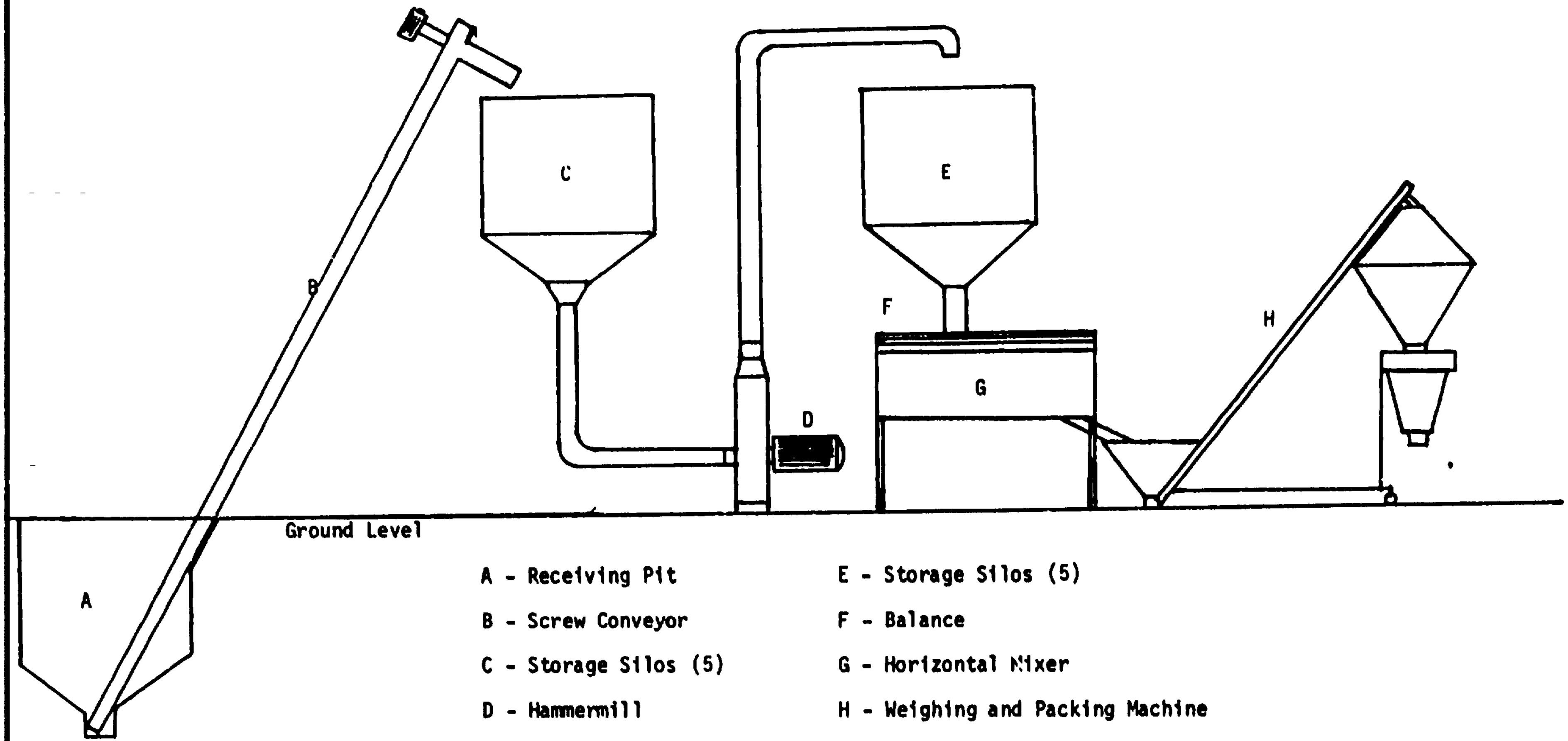


Fig. 1 - Plant Layout

7. Manpower and Management

The proposed plant is to have a total of six employees in the following categories - as shown in Table 8.

Table 8 - Manpower needed for the Project

Job title and number	Monthly Salary $	Qualifications
1 Director	600	B.Sc. in agricultural engineering
1 Accountant	500	B.A. accounting
4 Production laborers	1400	None required
Nutritionist	500	Lab technician/nutrition
Total monthly salaries	$ 3000	

8. Project Scheduling

Figure - 2

No. of Months / Job	1	2	3	4	5	6	7	8	9	10	11 12	13 14	15 16	17 18
Feasibility Study														
Investment Group	1		3											
Registration and licensing			3		5									
Purchase of land					5		7							
Construction							7			10				
Equipment Order and Installation									9			14		
Raw material order											12	14		
Training												13	15	
Production													15	

9. Financial Analysis

The financial analysis for the proposed project is based on estimates of revenue from section two above, cost of investment, and cost of production follows:

9.1. Investment Costs: The total estimated investment for the proposed project appear below in Table 9:

Table 9 - Investment Costs

Working Capital	$ 140,000
Equipment and Machinery	170,000
Building	30,000
Land	28,000
Organizational Costs	20,000
Total	$ 388,000

Working capital was calculated at 10% of total production costs and other expenses in addition to safety cash. More than 90% of the working capital is inventory of raw materials. Equipment and machinery costs include installation. Organizational costs include incorporation fees calculated at 0.01% of total investment in addition to lawyer's, accountant's, and consultant's fees.

9.2. Financing: Although the best form of business for the proposed project is that of a cooperative, they are nearly impossible to establish in the West Bank due to existing regulations. A private corporation in accordance with Jordan Corporate Law of 1964 with capital stock issued to the corporate customers would be the best possible business form.

Thus capital will be raised through the sale of capital stock of the corporation.

9.3. Production Costs and Other Expenses: The annual estimated costs of production and other expenses appear below in Table 10

Table 10 Production Costs and Other Expenses

		As a Percentage of cost	As a Percentage of sales
Prime Costs:			
Direct Materials (Table 7)	$1,201,849	89.4%	71.6%
Direct Labor	29,700	2.2%	1.8%
Other Costs and Expenses: (indirect materials and labor, utilities, maintenance, packing, selling and administrative expenses)	88,160	6.6%	5.2%
Depreciation and Amortization: (depreciation of plant property and equipment at 10% amortization of organizational costs @ 20%)	24,000	1.8%	1.4%
Total	$1,343,709	100%	80%

9.4. Commercial Profitability: The estimated net income after tax for the proposed project appear below. Table 11 is a condensed projected income statement.

Table 11 - Projected Condensed Income Statement

		As a Percentage of Revenue
Revenue (Table 6)	$ 1,678,560	100%
Cost (Table 10)	1,343,709	80%
Net Profit before Tax	334,851	20%
Tax Expense @ .385 *	128,918	
Net Profit after Tax	$ 205,933	12.27%

*Corporate Tax rate is 35% in addition to a 10% of the tax expense levied as a social welfare tax totalling to 38.5%.

9.4.1. Rate of Return: The simple rate of return on the total investment for the proposed project is calculated as follows:

$$\text{Rate of Return} = \frac{\text{Net Profit after Tax}}{\text{Total Investment}}$$

$$= \frac{205,933}{338,000}$$

$$= 53.1\%$$

An alternative way to calculate rate of return would be using a Dupont system which combines profit margin, with total assets turn over ratio, thus:

$$\text{Rate of Return} = \frac{\text{Total Revenue}}{\text{Total Investment}} \times \frac{\text{Net Profit after Tax}}{\text{Total Revenue}}$$

$$= \frac{1,678,560}{383,000} \times \frac{205,933}{1,678.560}$$

$$= 4.33 \text{ (times)} \times 12.27$$

$$= 53.1\%$$

9.4.2. Pay Back: The estimated amount of time required to recover the total investment for the proposed project can be calculated as follows:

$$\text{Pay Back} = \frac{\text{Total Investment}}{\text{Net Profit after Tax + Depreciation}}$$

$$= \frac{388,000}{205,933 + 24,000}$$

$$= \frac{388,000}{229,933}$$

$$= 1.69 \text{ years}$$

Thus the estimated time to recover total investment is one year and eight months.

10. Conclusions and Recommendations

The analysis of the proposed project shows an excellent rate of return exceeding 50% with a very good total assets turn over ratio at 4.33 times and a very short pay back period of one year and eight months. Profit margin for the proposed project is 12.27% and can be increased by increasing market share to reach full capacity. A cooperative form of operation will hold the market share for the proposed project and guarantee future expansion. The total investment is relatively small which would make it possible to raise the capital locally.

The project also being an agro-based industry is essential for the overall development of the West Bank and Gaza Strip.

In our opinion a more detailed study should be done to aid in the practical steps needed to implement this project. No need for a feasibility study due to the low amount of investment required for the proposed project.

AN OPPORTUNITY STUDY

ON

CABLE AND WIRE MANUFACTURING PLANT

Based on the work of Dr. Abdel Ruhman Hamad and
Dr. Said Haifa, UNIDO Experts

1. Cable and Wire Manufactory

1.1. General Consideration: Development of sources of energy to accomplish useful work is the key to the industrial progress which is essential to the continual improvement in the standard of living of people everywhere. To make energy available wherever needed, and to convert energy from one form to another and use it without creating the pollution which destroys our biosphere are among the greatest challenges facing the world today. The electrical power system is one of the means for converting and transporting energy which is playing an important role in meeting this challenge. For example, when electricity is supplied to a light bulb or incandescent lamp, its electrical energy changes into light. An electric motor converts electricity to mechanical energy. A hot plate changes electricity into heat energy... All of these devices, the light bulb, the electric motor, the hot plate, must be connected to an electric power source by suitable wires and/or cables before they can work, Fig. 1.

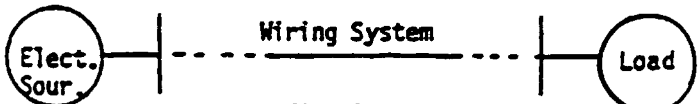


Fig. 1

So, the primary function of wires and cables is to carry electrical energy reliably between electric sources and utilization equipment.

1.2. Product Characteristics and Uses: This project aims at producing copper cables and wires, PVC insulated and/or sheathed, mainly non-armoured, to meet all the needs of the West Bank and Gaza Strip market. The main types of conductors to be produced can be classified as:

A. Soft Copper Conductors:

1) Insulated single core conductor
2) Insulated multicore round cables
3) Insulated multicore flat cables

Use: The first item is used in equipment wiring, lighting fittings, distribution in conduits. Rated voltage is 450/750 volts, 50 HZ.

The second and third items are used for installation on, in, or under mortar in dry and wet places, but not directly underground. Rated voltage is 500 volts, 50 HZ.

B. Flexible Cables and Cords:

1) Insulated single core conductor
2) Insulated multicore round cords
3) Domestic cords
4) Tough neoprene sheathed cables

Use: In all jobs which need flexibility such as mobile units, job site equipment, motors, pumps, household appliances, etc. Rated voltage is 450/750 volts, 50 HZ.

C. Underground Power Cables:

1) Circular copper conductors, non-armoured

2) Circular aluminium conductors, non-armoured

Application: In buildings and ducts as well as in air and in ground with mechanical protection to withstand damage if needed. Rated voltage is 0.6/1 KV, 50 HZ.

D. Telephone and T.V. Cables:

These types of conductors will cover more than 80% of the needs in the West Bank and Gaza Strip for domestic, industrial, and commercial electrical installations, whereas the other 20% will be covered by different types of conductors not mentioned here.

1.3. Justification for selecting the product: The West Bank and Gaza Strip are considered to be underdeveloped areas. However, electricity demand in these areas has been increasing rapidly for use in homes, commerce, and industry. Electrical energy has to be transported from the electrical source to the point of use, loads, by means of wires and/or cables. Currently, quantities needed per month in the West Bank and Gaza Strip are around 1654.2 km of multi-core conductors, 3356 km single-core conductors, 226 km telephone cables, and 540 km T.V. cables. As there are no wires or cables manufactured in the areas under consideration, all the needed conductors are imported from Israeli companies. The need for having a cable making plant either in the West Bank or in the Gaza Strip is essential for progress in the areas.

2. Market and Demand

The outcome of market survey on the most widely used conductors in the West Bank and Gaza Strip according to conductor size is tabulated in Table 1. According to the market survey, the present demand in the West Bank and Gaza Strip is 1654.2 km/month of multi-core conductors, 3356 km/month of single-core conductor, 226 km/month of telephone cables, and 540 km/month of T.V. conductors.

Table 1-A. 1988 Demand for PVC Insulated Single-core soft copper conductor

Nominal area of conductor mm^2	Approx. outer diameter mm.	Approx. weight kg/km	Current rating at 25°C, amps	Quantity km/month
1.0	2.6	15	12	220
1.5	2.9	20	16	1800
2.5	3.5	30	20	960
4	4.2	50	25	108
6	4.8	70	35	216
10	6.7	115	48	36
16	7.5	170	65	6
25	9.3	270	88	5
35	10.5	365	110	5
			Total	3356

The projected demand depends on the outcome of the political situation in the West Bank and Gaza Strip. A change in the political conditions will lead to a substantial change in the quantities demanded.

Table 1-8. 1988 Demand for PVC Insulated and Sheathed Multi-core Conductors

No. of cores & nominal area of conduc.mm^2	Approx. over all dimen. mm	Approx. weight kg/km	Current rating at 25°C amps.	Quantity km/month
2 * 0.5	7	50	2	230
3 * 0.5	7.5	55	2	188
2 * 0.75	8.6	45	12	50
3 x 0.75	9.2	60	12	180
2 x 1.0	8.0	65	16	154.3
3 x 1.0	9.6	70	16	180
3 x 1.5	10.2	85	20	360
4 x 1.5	11.0	160	20	7
5 x 1.5	12.5	190	20	7
3 x 2.5	11.5	190	27	36
4 x 2.5	12.5	230	27	11
5 x 2.5	13.5	270	27	7
3 x 4	13	265	36	7
4 x 4	14.5	320	36	7
5 x 4	16.5	380	36	7
3 x 6	22	490	47	80
4 x 6	23	610	47	7
5 x 6	24.6	745	47	11
3 x 10	25.5	760	65	33
4 x 10	27.5	960	65	25.2
5 x 10	29.7	1180	65	14.5
3 x 16	28.5	1100	87	23.4
4 x 16	32	1350	87	28.8
			Total	1654.2

According to the above figures and knowing the current price per item, the estimated annual sales revenues for the suggested factory is $ 23,032,970. Table 2 represents the total quantity of wires and/or cables demanded in the occupied territories, as well as the total monthly revenue.

Table 2 - Sales Program of the Proposed Factory

Type	Sizes - Cross-sectional Area mm^2	Quantity/ month km	Average Price $/m	Total Value $/month
1. Single-core conductor	1.0, 1.5, 2.0, 5.0, 4.0, 6.0, 10.0, 16.0, 25.0, 35.0	3,356	0.103	345,668
2. Multi-core conductor	2.*0.5, 3.*0.75, 3.*1.0, 2.*1.5, ..., 3.*16, 4.*16., 5.*16	1,654.2	0.861	1,424,266.2
3. Telephone cable	1.0*2.0*.06, 2.0*2*0.6, .., 50.*2.*0.6	226	0.26	58,760
4. T.V. cables	0.4, 0.28	540	0.168	90,720
Total		5,776.2		$ 1,919,414.2

3. Plant Capacity

The annual capacity is expected to be 69,314.4 km of different types of copper cables and wires. This output requires about 4,593.6 tons of copper for single and multi-core electrical conductors plus 406.4 tons of copper for telephone and T.V. cables. Therefore, the net required amount of copper is 5,000 tons annually. In addition, 2,750 tons of insulators are needed. Assuming 312 working days/year, 16 hrs/d y, the factory has to produce 222.16 km/day of different types of cables and wires or 13.885 km/hr. The factory sales revenue at capacity production is $ 4,614 per hr. The factory can also be used to treat overhead transmission aluminum conductors. 720 tons of aluminum is needed annually to cover the expected demand for aluminum conductors.

4. Supply of Raw Material and Other Inputs

Usually, wires are made of copper due primarily to its desirable electrical and mechanical properties, although aluminum is also used mainly because of its favorable conductivity-to-weight ratio. The two materials, copper and aluminum are not available locally, and must be imported from abroad, such as from East or West Europe.

The estimated need of copper/year is 5,000 tons, and of aluminum 720 tons/year. The raw material for insulation such as natural rubber, neoprene, and PVC compounds can be imported from Europe, namely Italy. The estimated needs of insulating material is 2,750 tons/year. Wooden drums are needed, especially for packing the cables. These drums can be produced locally under given specifications. Electricity is also needed for the proposed plant. So, step down transformers, switch gears, distribution and control panels, test equipment and a quality control panel have to be installed on the site of the proposed plant.

5. Location and Site

There is no definite location to be recommended for the proposed plant. However, it will be proper to locate this project in the Gaza Strip due to economic considerations. As a result, the living conditions of many families in the Gaza Strip would be improved.

6. Project Engineering

6.1. Process and Technology: The manufacturing of an electric wire or cable may be classified into five major processes:

a) Drawing Process: The conducting material, either copper or aluminum, has to be drawn into the specified cross-sectional area using a drawing machine. This process is essential especially for stranded cables or wires, Figure 2.
An annealing process is not required for this type of product.

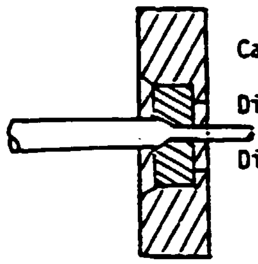


Fig. 2

b) Transposition Process: In this process a number of strands will be transpositioned in a spiral wrapping way to form a compact cable according to the desired specifications.

c) PVC Insulation and Sheathing Process: In this process extrusion of insulation and sheath is carried out using a suitable extrusion machine. The conductor to be covered or the core or cabled cores to be sheathed pass through a core tube supported co-axially within the head and located concentrically with the die by a tapered extension to the core tube. Cold feeding of the compound either in ship or strip form, to machines with length-diameter ratio of the scroll from 12:1 to 15:1 has been widely adopted. The use of dual extruders permits the simultaneous application of the two components of composite insulation. With appropriate combinations of compounds, the ensuing curing promotes bonding of the two layers. Line equipment consists of two capstans, one behind the extruder, one in front, interlinked one with the other and with the extruder drive, and so coordinated that the line can be run at low speed for setting up and then run up to full production speeds with the minimum of extruder readjustment. Tension control is effected by adjusting the speed differential between the two capstan units, Figure 3.

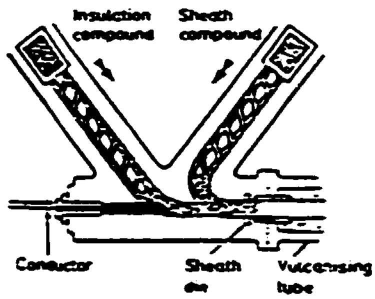


Fig. 3

Principle of synchronised dual extrusion machines

d) Testing Process: The wire or cable has to be tested according to electrical and mechanical standard properties.

e) Coiling and Packing Process: In this process the wires or cables are packed in coils or on wooden drums according to the cable cross-sectional area.

6.2. Machines and Equipment: The production machines and equipment required for the suggested factory are:

a) Drawing Machine	1
b) Transposition Machines	6
c) Extruder Machines	6
d) Inspection Equipment "Testing Lab"	1
e) Coiling and Packing Machines	3

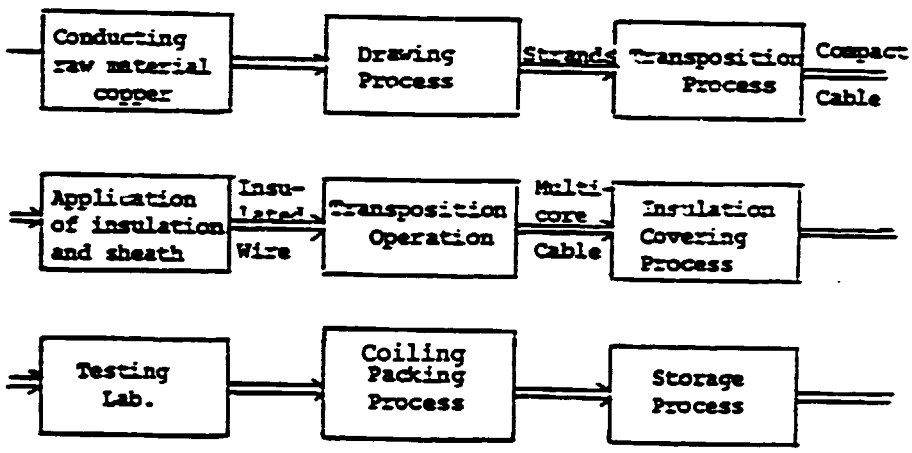
The auxiliary equipment for the proposed plant are:

a)	Fork lifts	3
b)	Trucks	2
c)	Stand-by generator	1
d)	Wooden drums workshop	1

The service equipment needed for the suggested factory are:

a) Storage and warehouse shelves
b) Electricity fixtures
c) Cold water fixtures
d) Furniture
e) Plant security fixtures, smoke and fire alarm systems

6.3. Flow Sheet:



7. Manpower and Management

It is expected that the proposed plant will need about 160 employees for production, service, management and marketing activities. This manpower requirement includes skilled, semiskilled and nonskilled labour. These different types of labour requirements are available locally; however, technical and production training is needed. The training can be done through a contract with suppliers of machines and equipment or in the National Cable and Wire Manufacturing Co. Ltd., Jordan.

8. Project Scheduling

To start the project a founder group is required to prepare and help in the establishment stage, to apply for licence and registration in the occupied territories and Jordan, to choose the site for the project, to collect the capital that is needed to purchase the land and to build the plant, and to do the necessary administrative procedures to set up the project. The time required for these different activities before the suggested project can start operation, is about two years, assuming no obstacles and delays from the occupying authorities.

9. Financial Analysis

9.1. Investment Costs: Based on consultations with experienced people in the occupied territories and Jordan, the estimated investment costs are as follows:

- Land: It is estimated that 10 dunums are needed for the plant at present and for future expansion. The estimated cost of land is $ 30/sq.m., = $ 300,000

- Buildings: The estimated area needed for this project is about 1500 sq.m. This area includes building for the plant, storage, and offices. The estimated cost is $ 450,000

- Machines and equipment needed for the proposed project are estimated at $ 3,455,000 distributed as follows:

Drawing machine	$ 875,000
Transposition machines	$ 720,000
Extruder machines	$ 1,080,000
Inspection equipment (testing lab)	$ 600,000
Coiling and packing machines	$ 180,000

- Installation of electricity, water supply and other facilities needed is estimated at a cost of $ 60,000.

- Cost of auxiliary equipment estimated at $ 250,000

- Cost of other service equipment needed is estimated at $ 60,000

- Total fixed assets: $ 4,575,000

- Working capital: $ 1,527,000 (considering the production cycle is one month)

- Total investment costs: $ 6,102,000

9.2. Production Costs: The production costs include the following items:

a) Raw Material: To produce the proposed output, the plant requires the following raw materials:

Item	Quantity ton/year	Price $ per ton	Total Cost $
P.V.C.	2,750	1,500	4,125,000
Copper	5,000	2,100	10,500,000
Aluminum	720	1,375	990,000
Total			$ 15,615,000

b) Labor Cost: It is estimated that the proposed plant will need about 160 employees. The average annual wage per employee is estimated at $ 6,000, thus total annual cost of labor would be $ 960,000.

c) Utilities: Elctricity, water, telephone and other expenses are estimated at about $ 50,000 per year.

The total annual cost is calculated to be 18,331,300 and distributed as follows:

Production Costs	\$ 16,625,000
Administrative Cost	500,000
Selling cost (4% of sales revenue)	921,300
Depreciation	285,000

The depreciation cost is calculated by using the straight line method and assuming the economic life of the project to be 15 years.

$$\text{Annual depreciation cost} = \frac{\text{Total fixed assets - cost of land}}{\text{Economic Life}}$$

$$= \frac{4,575,000 - 300,000}{15} = \$\ 285,000$$

9.3. Commercial Profitability: The commercial profitability of the project is measured by the Return on Investment and the Repayment Period. The Return on Investment by definition is equal to net profit divided by total investment cost.

$$\text{Net Profit} = \text{Total Revenue - Total Cost}$$

$$= 23,032,970 - 18,331,300 = \$\ 4,701,670$$

The applied corporated profit tax in the occupied territories is 38%. Thus, the net profit after tax is \$ 2,915,035 per year.

$$\text{Return on Investment} = \frac{\text{Net Profit after Tax}}{\text{Total Investment Cost}} \times 100\%$$

$$= \frac{2,915,035}{6,102,000} = 47.8\%$$

Payback Period: The period required to recover the total investment in the proposed project can be calculated as follows:

$$\text{Payback Period} = \frac{\text{Total Investment Cost}}{\text{Net profit after tax + depreciation}}$$

$$= \frac{6,102,000}{2,915,035 + 285,000} = 1.9 \text{ year}$$

10. Conclusions and Recommendations

This project is the first of its kind in the West Bank and Gaza Strip. It is designed to produce copper cables and wire, PVC insulated and/or sheathed, mainly non-armoured, to fulfil the needs of the domestic market in the occupied territories.

The value of the cables and wire presently used in the West Bank and Gaza Strip is estimated at $ 1,424,266/month of multi-core conductors; $ 345,668/month of single-core conductors; $ 58,760/month of telephone cables and $ 90,720/month of T.V. cables.

Establishing the proposed plant will achieve some economic and social benefits. It will reduce the dependency on Israeli products, improve the balance of trade, and create 160 jobs in the occupied territories with an annual wage of $ 960,000.

The financial analysis indicates that annual net profit of $ 4,701,670 can be generated from this project; the simple rate of return on investment is expected to be 47.8% and the investment cost of the project to be repaid in less than two years. The plant must be provided with testing equipment to ensure a high quality which meets all recognized international standards.

We highly recommend that a detailed feasibility study be conducted for this project.

AN OPPORTUNITY STUDY

ON

A REINFORCEMENT STEEL BARS MANUFACTURING PLANT

Based on the work of Zuheir Khalaf,
Abdel-Hafiz Abu-Isneineh and Hanna Quffa, UNIDO Experts

1. General Economic Data

1.1. Product Characteristics and Uses

a. Reinforcing steel bars are bars that are intended for use as reinforcement in reinforced concrete construction. Reinforcing bars are made in many grades. Proposed grades are :

- grade 300 with yield strength of 300 MPa
- grade 400 with yield strength of 400 MPa
- grade 500 with yield strength of 500 MPa
- grade 600 with yield strength of 600 MPa

b. All standard bars are round bars. The bar sizes are organized around convenient bar areas; however, the bar numbering is a measure of the bar diameter. The standard sizes and dimensions of reinforcing bars and their number designations shall be those listed below :

Proposed No.	Weight Kg/m	Area mm^2	Diameter mm	Perimeter mm
10	.79	100	11.3	34.6
15	1.58	200	16.0	50.1
20	2.37	300	19.5	61.4
25	3.95	500	25.2	79.3
30	5.50	700	29.9	93.8
35	7.80	1000	35.7	112.0
45	11.80	1500	43.7	137.0

Other bar sizes can be produced depending on market demand.

1.2. Justification for Selecting the Product :

a. Due to the unavailability and rarity in the West Bank and Gaza area of the basic raw materials needed for construction, such as wood and steel, most of the construction is carried out using reinforced concrete. This is due to the fact that many of the basic ingredients for making concrete are easily found locally.

b. To reinforce concrete one needs reinforcing elements to resist the high tensile stresses which develop during and after construction due to imposed weights. Concrete on its own is rather poor in resisting tensile stresses. Reinforcing bars are used to reinforce concrete in order to resist the tensile stresses, thus making reinforced concrete an attractive and safe material for use in the construction business.

1.3. Product Specification :

a. Reinforcing bars shall be rolled from properly identified heats of mold cast or strand cast steel using the open hearth, basic oxygen, or electric furnace process .

b. The surface of the bars is provided with lugs or protrusions which inhibit longitudinal movement of the bar relative to the concrete which surrounds the bar.

c. The modulus of elasticity which is a measure of the stiffness of the steel used in forming reinforced bars, is about 200,000 M Pa. Bars shall be free of injurious defects and shall have a workman-like finish .

2. Market Demand

2.1. Current and Projected Demand : A market survey was conducted to assess the demand of the West Bank and Gaza for the deformed steel bars for construction. The sample included wholesalers and retailers of steel bars in the West Bank , Gaza, and East Jerusalem. As a result the estimated domestic use of reinforcement steel bars exceeds 100,000 metric tons annually. Although there is a fluctuation in the growth of the construction sector, the average growth rate over a ten-year period is calculated at 3 percent annually . The results of the survey were reported for validation to local contractors and civil engineers in industry in addition to civil engineers in municipalities (local authorities that grant licensing for construction). No significant discrepancy was found .

2.2. Sale Program and Sale Revenues : The present source of supply for reinforcement steel bars for the West Bank and Gaza is Israel. Interviews with local wholesalers of this product revealed that there are unreconcilable differences (i.e. , quotas, transportation policies etc...). Accordingly, wholesalers would be more comfortable to deal with a local company even if the prices are the same . In addition to that, transportation cost will be reduced , giving the proposed plant a competitive edge .(1)
The proposed plant will capture a significant portion of the total market exceeding 60 percent . The average annual sales of reinforcement steel bars over a ten-year period is equal to 60,000 metric tons, with an average sale price of $600 per ton. The average annual revenue is equal to $36 million .

(1) During the interviews, many wholesalers showed interest in being shareholders of the proposed plant as a means of diversification.

3. Plant Capacity

A plant capable of producing 120,000 tons per year is needed in order to fulfill the local demand. A plant of two production lines, each capable of producing 5,000 tons per month, is preferable , thus making each production line function as a back-up for the other. Such a set-up will eliminate any possibility of total break-downs in production at any time.

4. Supply of Raw Material and Other Input

Iron, which is the basic raw material needed to produce reinforcing bars, is not available locally ,thus creating the need for importation of raw material in order to set up a reinforcing steel bar plant. It is suggested that the imported material is to be in the form of plain billet steel bars. These billet steel bars shall be the initial product for producing reinforcing steel bars. Although billet steel bars are readily available on a world-wide market,one must conduct a study of all available sources in order to secure them at the most advantageous conditions .

5. Approximate Location and Site

An approximate area of 20 dunums (20,000 m^2) is needed for constructing the reinforcing steel bar plant. A suggested site for such a plant is the Ramallah Industrial Zone for the following reasons :

1. Ramallah's central location which gives easy access to the Northern and Southern parts of the West Bank as well as Gaza .
2. Ramallah's relatively strong construction activities.
3. Availability of the land, supporting facilities, and required utilities.

6. Project Engineering

6.1. Process and Technology: Process used to produce reinforcing bars is a hot-working forming operation. The suggested initial product of the process is a steel billet with a known chemical composition.The steel billet is heated in an electric furnace to a temperature of approximately 950^{O}F which is the recrystallization temperature of iron with 10 percent cold work. The heated metal then goes through a rolling mill which is a forming machine having circular rotating cylinders. By means of friction between the cylinders and the steel billet bar, the bar goes through the opening between the cylinders, thus reducing the thickness and the cross-sectional area of the bar.The reduction in thickness of the bar is normally about 1 to 10 percent per pass through each set of cylinders. Thus, a series of rolls are lined up so that each set of rotating cylinders is spaced slightly closer together and rotate correspondingly faster. This enables the bar to move continuously through the production line until the final thickness is achieved.

6.2. Machines and Equipment:

1. Electric furnace
2. Rolling mill for each production line
3. Cranes for each production line
4. Forklifts (4 forklifts)
5. Hand trucks (5 trucks)
6. Industrial building (100 m x 75 m)
7. Management area and office equipment

6.3. Flow Chart : Refer to Diagram 1.

7. Manpower and Management

The local population can provide the plant with the required labor force. The expertise needed to monitor and check quality control of steel at different stages of the production process is available and many qualified individuals can be found to fulfill this task. The estimated number of persons needed to operate the plant is as follows:

	Number
Director	1
Secretary	1
Controller	1
Accounting staff	3
Purchase and inventory control	3
Plant manager	1
Foremen	2
Marketing and sales	5
Drivers	8
Quality controllers	4
Crane operators	4
Technicians and electricians	4
Production labourers	16
TOTAL	53

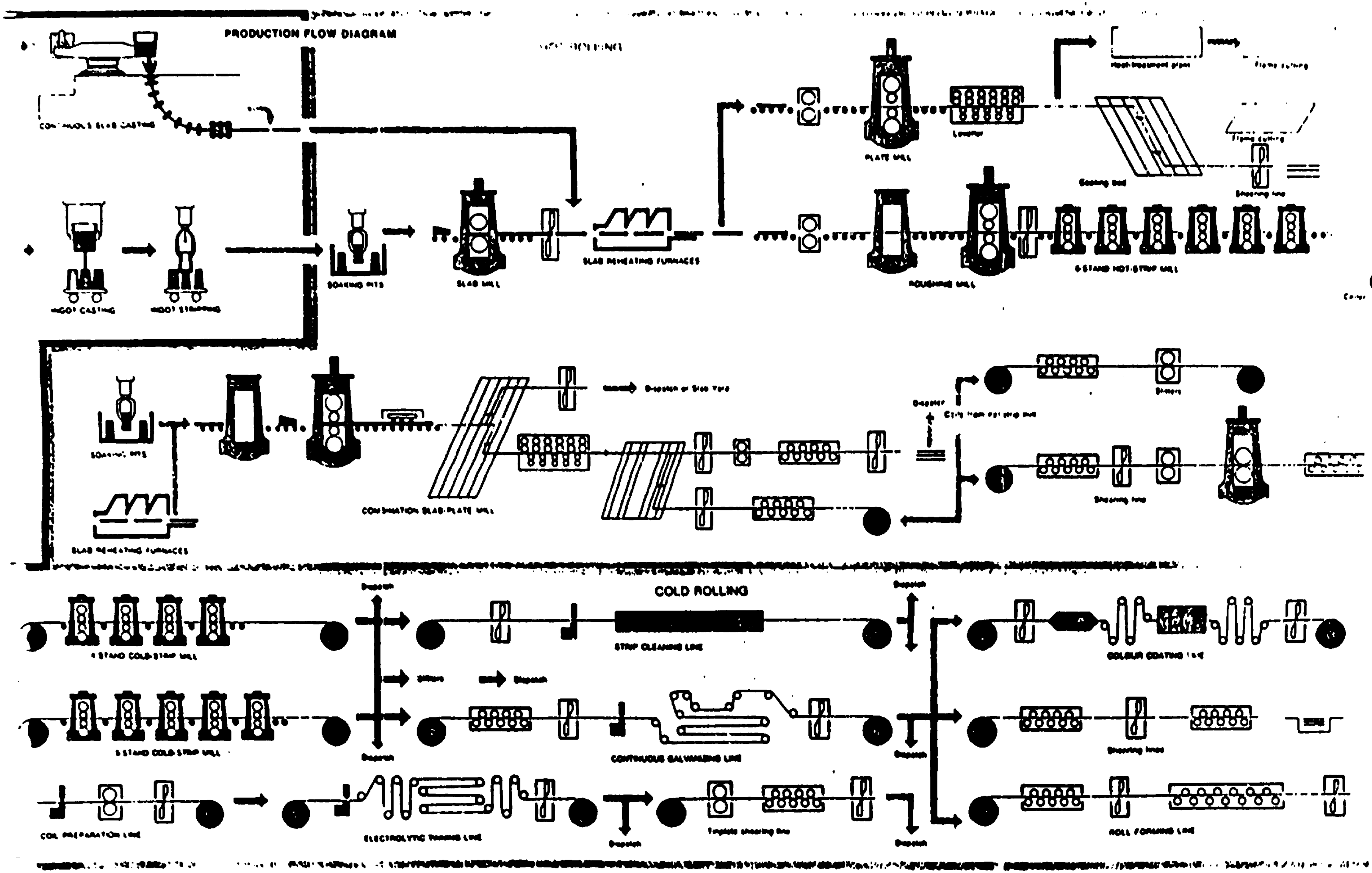


Diagram "1" - Production Flow Chart

8. Project Scheduling

time period month / Tasks	1,2	3,4	5,6	7,8	9,10	11,12
Feasibility study	—					
License and registration		—				
Selection, purchase of land		—	—			
Equipment		—	—	—		
Construction and setting-up the plant			—	—	—	—
Training of Personnel				—	—	—
Testing the system and start operation						—

9. Financial Analysis

The financial analysis was based on forecasted revenue in Section 2 and on estimates of costs as follows :

9.1. Investment Costs : The investment necessary for the proposed project is high due to the project being capital intensive. Investment cost appears below

Table 1

Investment Costs

Working Capital	$ 4,500,000
Plant and Equipment	9,300,000
Building	750,000
Land	250,000
Organizational Costs	200,000
Total Investment	$ 15,000,000

Equipment includes furniture and fixtures and all installation costs. Europe is the source of such equipment. Working capital has been calculated based on 2 months supply of raw material inventory, cost of utilities and supplies in addition to labor and a safety cash . Organization cost includes incorporation fees calculated at 0.01% of invested capital in addition to lawyer, accountant, and consultant fees.

9.2. Financing: The total 15 million dollars are to be raised in the form of equity capital; the form of incorporation is that of a public corporation under laws and regulations of Jordanian Corporation Law for 1964. It is important to note that such a corporation has been very rare due to existing Israeli regulation in the West Bank .

9.3. Production cost and other expenses : The total cost of producing 60,000 tons annually and other related expenses appear below , Table 2 .

Table 2

Production Costs and Expenses

Prime Costs :	Amount	Ratio as % Sales	Ratio as % Cost
Direct Material (iron billet)	$ 18,000,000	50%	70.7%
Direct labor	372,000	1%	1.5%
Other costs and expenses : (indirect labor, utilities, maintenance, insurance , property taxes, supplies, administrative and selling expenses , etc ...)	6,000,000	16.7%	23.6%
Depreciation of property plant and equipment @10% plus Amorization of organizational costs @ 20%	1,070,000	2.97%	4.2%
Total Costs and Expenses	$25,442,000	70.67%	100%

The cost of utilities alone represents more than 40% of the six million dollars labeled "Other Costs and Expenses", and which amounts to approximately 10% of the Total Production Costs .

9.4. Commercial Profitability : Using the estimated sales revenue from section two and the estimated investment costs and production costs a condensed forecasted income statement appears below, Table 3 :

Table 3

Forecasted Income Statment

		Ratio as % of Sales
Revenue (Section Two)	$36,000,000	100%
Total Costs and Expenses (Table 2)	25,442,000	70.67%
Net Profit before Tax	10,558,000	29.33%
Income Tax Expenses (@ .385)*	4,064,830	
Net Profit after Tax	$ 6,493,170	18.04%

* The corporate income tax rate is 35% in addition to 10% of the tax expenses levied as a social welfare tax, totaling 38.5%

9.4.1. Rate of Return: The simple rate of return for the proposed project is calculated as follows:

$$\text{Rate of Return} = \frac{\text{Net Profit after Tax}}{\text{Total Investment}}$$

$$= \frac{6,493,170}{15,000,000}$$

$$= 43.3\%$$

Using a Dupont System to calculate rate of return;

Rate of Return = Net Profit on sales ratio x total assets turn-over ratio

$$= \frac{\text{Net Profit after tax}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total Investment}}$$

$$= \frac{6,493,170}{36,000,000} \times \frac{36,000,000}{15,000,000}$$

$$= 18.04\% \times 2.4 \text{ times}$$

$$= 43.3\%$$

9.4.2. Pay Back: The amount of time needed to recover total investment will be calculated as follows:

$$\text{Pay Back} = \frac{\text{Total Investment}}{\text{Net Profit after tax + Depreciation \& Amortization}}$$

$$= \frac{15,000,000}{6,493,170 + 1,070,000}$$

$$= \frac{15,000,000}{7,563,170}$$

$$= 1.98 \text{ years}$$

That is, total investment will be recovered in approximately two years.

Conclusion

The proposed project's primary analysis shows an excellent rate of return of 43.3%, which exceeds the rate of return on long term deposits, thus shows a good opportunity for investment. A profit margin of 18.04% is close to industry average and can be improved with increase of market share. A 2.4 times turnover rate is good and 2-year pay back period is excellent compared to the useful life of the project .

We recommend this project for further investigation to help reach a final decision before implementation. The only draw back is the dependency of its revenue on building industry which has been fluctuating heavily in the last 5 years .

AN OPPORTUNITY STUDY

ON

SYNTHETIC LEATHER PRODUCTION PLANT

Based on the work of Dr. Said Haifa, Dr. Samir Hazboon
and Mr. Mazin Badra, UNIDO Experts

1. General Economic Data

1.1. Product characteristics and uses: This proposed project is designed to produce synthetic leather, mainly to satisfy the need of the shoe industry in the occupied Palestinian territories. It should be pointed out that the synthetic leather can be used for other activities such as, fashion leather industry, furniture, chairs, school bags, luggage and other tourist products. The synthetic leather that is used as a basic raw material for shoe industry is divided into two main kinds, these are:

a. The Poly-Urethane-P.U.R.

b. The Poly-Vinyl-Chloride-P.V.C.

1.2. Justification for selecting the product: The main reasons for proposing this project are:

a. High and continuous increasing demand for synthetic leather.

b. All the synthetic leather consumed in the occupied territories is imported from Israel.

c. No project is found in the occupied territories which produces this kind of product (synthetic leather). The proposed project will be the first plant to be erected in the territories.

d. This project will serve as an inter-industry linkage by supplying the shoe industry and other industries with the required synthetic leather.

e. The project's output stands a good chance to be exported indirectly to Israel through the sub-contract between the Arab shoe firms in the occupied territories and other shoe makers in Israel.

1.3. Product Specification: The project will process the raw material of the synthetic leather which can be imported from Israel or other European countries - Germany, Bulgaria, and Italy - to produce different types of synthetic leather that can be used as a basic raw materials for the following kinds of shoes:

a. Sport shoes
b. Ladies' and men's shoes
c. Babies' shoes

These different types of shoes need the P.U.R. for the face and the sole of the shoes and the P.V.C. is used for the lining of the shoes.

2. Market and Demand

2.1. Current and projected demand: The potential market for the recommended plant will be limited to the West Bank and Gaza Strip. Besides the potential domestic market, there are possibilities for export to Israel. The demand for the synthetic leather is a derived demand. It is derived from the underlying demand of other activities namely, the shoe industry and other synthetic leather products industries. As mentioned before, the proposed output will be used mainly for shoe industry; thus, it is reasonable to base our estimation of the demand for the synthetic leather on the production and activities of the shoe industry in the potential domestic market. Table 1 shows the geographical distribution of shoe firms in the occupied territories.

Table 1 - Shoe Firms in the West Bank and Gaza Strip

District	No. of firms	Employment
Nablus	61	360
Bireh and Ramallah	10	19
Hebron	200	480
Tulkarm and Qalqiliya	4	5
Jerusalem and El-Ram	30	120
The West Bank	305	984
Gaza Strip	6	16
	311	1000

Sources: 1) UNIDO, "Survey of the Manufacturing Industry in the West Bank and Gaza Strip in 1984

2) Market Survey by the authors, 1987

A market survey of the shoe industry in the occupied territories indicates that the total quantity of shoes produced in 1987 reached 7,900,000 pairs. It should be mentioned that this rate of output was produced by using only 45% of the total productive capacity of the shoe firms in the territories. Table 2 gives details about different kinds and quantities of shoes produced during the year 1987.

Table 2 - Types and quantities of synthetic leather shoes produced in 1987*

Type of product	No. of pairs
1. Ladies', men's and babies' shoes	3,000,000
2. Sport shoes	500,000
3. Light shoes - for home use	1,500,000
2. Sub-contract with Israeli firms	2,400,000
5. Other uses	500,000
Total	7,900,000

It is estimated that each pair of shoes needs on the average about 2.5 sq. ft. of synthetic leather and each square meter of synthetic leather equals 14.5 sq. ft. Based on these facts, the total quantity of synthetic leather demanded for manufacturing shoes in 1987 equals:

$$\frac{7,900,000 \times 2.5}{14.5} = 1,362,069 \text{ sq. m. annually}$$

which is equivalent to approximately 5000 sq. m. daily. Regarding the projected demand, it should be pointed out that the union of shoe makers in the occupied territories is trying seriously with the Jordanian authorities to get permission to export their products of shos to Jordan and other Arab countries. They also will try to find new markets in the E.E.C. countries. If these efforts succeed, it is expected that the future demand for synthetic leather will increase sharply.

* These figures do not include natural leather shoes. Generally only a part of adult men shoes are made from natural leather.

2.2. Sales program and sales revenue: Based on the market survey, the following sales program and revenue may be expected for the proposed project:

Type of Product	Pairs of shoes	Amount of synthetic leather (sq.m.)	Project's share 60% of the market	Expected Revenue (US$)
Ladies', babies' & men's shoes	3,000,000	517,241	310,344	1,396,548
Sport shoes	500,000	86,206	51,723	232,753
Light shoes (slippers)	1,500,000	258,620	155,172	698,274
Sub-contract with Israeli firms	2,400,000	413,793	248,226	1,117,242
Other uses	500,000	86,206	51,723	232,753
Total	7,900,000	1,362,066	817,238	3,677,570

The market survey shows that the average price of one square meter of synthetic leather - both kinds,the P.U.R. and the P.V.C. - is $5.5. In order to be conservative and to be able to compete with foreign producers, we consider a price of $4.5/ sq. meter.

3. Plant Capacity

The capacity of the proposed project is expected to produce about 817,240 sq. m. of synthetic leather annually. This rate of output is expected to meet 60% of the total market's need for synthetic leather by Arab shoe makers in the occupied territories. Assuming that there will be 275 working days, it means that the plant capacity per day will be 2,972 sq. m. of synthetic leather mainly for shoe making.

4. Raw Material and Other Inputs

4.1. Raw material, availability and sources: The basic raw materials needed for the suggested project are the P.V.C., the P.U.R. and the colouring paste. These materials are not available in the occupied territories, but can be imported from Europe and/or Israel. The average prices of the needed raw material are expected to be as follows:

The P.U.R. cost	U.S.$ 5/kg
The P.V.C. cost	U.S.$ 4/kg
The colouring paste cost	U.S.$ 7/kg

It is estimated that each kg of raw material can produce in the average 4 sq.m. of finished synthetic leather, and each kg of colouring paste will serve 500 kg of raw material. Based on the productive capacity stated above, the expected quantities of P.U.R. and P.V.C. needed are 204,310 kg/year and 409 kg of colouring paste. The annual cost of the P.V.C. and the P.U.R. is expected to reach U.S.$. 919,395 and the cost of the colouring paste is $ 2,863 per year. The proposed project needs other inputs such as the aluminium foil which is used to pour the mixed raw materials coming out of the oven.

4.2. Utilities: The following utilities and indirect materials are needed for this project:

Office supplies

Cleaning materials

Water, fuel oil and electricity

Tiny ropes and rolling paper.

5. Location and Site

Three possible locations may be suggested for this project. These locations are: Jerusalem area, Hebron city and Nablus city. The choice of each of these locations is based on the existence of large number of shoe firms that demand the synthetic leather. However, we recommend that the plant to be located in Jerusalem district because it is located in the center between Nablus and Hebron which w. l reduce the transportation cost.

6. Project Engineering

6.1. Process and technology: The following operations are needed to produce the synthetic leather:

a. Preparation of raw material: As a first step, the raw materials have to be available before the plant starts functioning. It is important to be sure that the raw materials - P.U.R. and P.V.C.- are carefully handled and stored in a cool place. They should be taken from storage only when needed for immediate use.

b. Production processing step: There are two methods of production as well as different sizes of plant capacities. It is recommended to use an automatic production line for the proposed synthetic leather. The length of this line of production ranges from 60-120 meters in which the following operations are carried out:

Mixing the raw material
Heating the raw material
Pouring it on the aluminium foil

The mixed raw materials are rolled between adjustable squeezing rollers

The output is transferred to a simple cooling system to cool the finished leather. After cooling the rolls are ready to be stored.

The above production process is applicable for both kinds of synthetic leather - P.V.C. and P.U.R.- However, it should be pointed out that each kind needs a separate machine because the temperature needed, the thickness and the use of each kind are different. The production process includes a very important operation called "the glossing operation." This stage of production determines the size, the thickness and the quality of the final product. The width of the synthetic leather for shoe making should be between 140-150 cm.

6.2. Machines and equipment: The complete production line consists of many related machines that depend on each other and look like one unit. This complete line of production includes, the mixer, the boiler, the gloss unit which is considered the basic unit for the whole operation, the cooling and cutting system. All these units are automatically connected and operated. If required before the cooling step, fabricated material might be introduced on special wheels over the aluminium foil in order to stick it to the leather, which will serve as a lining. As mentioned before, the length of the production line ranges between 60-120 meters depending on the plant capacity. This line of production can produce synthetic leather with width reaching up to 2.5 meters. The estimated cost of the complete line of the production is U.S.$ 1,500,000. The production line is provided with a control system where all the production operations are automatically controlled.

6.3. Flow Sheet: The flow sheet for processing the raw material into finished product -synthetic leather- may be stated as follows:

- Transportation →
- Operation O
- Inspecting I
- Delay D
- Storage S
- Cleaning machine C

Operation \ Process	Supply Materials	Production	Finishing	Storage
Supply R.M.	→	→		
Inspecting R.M.	I			
Inspecting Machines		I		
Mixing Paste		O		
Heating		O		
Pouring Paste		O		
Adjust Thickness		O I		
Cooling		O I		
Cutting		O I		
Winding			O	
Dyeing			O	
Finishing			O I	
Storage				→ S
Cleaning Machine				C

Talking about the flow sheet, we have to keep at a minimum the material handling and transportation costs.

7. Manpower and Management

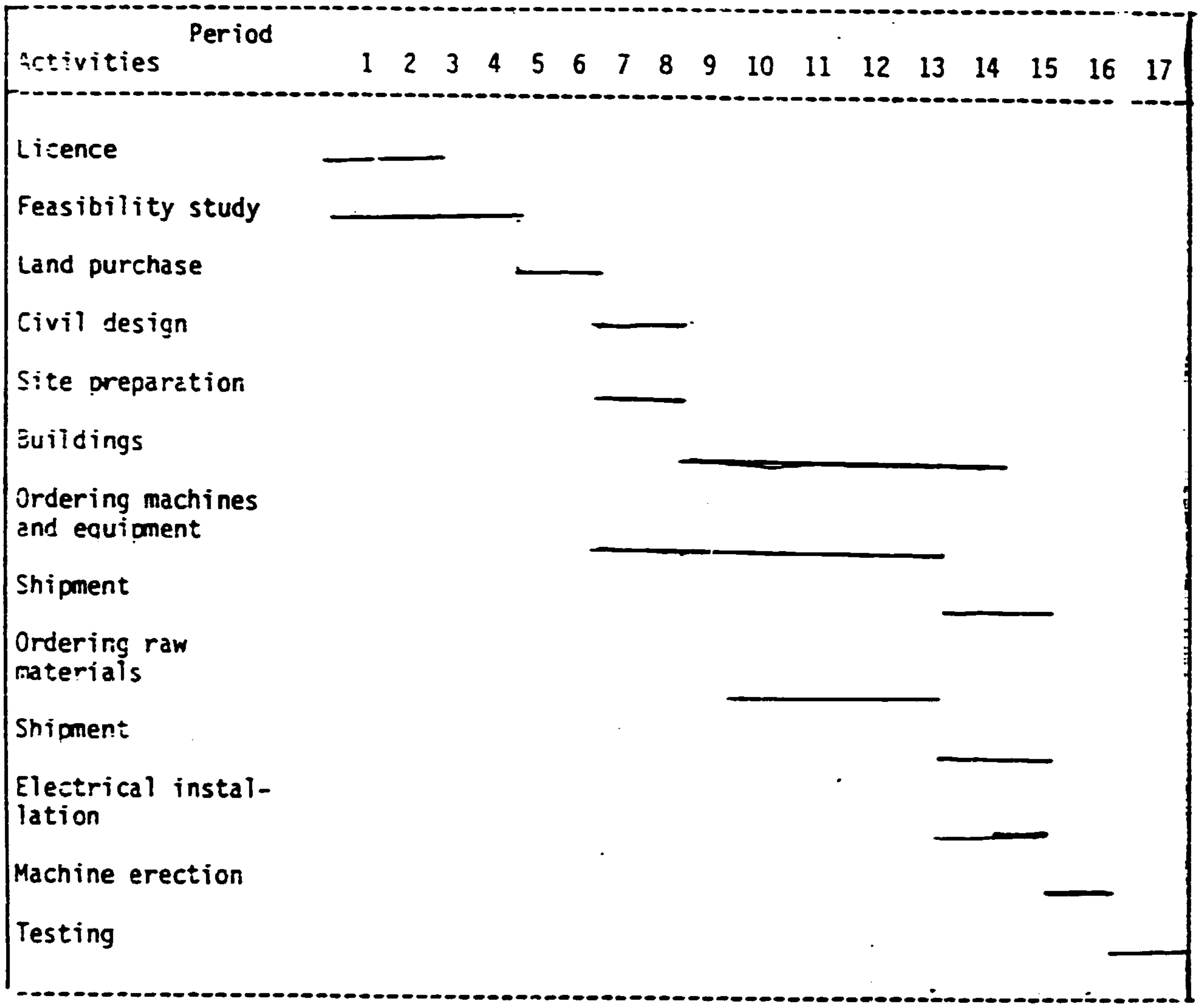
The manpower requirement for the proposed plant is expected to be about 31 persons for administration, production and service activities. The following is a list of all the employees required for the plant management and operation:

General Manager	1
Financial Controller	1
Marketing and Sales	3
Administration and personnel	2
Secretaries	2
Main production staff including:	
Supervisors, maintenance, chemical engineer, etc...	22
Total	31

All the personnel required are available in the occupied territories. However, synthetic leather expert needs to be recruited from outside. Total annual pay-roll is expected to be U.S.$. 205,000

8. Project Scheduling:Construction Period

The schedule and construction periods for the proposed project may be estimated as follows:



The total period required for the implementation of this project is estimated to be 17 months, given that there will be no obstacles imposed by the Israeli authorities. The cost of land and building that are needed to establish the proposed synthetic leather production plant is estimated as follows:

Item	Area needed		Cost (US$)
Land	5 dunums		150,000
Building:			
Production unit	700 sq. m.	105,000	
Storage (raw material)	200 sq. m.	30,000	
Storage (finished product)	300 sq. m.	45,000	
Parking lot and other facilities	800 sq. m.	120,000	300,000
Total			450,000

9. Financial Analysis

The following calculations are based on the annual figures set out in the previous sections:

9.1. Investment Cost:

Item	Cost US$	Salvage value US$
Land	150,000	150,000
Building	300,000	30,000
Machines and equipment	1,500,000	75,000
Machines erection	150,000	
Electrical installation	60,000	
Working capital	368,000	
Establishing cost and other expenses	150,000	
Sub-total	2,678,000	
Unforeseen (10%)	267,800	
Total	2,945,800	255,000

9.2. Operation Cost:

Item	Cost US$
Manpower	205,000
Raw material	922,260
Utilities	110,000
Other expenses	80,000
Marketing and administration cost (5% of sales)	183,880
Total	1,501,140

9.3. Commercial Profitability: Commercial profitability of the project is measured by net profit after tax.

Net profit = Total revenue - Total costs - Tax

The feasibility of the project is measured by the return on investment, and the payback period. The higher the return on investment, and lower the payback period, the more feasible this project is:

a. Rate of Return:

Annual sales revenue	$ 3,677,570
Annual operating cost	1,501,140
Depreciation	232,280
Annual operating profit	1,944,150
38% corporated tax	- 738,777
Net annual profit after tax	$ 1,205,373

$$\text{Rate of Return: } \frac{\text{Net profit}}{\text{Total investment cost}}$$

$$= \frac{1,205,373}{2,945,800} = 40.92\%$$

b. Payback period: determines the number of years that will have to elapse in order that the invested capital to be recovered out of the net incoming cash flow.

$$\text{Payback period} = \frac{\text{Total investment cost}}{\text{Net profit and depreciation}}$$

$$= \frac{2,945,800}{1,437,653} = 2.05 \text{ years}$$

10. Conclusions and Recommendations

The proposed plant is aimed to produce synthetic leather, mainly for shoe-making. The productive capacity of this project is expected to be 2,972 sq.m. per day. The financial analysis shows that this project is economically feasible, it produces very high rate of return. The payback period is about 2 years. It creates job opportunities for about 31 persons in this plant in addition to other opportunities in other related fields. Based on the above findings, the project is recommended.

AN OPPORTUNITY STUDY

ON

OLIVE OIL CANNING PLANT

Based on the work of Dr. Said Haifa,
Dr. Omar Abdel-Razaq and Odeh Shehadeh, UNIDO Experts

1. General Economic Data

1.1. Product Characteristics and Use: This is an opportunity study of a project that will produce canned olive oil in containers of 2 kg and 4 kg sizes. The olive oil is to be purchased from the West Bank oil presses and farmers. It is to be of high quality and low acidity degree (less than 2%). The project will make the steel cans from imported steel sheets and then fill them with the oil. The canned oil is to be marketed in the big cities of the West Bank and Arab countries. The main use of the canned olive oil is as cooking oil.

1.2. Justification for Selecting the Project: Olive pressing for oil extraction is one of the oldest and most traditional industries in the West Bank. It goes back thousands of years and its annual yield is related to the fluctuation in olive production from the agricultural sector. Olive production is seasonal and it has a great annual fluctuation. Active production involves a short season,usually two months. In terms of GDP, its yield (based on a biannual average) involves about 37.5% of industrial output. Table 1 shows the olive presses in the West Bank: Employment and oil extraction during the period 1974/75 - 1984/85. It can be seen from the table over the 10-year period the number of active olive presses fluctuated even more—from 633 to 3,500 workers (average 1,776). This situation is even more extreme if we look at working days of employees - from 6,509 to 202,000 (average 58,815).

Table 1

Olive Presses in the West Bank : Employment and Oil Extraction,1974/75 to 1984/85*

Year	Active Olive Press Establishments	Employed Persons	Working Days of employees	Olives input(tons)	Olive oil : Output (Tons)	Extraction Rate %	Employed per Establishment
1974/75	102	633	6509	3571	981	27	5.6
1975/76	250	2335	52561	31651	8304	26	7.0
1976/77	175	964	11720	6297	1786	28	6.8
1977/78	272	2468	102969	50839	12685	25	9.3
1978/79	186	1130	19930	9771	2388	24	12.5
1979/80	279	3500	202000	88800	22200	25	6.1
1981/82	251	2342	89394	61837	13657	22	9.1
1982/83	228	1556	45769	31852	8123	25	5.5
1983/84	238	1663	38696	36127	8492	23	9.3
1984/85	210	1174	18598	12348	3024	24	6.2
Average	219	1776	58815	33309	8164	24.5	8.1

* Source : Statistical Abstract of Israel 1980,1986 (excluding 1980/1981)

Yield (or extraction rate) in terms of tons of olive oil output per ton of olive input averaged nearly 25 percent over the 10-year period. Output averaged about 8,164 tons and ranged from 981 tons to 22,200 tons. A large proportion of olive production is exported to Arab countries through Jordan. Table 2 gives the value of exported olive oil during the period 1980-1986.

Table 2

Olive Oil Exports to Jordan 1980-1986 (thousand US$)

Year	Olive Oil
1980	28,548
1981	24,047
1982	20,311
1983	13,574
1984	26,940
1935	687
1986	3,294

Source: Statistical Abstract of Israel 1980, 1986

Olive farming has been facing major marketing problems. The main reason for these problems is the large dependence on exports. The traditional market for the West Bank olive oil surplus is mainly the Arab countries. The consumption habits as well as the social structure have changed in the market. The middle class in these countries has been growing and consumption habits have been shifting towards shopping monthly or even weekly. These changes in the consumption habits are basically apparent in the consumption of the "staple" goods including olive oil.

People in the Arab countries used to purchase the quantities of olive oil needed for the whole year or even for two years. Now the presence of olive oil from other sources in appropriate containers (2 and 4 kg cans) has become highly competitive to the Palestinian olive oil. The proposed project will help improve the competitive position of Palestinian olive oil in the Arab market through making olive oil of good quality available under a brand name and in appropriate size containers to be placed on a supermarket shelf rather than exported in bulk.

1.3. Product Specification: The project will produce canned olive oil. The cans will be steel containers of 2 kg sizes. The olive oil is to be chosen of high quality type (freshly pressed, low acidity, good taste, good smell, ... etc.).

2. Market Demand

2.1. Current and Projected Demand: In the first stage of the project, it will can 1,000 tons of olive oil each year. This amount is experimental. There is no specific reason for choosing it. On the other hand, this amount, in the first stage of the project, will not be an addition to the total quantity of oil exported each year. It is a part of the already produced quantity. There are two main reasons for this: first, in this way marketing the output of the project is almost guaranteed. To increase the quantity already exported needs further exploration of the Arab markets. Secondly, the quantity of olive oil exported each year is usually determined (and limited) by the Jordanian and Israeli authorities. As Table 2 shows, the current demand for exported West Bank olive oil is at least about 5,000 tons a year. We expect that these markets will be able to absorb the 1,000 tons of oil in the new small size container. With relation to the local market, it is estimated that an average of 7,500 tons are consumed locally each year. We don't expect the local market to adjust to the new product (the canned oil) to a noticeable degree. This is because of the large percentage of people who own olive farms and thus produce at least their consumption needs. As for projected demand, we expect the demand for olive oil to grow at a moderate rate due to population growth. We also expect the demand for the canned olive oil to grow at a rate that might be higher than that of demand for olive oil in general. This expected growth depends on the intensity of the changes in the social structure of the Arab countries. Anyhow, we expect the projected demand to be higher than present demand. To get a reasonable estimate of projected demand, a detailed market study is required.

2.2. Revenues: At the initial stage, 60% of the output of the project will be in 2 kg cans and the rest (40%) in 4 kg cans. Thus, the project will produce 300 thousand 2 kg cans and 100 thousand 4 kg cans. The estimated average price of the 2 kg cans is about $ 9.50 per can and that of the 4 kg is 19 U.S. dollars per can. Therefore, the total expected sales revenues of the project are about:

300 thousand x $ 9.50	=	$ 2,850,000
+ 100 thousand x $ 19.00	=	$ 1,900,000
Total		$ 4,750,000

The sales are to be carried out through contracts with government agencies and government consumer cooperatives in Jordan and other Arab countries. In addition local merchants and Arab private consumer cooperatives are expected to market the product. It should be noted here that the division between the 2 kg and 4 kg quantities is basically arbitrary; however, the chosen distribution favors the 2 kg cans because we expect it to be easier to market.

3. Plant Capacity

The annual capacity of the proposed project is expected to be 4 tons/day. The project is supposed to work about 10 months and produce 1,000 tons of olive oil. This capacity can be expanded if necessary. Thus, the total amount of olive oil canned can be increased to 2,000 tons a year by running two shifts a day.

4. Raw Materials

4.1. Olive Oil: The plant needs olive oil, iron sheet, and carton boxes. The average price of olive oil is about $ 3.60 per kilogram, (including transport costs from the presses to the project) which brings the total cost of the olive oil needed for the project to:

1,000 tons x $ 3,600 per ton = $ 3.6 million

4.2. Cans: The average cost of the 2 kg can is about $ 0.85 and that of the 4 kg can is about $ 1.10. This brings the total cost of the cans to:

300 thousand x $ 0.85	=	$ 225,000
100 thousand x $ 1.10	=	$ 110,000
Total		$ 335,000

4.3. Carton Boxes: The average cost of each carton is about $ 0.65 and the project needs 31,250 boxes. Thus the total cost of carton boxes is about $ 20,313. This brings the total cost of raw materials to about $ 3,955,313. Olive oil is easily available in West Bank, as is clear from Table 1. Iron sheets are to be imported from Europe (Italy) through Israeli ports. The carton boxes are produced locally in the city of Nablus.

4.4. Utilities: The project needs utilities like electricity and water, the estimated total cost of which is about $ 150 for electricity per month and $ 30 for water per month. This brings the total cost of utilities to $ 1,800/year.

5. Approximate Location and Site

The suggested location of the plant is the Nablus area in the North of the West Bank. The town of Salfit is a suitable location for the plant. The reasons for choosing Salfit are the following:

- Salfit is the largest producer of olive oil in the West Bank. In the good years, the town produces about 600 tons. The town also is surrounded by many olive oil producing villages.
- The availability of a good road network.
- The availability of labor.
- The availability of relatively cheap land which is quoted as agricultural zone.
- The fact that the town is a municipality which makes the process of getting permits easier.
- The availability of utilities.

6. Project Engineering

6.1. Process and Technology: The basic technology used in the proposed plant is to produce cans and fill them with oilive oil. To produce cans, iron sheets must go through several processes.

- Folding the sheets into the desired shape
- Welding by drops
- Reshaping the cans with square sides
- Joining the bottom and top on the cans
- Testing the cans for holes

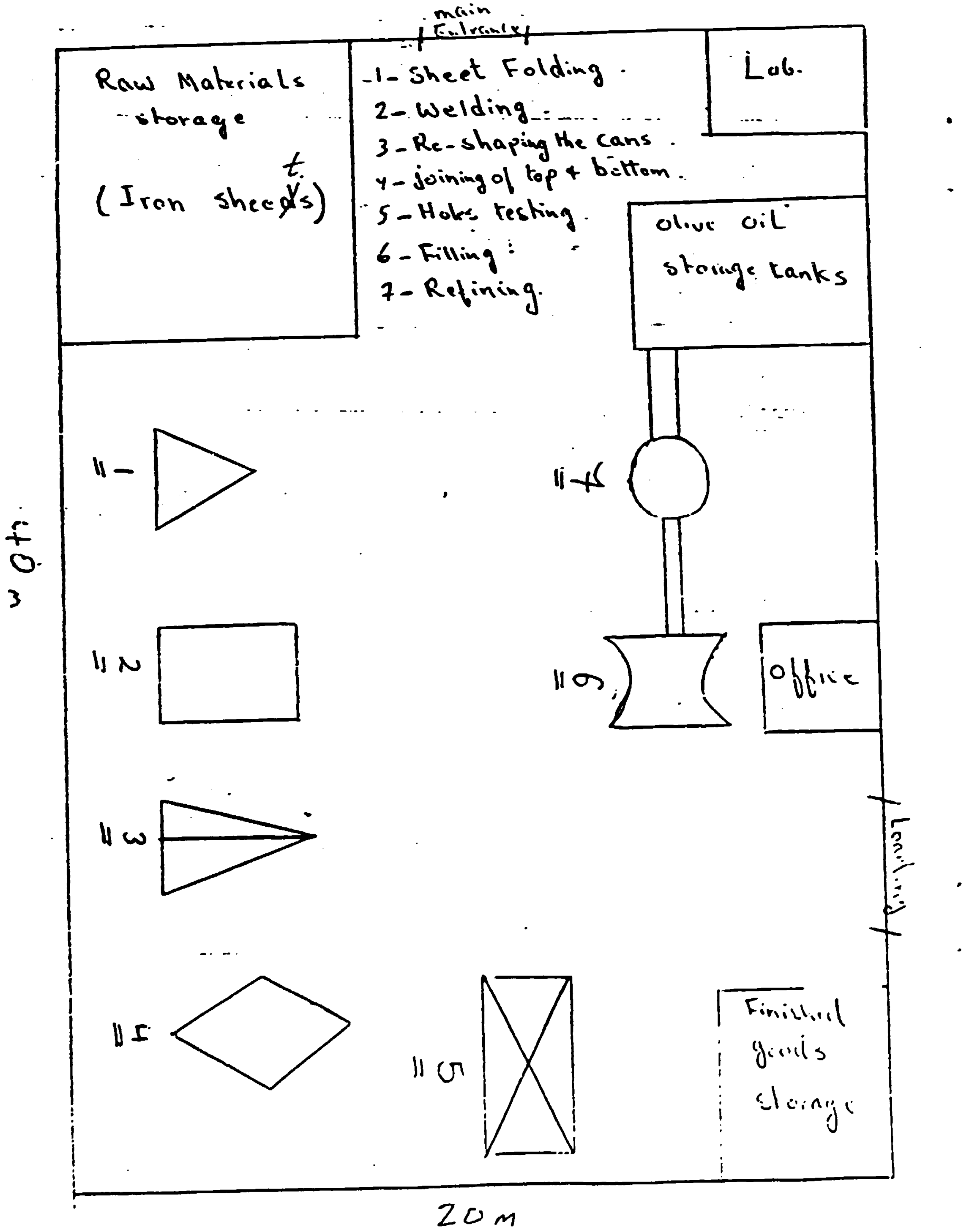
Olive oil is to be refined and tested to be sure that olive oil used is of high quality and low acidity (less than 2%). Olive oil is then filled into cans of 2 kg and 4 kg capacity; then the olive oil cans are placed into cartons.

6.2. Machines and Equipment: The following machines are required:

- Sheet folding machine
- Welding machine (by drops)
- Reshaping the cans
- A machine to join the bottom and top of the cans
- Holes testing machine
- Filling machine

Total cost including tax	$ 105,651
Other machines and equipment:	
- Refining machine	10,000
- Laboratory	1,500
- Office furniture	1,000
- Storage tanks (20 tons)	45,000
Total estimated cost	$ 163,151

6.3. Flow Sheet: The flow sheet can be shown in the following chart:



7. Manpower and Management

The manpower needed for the plant is available locally and does not need outside intensive training. The plant needs a director (mechanical engineer), a laboratory technician, and seven unskilled workers. The estimated salaries per year are as follows:

-	Director	\$ 540 x 12 =	\$ 6,480
-	Lab. Technician	\$ 450 x 12 =	\$ 5,400
-	Unskilled workers	\$ 360 x 10x7=	\$ 25,200
	Total		\$ 37,080

8. Project Scheduling

The total period required for the implementation of the project is 15 months. The different activities, their starting times and respective periods are shown in Table 3 (on page 11).

Table 3

Project Scheduling

Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Formation of Company ←															
2. Purchase of Land	←	—	→												
3. Civil Design			←	→											
4. Engineering			←	—	→										
5. Site Preparation					←	—	—	→							
6. Buildings							←	—	—	—	→				
7. Ordering Machines and Equipment				←	—	—	—	—	—	—	→				
8. Mechanical Installation												←	→		
9. Electrical Installation													←	→	
10. Testing															↔

9. Financial Analysis

9.1. Investment Costs: According to the suggested capacity and based on consultations with suppliers of machines, the following investment costs are estimated:

- Land: 1.5 dunums are needed for the present capacity and future expansion at cost of about	\$ 15,000
- Building: building needed for the plant and management	\$ 65,000
- Machines and equipment	\$ 181,150
- Organization and establishment cost	\$ 10,000
- Other precautionary expenditures	\$ 5,000

Total fixed assets needed	\$ 276,150
- Working capital	\$ 540,000
Total investment cost	\$ 816,150

9.2. Financing: The project is advised to be in the form of a corporation in which capital is divided into shares of at least \$ 30 per share. Founders group could contribute about 10% of the capital, the rest could be sold in the form of shares to other share holders.

9.3. Production Cost: The estimated production costs are as follows:

- Depreciation cost of fixed assets: Assuming the following depreciation rates, the depreciation costs are calculated as follows:

Building (4%)	\$ 2,600
Machines and equipment (10%)	\$ 16,315
Preproduction expenditures (10%)	\$ 1,500
Total depreciation cost	\$ 20,415

- Operating costs: Consists of raw material, labor and utilities costs which are estimated as follows:

Raw material classified as follows:		\$ 3,955,313
- Olive oil	\$ 3,600,000	
- Steel cans	\$ 335,000	
- Cartons	\$ 20,313	
Labor		37,080
Utilities		1,800
Total production cost		\$ 3,994,193
Marketing cost 5% of sales		237,500
Total annual expenditures		\$ 4,231,693
Depreciation		20,415
Total annual costs		\$ 4,252,108

9.4. Commercial profitability: Based on the expected annual revenus and the sales program suggested earlier, the total cost of production and the legal form of the business, the following commercial profitability is calculated:

a. Rate of return: The annual simple rate of return is calculated as follows:

$$R.O.R. = \frac{\text{Net Profit after Tax}}{\text{Total investment}}$$

Net profit = total revenue - total cost

= 4,750,000 - 4,252,108

= $ 479,892

The applied corporated profit tax in the occupied territories is 38.5%. This makes net profit after tax equal to:

S 479,892 - 184,758 = $ 295,134

$$\text{Rate of Return} = \frac{\$\ 295,134}{\$\ 816,150} = 36.16\%$$

b. Payback period: Payback method is used to determine the repayment period which is needed to recover total investment out of the net operating profit. The payback period is equal to total investment divided by operating profit after tax plus depreciation cost.

$$\text{Payback period} = \frac{\text{Total investment}}{\text{Net profit after tax + depreciation cost}}$$

$$= \frac{\$\ 816,150}{\$\ 295,134 + \$\ 20,415} = 2.6 \text{ years}$$

Total investment in the suggested project is expected to be recovered in about 2. 6 years.

10. Conclusions and Recommendations

The proposed plant is expected to produce 1,000 tons of canned olive oil annually, 60% of the project's output will be filled in small cans of capacity 2 kg and the remaining 40% will be filled in cans weighing 4 kg. The presence of olive oil in the Arab countries' markets (from other sources) in small containers and the shift in the consumption habits in these countries towards purchasing smaller containers are adversely affecting the demand for Palestinian olive oil.

The proposed project will improve the competitive position of the West Bank's olive oil in the Arab market through making olive oil of good quality available under a brand name and in appropriate containers to be placed on the supermarkets' shelves rather than exported in bulk. The project is considered economically feasible, the rate of return on investment is expected to be 36,16% annually. Investment cost is expected to be recovered in about 2.6 years. Annual sales is expected to be $ 4,750,000

For all the above reasons, the project is recommended. However, a feasibility study should be conducted before the implementation stage.

AN OPPORTUNITY STUDY

ON

TOMATO PROCESSING PLANT

Based on the work of Dr. Nidal R. Sabri, UNIDO Expert

1. General Economic Data

1.1. Product Characteristics and Uses: This project is aimed to process tomatoes in the following forms; puree-paste cans, juices and other tomato sauces. The processed tomatoes are considered as an important part of the diet;thus there is heavy consumption of processed tomatoes in the occupied Palestinian territories (West Bank and Gaza Strip). In comparison to all other processed food products that are consumed in the area for home use, the imported processed tomatoes represent 25% of their value. Processed tomatoes are an important and major element of Arabic cooking and diets, it is used at home as well as commercial cooking.

1.2. Justification for Selecting the Product: Tomato product is considered to be number one in farm produce, in the occupied territories (West Bank and Gaza Strip) 95 thousand tons are produced annually, which is one third of all vegetables produced other than olives.

1.3. The local market consumes only two thirds of the crops, leaving one third of the crop as surplus, while the needed processed tomatoes for local market are imported from Israel, thus increasing the foreign trade deficit for the occupied territories.

1.4. This agro-based plant will process a substantial part of the surplus tomatoes in the occupied territories, which leads to gains from the value added by processing rather than selling tomatoes as farm products. In addition to that, this may create price stability for tomatoes as well as other farm products.

1.5. The proposed plant will face no problems in exporting to Jordan and other Arab markets as long as local raw materials are used.

1.6. Products Specification: This agro-based industrial project will produce various types of processed tomatoes, such as puree-paste, ketchup, sauces and juices of various sizes, in order to meet local needs and for possible exportation to Arab markets.

2. Market and Demand

2.1. Current Demand-Domestic: A market survey conducted gave us the following results:

a. An average Palestinian family of 6 persons consumes annually 12 kg of tomato puree-paste. From this we can conclude that the demand for this product for home use is about 3200 tons of final products, which is consumed annually by the Palestinian people in the West Bank and Gaza Strip.

b. The average annual consumption of tomato puree-paste for commercial uses (hotels, restaurants, hospitals and other) is about 575 tons of final product.

c. The average annual consumption of other tomato related products such as ketchup, pizza sauce, chili sauce and other tomatoe sauces for home and commercial uses is about 150 tons of final product.

d. The average annual consumption of tomato juice for home and commercial uses is about 50 tons (which equals 50,000 litres) and 25 tons of small cans (which equals 100,000 units of 250 milliliter).

e. Therefore, the total local current demand is about 4000 tons a year of tomato products.

2.2. Foreign Demand (exports to Jordan and Arab markets): There is a high possibility of exporting the processed tomatoes to Jordan and other Arab states, since the product meets the export conditions of using local raw materials. It is estimated that 1200 tons and more may be exported to Jordan and other Arab states.

2.3. Currently, there is a small local plant located in Hebron which produces 120 tons a year of processed tomatoe , and among others canned vegetables. The other needed processed tomatoe products are imported from Israel, which forms about 97% of the total current demand. In addition, the local demand for processed tomatoes is expected to increase annually as population increases.

2.4. Considering the above factors, including the market survey, exportation possibilities, and the surplus of fresh tomatoes, the sales program for the proposed project may be stated to be 5000 tons of final products (processed tomatoes) a year.

2.5. Types, sizes, containers and shapes of the final products: The market survey showed that there are a variety of sizes, shapes and containers of the final products. However, taking into consideration the local market survey, the following ranked the highest suitable items in the local market:

Rank		Container	Size/weight
# 1	Tomatoe puree-paste 20 - 25	Tin	100 grs
# 2	Tomatoe puree-paste 20 - 25	Tin	570 - 850 grs
# 3	Tomatoe puree-paste 25 - 30	Tin	5 kg
# 4	Ketchup	Glass	340 grs
# 5	Tomatoe juice	Tin-Cans	350 grs
# 6	Tomatoe juice	Glass	1000 grs (1 lit.)
# 7	Pizza sauce	Tin	560 grs

2.6. Finally, the suggested annual sales program and sales revenue, may be stated based upon the marketing survey findings and other elements as follows; (the local market has 74% and the exports have 26% of total sales)

Product	Contents weight	Container	Quantity in units	Competitive wholesale price/unit	Sales value in $
Tomato puree-paste	100 grs	tin/cans	19,000,000	.26	4,940,000
Tomato puree-paste	750 grs	tin/cans	1,920,000	1.10	2,112,000
Tomato puree-paste	5 kg	tin/cans	270,000	5.20	1,404,000
Ketchup	340 grs	glass	400,000	.90	360,000
Tomato juice	250 ml.	tin/cans	200,000	.26	52,000
Tomato juice	(1 kg.) 1 litre	glass	50,000	1.04	52,000
Pizza sauce	560 grs	tin/cans	100,000	.80	80,000
Total			21,940,000		$9,000,000

2.7. The proposed plant will generate an average annual sales revenue of 9,000,000 dollars.

3. Plant Capacity

3.1. The plant will produce 5000 tons of final products of processed tomatoes, and will consume 15,000 tons of fresh tomatoes, considering the input/output ratio as 33%.

3.2. 5000 tons of final products will produce 21,940,000 units of different types, sizes and weights as is indicated in the sales program.

3.3. An assembly line of annual capacity of 21.9 million units (cans) of various sizes is recommended to be established as a part of the proposed plant.

4. <u>Supply of Raw Material and Other Inputs</u>

4.1. Fresh tomatoes are the raw materials to be used in production. The tomatoes should have a shallow stem cavity and be of deep red color and smooth skin. Size of the tomatoes is not important but care should be taken in picking and transporting of tomatoes from the field to the plant.

4.2. Fresh tomatoes are widely available in the West Bank and Gaza Strip with good merits for processing. The average annual production of fresh tomatoes in the West Bank and Gaza Strip is about 95 thousand tons, while the local consumption of fresh tomatoes is about 68 thousand tons, which means there is an annual surplus of 27 thousand tons, which is about two times of the proposed plant capacity.

4.3. Fresh tomatoes are available in all seasons, Gaza Strip (summer), West Bank (fall), Jordan Valley (winter), this would permit the factory to operate eleven months of the year continuously.

4.4. The cost of raw materials will be about US$2,400,000 as the value of 15,000 tons of tomatoes with an average price of $160 per ton, which forms 26% of the total sales value of final products.

4.5. Other Inputs:

a. The containers will be either cans or glass; according to the sales plan there will be a need of about 21.5 million cans of 5 different sizes and 450,000 glass containers for juice and ketchup. It will be preferable to manufacture the cans inside the project while the glass container may be bought from local sources. The average price of glass containers and jars is between 25 and 35 cents. While the cost of cans ranges between 10 cents for the small sizes up to 60 cents for the larger sizes.

b. The salt needed for production is about 3% of the total output of the processed tomatoes and 5% of the tomato juice with an average annual need of 155 tons.

c. Other additives to be used in ketchup and pizza sauces such as spices, mustard, sugar, vinegar, cayenne, cloves, mace, cinnamon, chopped onions and garlic.

d. Cartons, paper, packages and labelling materials.

4.6. Utilities; other utilities are needed:

a. Fuel oil, lubricants, cleaning materials.
b. Office supplies.
c. Equipment parts.
d. Electricity for heat, light and power.
e. Water for washing (soaking) operations.

5. Location and Site

5.1. There are two possible locations, both are found in areas where tomatoes are grown. First the Jordan Valley which produces a major portion of fresh tomatoes, and second the Gaza Strip which is also a major area that produces fresh tomatoes and has relatively cheap labor. Both areas will benefit from the project.

6. Project Engineering

6.1. Process and technology: The proposed plant is planned to process annually 15,000 tons of tomatoes to produce 5,000 tons of processed tomato products during eleven months, which is about 275 working days, eight hours a day, which means the capacity per working day will be 54.6 tons of tomatoes to produce 18 tons of processed final product, or 2.25 tons of final product per hour. The plant capacity may be extended to produce more products for export, using more than eight hours per day. The p roject engineering may be broken into the following:

6.2. Supply Process Line: The operation of the factory should be started after contracts are made with the farmers. Control over the propagation of tomato fields is recommended, special attention should be given to picking, transporting, and receiving of the tomatoes, the picked tomatoes should be completely red and ripe, it should be transferred in clean shallow boxes, the tomatoes should be washed, sorted and trimmed. Production should be by batches and a specific timetable should be followed.

6.3. Production Processing Line: There are several methods of production as well as different sizes of plant capacities. It is recommended to use an automatic production line which includes all operations of corning, crushing, heating, pulping, extracting and concentrating up to the finishing point. Other simple operations should be added to produce ketchup and other sauces where additives should be added. The tomatoe juice is produced after preheating,crushing, extracting and adding the salt. The proposed capacity for the production line is 50 tons per day; 16 tons of tomatoes will be produced from each batch, it will take 2.30 hours for each batch to be processed, producing 3.3. tons of processed tomato products.

6.4. Manufacture of Containers (Cans): A separate manufacturing line of cans should be added to supply the factory with the needed tin (cans) containers as it was stated in the sales program.

6.5. Finished Goods Line: The finished goods line may be separate from the rest of the production line, or might be the final part of a most advanced plant. It contains the processes of inspecting the color , quality and uniformity, also it will include filling of the containers, sealing, sterilizing, cooling, labelling, wrapping and casing.

6.6. Machines and Equipment: The above section needs the following machines and equipment:

* Input materials equipment: The following machines and equipment are needed for supplying the tomatoes:
  a. tomato washer
  b. trimming machines
  c. roller sorting equipment
  d. stainless steel containers
  e. stainless steel tanks
  f. other handling tools and vehicles

* Production Line Machines: An automatic tomato production line of 16 tons of tomatoes for each batch, which includes set up machines related to crushing, heating, pulping and concentrating processes.

* Line for Cans: The following manufacturing machines are needed:

  a. cutting machines

  b. rolling production line

  c. welding machines

* Finished Production Line Machines: A refractometer (to measure the solid content of tomatoes), two filling and canning machines, sterilizing equipment and tanks, sealing machines, labelling machines, wrapping, casing, cartoning machines, several containers for cooling.

6.7. Auxiliary, supportive and service equipment include the following:

* storage and warehouse equipment
* plant-security fixture and equipment
* stainless steel pipes
* fitting, pumps and valves
* freezers
* conveyors, trucks and fork lifts
* boilers
* hot and cold circulating water system
* laboratory equipment

6.8. Flow Sheet: The estimated flow sheet of the project for the factory processes may be stated in the following way:

⇒ Transport, ○ Operation, □ Inspection

D Delay △ Storage.

Operation \ Process	Supply Materials	Production	Canning	Finishing
Supply fresh tomatoes	⇒ △			
Wash tomatoes	○			
Inspect tomatoes	□			
Sorting + trimming	○			
Transfer material for processing in batches		⇒ D		
Crushing		○		
Heating		○		
Pulping		○		
Adding salt		⇒		
Concentrating		○		
Finishing point		□		
Transfer to filing		D ⇒	△	
Supply of cans/ containers	⇒		⇒	
Inspecting (consistency, uniformity, color and flavor)			□	
Filling			○ ⇒	
Sealing				○
Sterilizing				○
Cooling				○
Labeling and casing				○
Final inspection				□
Storage				△ ⇒

7. Manpower and Management

7.1. The estimated labor requirement will be about 115 people distributed as follows:

a.	Variable Cost: Unskilled labor (handling materials and other services in production centers)	15 persons
	Skilled labor (can manufacturing)	8 persons
	Skilled labor (production)	70 persons
b.	Fixed Cost: Nutrition/food specialist and laboratory chemist	3 persons
	Maintenance engineers	2 persons
c.	Marketing staff	7 persons
d.	Finance and administration	10 persons

7.2. Estimated total labor requirements are available locally; however, the maintenance engineer and the nutrition specialist may need additional special training.

8. Project Scheduling

8.1. The project scheduling of the construction periods (initial processing) of the proposed plant may be divided into the following major activities:

a. License and registration in the occupied territories and Jordan

b. Collection of share instalments as stated in the bylaws

c. Selection and purchase of land

d. Plant and production design

These activities may be started after a detailed feasibility study is carried out.

8.2. The timetable of construction scheduling of the proposed plant, for the major activities and tasks is as follows: (24 months)

tasks \ time	1,2	3,4	5,6	7,8	9,10	11 12	13 14	15 16	17 18	19 20	21 22	23 24
Detailed feasibility study	o											
Formulate groups founders		o										
Get licence/occupied territories		o	o									
Get licence/Jordan		o	o									
Open a bank account			o									
Collect instalments shares			o	—	o	—	o	—	o	—	o	o
Acquire the land				o								
Design and draw blue-prints				o	o							
Get permission for building					o	o						
Building and civil works						o	o	o	o	o		
Primary communications with tomato farmers				o	o	o	o					
State formulas,brands, trademarks								o	o	o		
Communications for technology supply							o	o	o	o		
Tendering										o		
Select equipment											o	
Get permission to import equipment											o	
Install equipment											o	o
Arrangement for training required labor									o	o	o	o
Arrangement for containers supply								o	o	o	o	o
Formulate agreements with farmers											o	o
Test the system												o

8.3. The estimation of time periods of the major activities and tasks for the proposed tomato project assumes that there are no delays or objections from the occupying authorities towards this project.

9. Financial Analysis

9.1. In order to accomplish the financial analysis of the proposed project an estimation of revenues, project cost, and operation costs should be made. Since the estimation of revenues have been presented in section 2, in this section, we will estimate the following:

Investment Cost

Land	$ 100,000
Building	400,000
Furniture and fixtures	60,000
Production line units, machines equipment, trucks	2,800,000
Working capital	570,000
Licence and establishment cost	70,000
Total Investment Cost	$ 4,000,000

The estimated annual requirements of working capital is relatively high in order to buy tomatoes from farmers before picking and receiving the goods. Therefore, the estimated total investment cost required for the proposed project is about four million dollars, of which 72% of the total required assets need to be imported.

9.2. Financing: The financing of the proposed project will depend on the type of legal business entity. Here we would like to assume that it is a public corporation. Therefore, the following distribution will be used to finance the project:

Founders stockholders	10%	$ 400,000
Other stockholders	90%	3,600,000
Total owner equity		4,000,000

9.3. Production Cost: The annual estimated production cost for the proposed project, according to the stated capacity will be the following:

a. Variable production cost	Value	Ratio
Direct materials (15,000 tons)	$ 2,400,000	35%
Containers (glass and tin sheets)	980,000	14%
Direct labor	710,000	10%
b. Fixed and semi-fixed cost		
Other factory cost (indirect materials, indirect labor, insurance, heat, property tax, water)	585,000	9%
c. Depreciation (10% of fixed assets except land and 20% of establishment exp.)	340,000	5%
d. Variable marketing expenses (10% of sales value)	900,000	13%
e. Fixed administrative and other marketing expenses	985,000	14%
Total production cost and periodical expenses	$ 6,900,000	100%

9.4. Commercial Profitability: This proposed project is expected to have sales revenue of $9,000,000 annually, with cost of goods and expenses of $6,900,000 based upon processing of 15,000 tons of tomatoes to produce 5,000 tons of final products. The total investment requirements are about 4 million dollars. This will lead to the following profitability trends:

9.5. The net profit after taxes may be calculated for the proposed project as follows:

	Source of Data	Ratio %	Value $
Estimated Sales Revenue	Section 2.6	100%	9,000,000
– Estimated production cost and periodical expenses	Section 9.3	76.7%	6,900,000
= Net profit before taxes		23.3%	2,100,000
– Corporate income taxes	38%		798,000
= Net profit after taxes		14.5%	1,302,000

9.6. Therefore, the accounting rate of return may be calculated as follows:

$$\frac{\text{Net profit after taxes}}{\text{Total Investment}} = \frac{1,302,000}{4,000,000} \times 100 = 32.6\%$$

or

it may be calculated using the Du Pont system that is by multiplying net profit ratio x total investment turnover as follows:

$$\frac{1,302,000}{9,000,000} \times \frac{9,000,000}{4,000,000} =$$

$$14.47\% \times 2.25 \text{ (times)} = 32.6\%$$

9.7. Repayment Period: The recovering period of the total investment of the proposed project may be calculated as follows:

$$\frac{\text{Total Investment}}{\text{Net profit after tax + depreciation}} = \frac{4{,}000{,}000}{1{,}302{,}000 + 340{,}000}$$

$$= 2.4 \text{ years}$$

9.8. The above appraisal indicates that the proposed project is acceptable and profitable, since it is expected to produce a rate of investment of about 32.6%, and the total investment cost may be recovered in about two years and a half.

10. Conclusions and Recommendations

10.1. This proposal is an agro-based industrial project which aims to process a substantial part of the agricultural surplus of fresh tomatoes which is about 15,000 tons annually. The market survey indicated that 97% of the local consumption of the processed tomatoes is imported from Israel.

10.2. This project will absorb a substantial part of farming produce, which is about 1/3 of the annual total surplus. This project may create price stability for tomatoes and will multiply the value of farming products. In addition, it will reduce the annual deficits of the foreign trade balance of the occupied Palestinian territories. There are also export opportunities to other Arab markets of about 2.16 million dollars.

10.3. The primary analysis of the proposed project indicated that this will be an excellent venture. The financial analysis indicated good profitability with 32.6% of return of investment and annual net profit after taxes of $1,302,000 with net profit-sales ratio of 14.47% and investment turnover ratio of more than two times, with a repayment period of 2.4 years.

10.4. The proposed plant will use simple operational processes with a total investment of 4 million dollars, and be considered a sizeable plant for an underdeveloped environment.

10.5. Among the economic and social benefits, there will be an opportunity for 115 jobs for labor, marketing and administrative staff with annual wages and salaries of about one million dollars.

10.6. Therefore, it is highly recommended that a detailed feasibility study be conducted in order to formulate the final studies and steps for implementation of such a project.

AN OPPORTUNITY STUDY

ON

A MULTIPURPOSE PLANT FOR THE PRODUCTION OF CONCRETE CONSTRUCTION ELEMENTS

Based on the work of Abdel-Hafiz Abu-Isneineh,
Dr. Atallah Kutab and Hanna Quaffa , UNIDO Experts

A MULTIPURPOSE PLANT FOR THE PRODUCTION OF CONCRETE CONSTRUCTION ELEMENTS

1. General Economic Data

1.1. Product Characteristics and Use : The products are mostly substitutes for in situ concrete. Essentially, the concrete is mixed and put in moulds in a precast yard and when ready, it is transported to its final location as required by the designer. The product line includes light-weight concrete blocks, normal-weight concrete blocks, sewer pipes, and precast concrete elements for housing and industrial installations. Such a technique of construction allows better quality control and superior end products as compared with in situ jobs. In addition, off-site production enables construction activities that traditionally are considered sequential, to be executed simultaneously; for example, foundations and floors or floors and columns. This would result in the reduction of the time required for completion of a certain project, and possibly reduction of the overall cost.

1.2. Justification for selecting the product: The 1970's witnessed a construction boom in the West Bank and Gaza Strip. The material used for construction was predominantly concrete and reinforced concrete. The reason for the widespread utilisation of concrete is mainly due to the availability of its constituent ingredients, i.e., stone aggregates and cement, locally. Although at present the cement is produced by an Israeli factory in Haifa, there are plans to establish a Palestinian cement factory in Hebron on the West Bank. In addition, concrete construction does not depend on skilled labor when compared to other types of construction, for example, timber, steel and other metallic alloys. Therefore, concrete being a local material coupled with relatively low labor cost results, in most cases, in the cheapest type of construction. However, the 1980's witnessed the introduction of new building systems in the concrete construction market. The objective was to create a more competitive market. Invariably, most projects use at present ready-mix concrete which replaced in-situ mixed concrete. The modernization in the construction industry is expected to continue especially since the market is tending to be more competitive and most construction techniques used at present are obsolete and cost ineffective. A study of the types of scaffolding indicates the point. Wood or steel scaffolds are exclusively used as temporary supports. Such a practice requires that the scaffolding stays in place for at least two weeks, until the concrete achieves enough strength for self support. This, in addition to effectively freezing the work on site until the scaffolding is removed, results in inefficient management of the contractor's assets. Also, present construction techniques can be characterized as time-consuming and since time is money, expensive. In the last couple of years, modernization of the construction industry has been taking place with the introduction of precast concrete coupled with light-weight fillers. Although the change has been slow, it is coming quickly. The slow pace in the change can be attributed to the radical deviation from the traditional construction techniques. Additionally, there has been recently a demand for concrete sewer pipes ranging from 200 mm to 600 mm diam.,as replacement for PVC(which is expensive) and asbestos cement (which can be a health hazard). It is well known that concrete pipes can be produced at very competitive prices. This is a promising market as most towns and cities in the West Bank and Gaza Strip are at the initial stages of installing sewer lines. For example,Gaza City,which has relatively the best sewerage services,has installed up to 1987 45,000 meters of sewer lines and this constitutes only 40 percent of its total network.

1.3. Product Specification: The specifications of concrete products depend primarily on the type of aggregates forming the concrete , namely,stone aggregates plus cement and water. The specifications include the weight of the constituent ingredients and the compressive strength of the hard concrete. For this purpose a material laboratory should exist in the plant to make sure that products meet the required specifications.

2. Market Demand for Premix and Precast Concrete

2.1. Current and Projected Demand: The Statistical Abstract of Israel estimates the total area of Building for the West Bank and Gaza for 1986 at 1,110,900 m^2. The average growth in this sector is estimated at 3 percent annually over the past 10 years. However, these estimates are understated due to the following reasons:

a. Some construction work does not require license from local government or Israeli authorities and , thus, is not reported i.e., repair of existing building, water drainage, concrete fences .

b. Buildings in refugee camps require UNRWA approval only. No record of the amount of such building area is available .

c. Illegal construction of buildings.

d. Illegal expansion of existing buildings.

e. Building in East Jerusalem, which is not included in the Statistical Abstract of Israel, is estimated at 8 percent of the total area in the West Bank and Gaza.

Concrete requirements for the total area for building completed in 1986 is 333,300 m^3 of concrete.

Table I shows projected total building area for the period 1990-99. The projections are based on the 1986 figures and a rate of growth of 3 percent annually.

Projected percentages of market share for the precast concrete elements are derived from discussions with local civil engineers and construction contractors. These percentages represent their conservative projections. The ratios of the sizes of various precast concrete elements to building areas were determined, based on the experience and background of one of the authors in the area of civil engineering and construction.

Table II presents projected sale quantities of premix concrete products in Hebron(the proposed site). Premix concrete products can not be easily transported to other locations.

2.2. Sales Program and Sales Revenues: Table III presents projected revenues from the sales of precast concrete elements and premix concrete in the West Bank and Gaza for the years 1990-99.

Quantities of various elements (Tables I and II) are multiplied by corresponding prices to derive revenue figures in Table III. The market approach was used to price concrete blocks, sewer pipes , and premix concrete element. This approach was used to be competitive in the market. However, the cost approach was used in pricing the new precast concrete slabs, beams, foundations,and columns.

3. Plant Capacity

The plant capacity is intended to match the market demand in the year 1999. It is envisaged that a concrete batch mixer with an output capacity of 100 m^3/hour working single shift of 7 hours/day plus 1 hour/day maintenance period, should be appropriate to meet the market demand. It is expected the plant capacity to reach the following:

1.	Ready-mix concrete	100 m^3/day
2.	Precast concrete elements for buildings	500 m^3/day
3.	Concrete sewer pipes (miscellaneous diameters)	100 m/day
4.	Light weight concrete products	20 m^3/day

4. Supply of Raw Materials and Other Inputs

4.1. Raw Material Availability and Source: The raw material is locally produced and the West Bank does not lack reserves of most ingredients. The raw material includes the following:

1. Portland Cement
2. Stone aggregates in various grades
3. Sand in various grades
4. Ground, white fine lime
5. Anhydrite
6. Aluminium paste
7. Concrete admixtures
8. Water

Table I — Projected Sale Quantities of Precast Concrete Elements in the West Bank and Gaza Strip

m = meter

	1990	1991	1992	1993	1994	1995	1996	1997-99
Projected Total Building Area (m^2)	1,241,800	1,279,000,	1,317,400	1,356,900	1,397,600	1,439,500	1,482,700	1,527,200
Projected Market Share (%)	10%	11%	13%	17%	24%	30%	33%	35%
Projected Market Share (m^2)	124,180	140,690	171,262	230,673	335,424	431,850	489,291	534,520
Projected Sale Quantities of:								
1) Number of light weight blocks	248,360	281,380	342,524	461,348	670,848	863,700	978,582	1,069,040
2) Number of normal weight blocks	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000
3) Slabs and Beams (m^3)	18,627	21,104	25,689	34,601	50,314	64,778	73,394	80,178
4) Foundations (m^3)	12,418	14,069	17,126	23,067	33,542	43,185	48,929	53,452
5) Columns (m^3)	6,209	7,035	8,563	11,534	16,772	21,593	24,465	26,726
6) Sewer Pipes (m)	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000

NOTES: (1) Light weight blocks of the size 40 cm x 20 cm x 10 cm are expected to be used in 20 percent of the slabs of the projected market . Rate of use is 10 blocks per square meter .

(2) Normal weight blocks of the size 40 cm x 20 cm x 10 cm are assumed to be marketed in the local market (Hebron). Due to present and prospective future competition, sale of normal weight blocks is expected to be 250,000 blocks annually.

(3) Size of slabs and beams is estimated to be 15 percent of the building area.

(4) Size of foundations is estimated to be 10 percent of the building area.

(5) Size of columns is estimated to be 5 percent of the building area.

(6) Domestic requirements for sewer pipes is approximately 500,000 meters. This quantity is expected to be demanded before the year 2000.

Table II   Projected Sale Quantities (m^3) of Premix Concrete in the Local Market (Hebron)

	1990	1991	1992	1993	1994	1995	1996	1997-99
Projected total building area in Hebron (m^2)(1)	99,344	102,320	105,396	108,552	111,808	115,160	118,600	122,176
Building area not covered by precast concrete elements (m^2)(2)	89,410	91,065	91,695	90,098	84,974	80,612	79,462	79,414
Premix concrete requirement for the market segment not covered by precast concrete elements (m^3)(3)	26,823	27,320	27,509	27,029	25,492	24,184	23,839	23,824
Projected size of the market share (m^3)(4)	8,047	8,196	8,253	8,109	7,648	7,255	7,152	7,147

(1) Total building area in Hebron is approximately 8 percent of total building area in the West Bank and Gaza.

(2) Projected area not covered by precast elements =(1-projected market share(%) of precast elements) x building area in Hebron.

(3) Concrete requirements is approximately 30 percent of building area.

(4) It is projected that the proposed plant will have 30 percent of the market not covered by precast elements.

Table III

Projected Revenues from the Sale of Precast and Premix Concrete
Elements in the West Bank & Gaza
All amounts in U.S. Dollars

	1990	1991	1992	1993	1994	1995	1996	1997-99
Precast Concrete Elements (see Table I)								
1) Light weight blocks @ $0.50 each	124,180	140,690	171,262	230,674	335,424	431,850	489,291	534,520
2) Normal weight blocks @ $0.30 each	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
3) Slabs & beams @$160 per m^3	2,980,320	3,376,640	4,110,240	5,536,160	8,050,240	10,364,480	11,743,040	12,828,480
4) Foundations @ $ 1[illegible] per m^3	1,986,880	2,251,040	2,740,160	3,690,720	5,366,720	6,909,600	7,828,640	8,552,320
5) Columns @ $ 160 per m^3	993,440	1,125,600	1,370,080	1,845,440	2,683,520	3,454,800	3,914,400	4,276,160
6) Sewer pipes @ $ 16 per meter	560,000	560,000	560,000	560,000	560,000	560,000	560,000	560,000
TOTAL (Rounded)	6,719,800	7,529,000	9,026,700	11,938,000	17,070,900	21,795,700	24,610,400	26,826,500
Premix concrete elements (see Table II) Local Sale of premix concrete @ $60 per m^3 (rounded)	482,900	491,800	495,200	486,500	458,900	435,300	429,100	428,800
Total revenues from sales of precast and premix concrete elements	7,202,700	8,020,800	9,521,900	12,424,500	17,529,800	22,231,000	25,039,500	27,255,300

4.2. Utilities: The proposed plant depends on the existence of the following basic utilities :

1) Source of clean water
2) Road network
3) Communication network (for example telephones)
4) Public electricity (stand-by generator)

5. Approximate Location and Site

It is flexible as to where the proposed plant is situated . However, the city of Hebron is the best possible location due to the availability of raw materials plus inexpensive labor and land. The site should be about 30,000 m^2 distributed as follows :

- Production building area 7,000 m^2
- Production building space 5,000 m^2
- Factory roads and storage area 18,000 m^2

6. Project Engineering

6.1. Process and Technology: The precast concrete building products and the concrete sewer pipes follow the same process and technology of production. The basic ingredients are stone aggregates,sand, cement, water and in some cases specific admixtures. The materials stored in supply containers are metered in an automatic weighing plant in accordance with the required recipe and mixed in a concrete batch mixer. The mixed charge is transported by trucks, fork lifts or cranes to the relative moulds. The concrete in the moulds is cured until it gains the required strength. Then it is removed from the moulds by fork lifts or cranes to storage areas. The final products are transported to building sites using purpose-built trucks. The light weight concrete products comprise quartzeous sand, cement, lime, anhydrite, aluminium paste and water. Sand and anhydrite are reduced to the required degree of fineness by grinding and broken down for the subsequent processes. The materials stored in supply containers are then metered in an automatic weighing plant in accordance with the required recipes and finally mixed with water in a special mixer. The mixed charge is cast into a mould. The decomposition product, hydrogen gas, which is formed by adding aluminium paste, expands the vicid compound whereby spherical, uniformly distributed pores are formed. The setting process which is accelerated by heat allows the soft blocks to be removed from the moulds after only a few hours. The soft block is placed in a cutting machine designed specially for this purpose and cut into sections by wires. The cut blocks are then moved into the autoclaves. The hardening process lasts roughly 6 hours in the autoclaves at a steam pressure of 12 bars. When the steam hardening process has been concluded, the blocks are wrapped and packed ready for transport and use.

6.2. Machines and Equipment:

- Cement storage silos of 250 m^3 capacity (usually supplied by cement factories)
- Concrete compartments for storing aggregate with 2000 m^3 capacity.
- Concrete batch mixer with 100 m^3/hour capacity
- Light weight concrete batch mixer for 25 m^3/hour capacity
- 2 belt conveyors 15 ton/hour capacity

- Sand grinding plant 10 ton/hour capacity
- Light weight casting plant

  10 moulds size 1.5 x 1.2 x 0.625 m

  1 crane lifting capacity 4.0 tons

  cutting machine

  1 set of curing support equipment

  4 transport devices for curing cars

  1 transport device for moulds

  1 waste slurry mixing system

  1 device for cleaning and oiling moulds

  6 autoclaves 2.2 m diameter x 37 m length

  6 sets of fittings

  1 evacuation unit 400 m^3/hour capacity

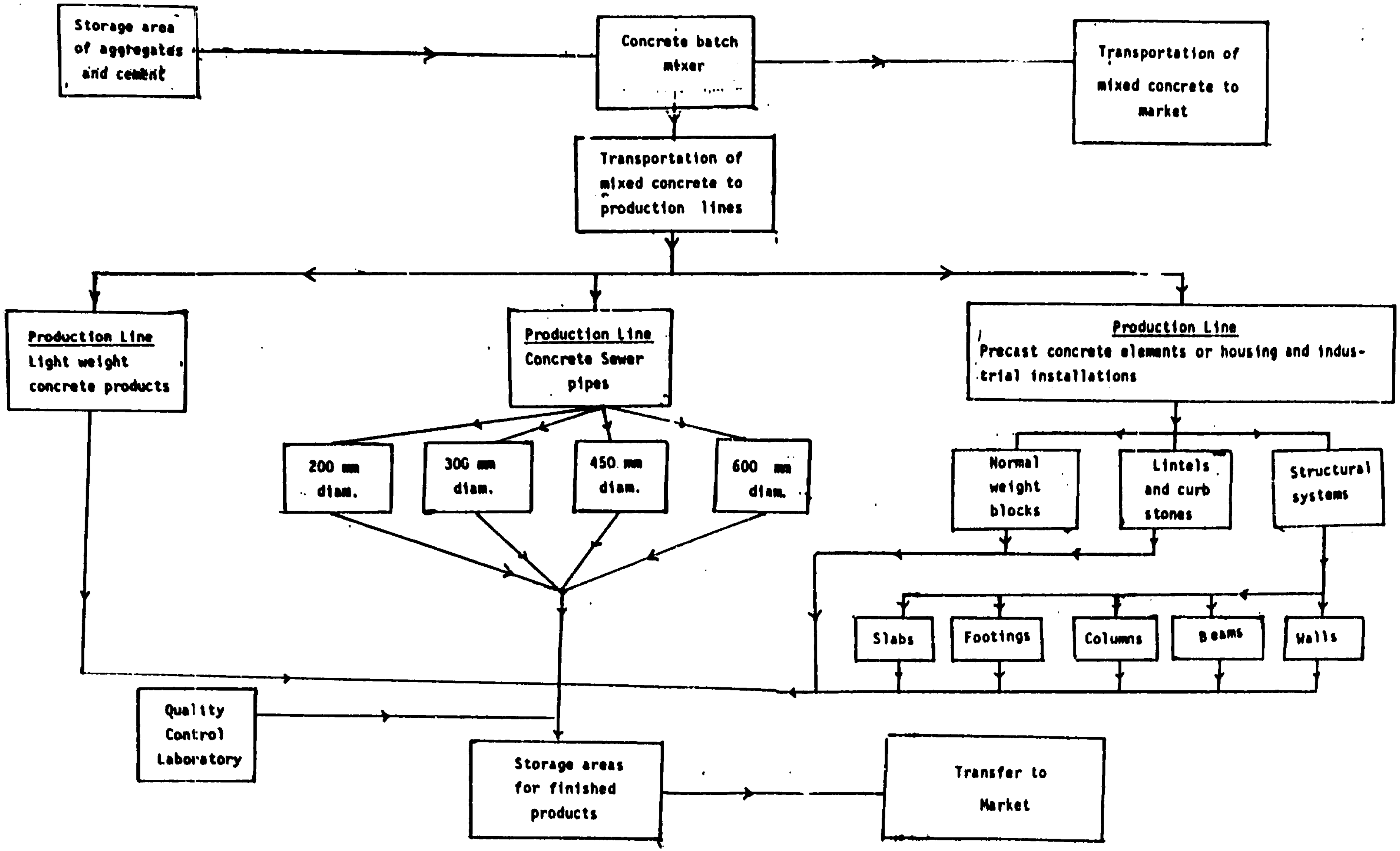
  1 autoclave travelling platform

  1 silencer capacity 4.5 t/h

  1 control system for steam
- Steam generator 7 tons/hour
- 4 fork lifts 2 tons capacity
- 2 crane lifting capacity 10 tons
- 1 gantry crane lifting capacity 10 tons
- Material laboratory
- Moulds for precast concrete(various shapes)
- Sewage concrete pipe moulds (1 m lay length plus accessories)

  200 mm diameter
  300 mm diameter
  450 mm diameter
  600 mm diameter
- Stands in storage area
- 7 trucks with rotating drums
- 2 vehicle mounted pumps

Figure No. 1 Flow Sheet



- 5 purpose-built trucks for precast elements
- Maintenance workshop
- Electric generator
- Land 30 dunums (30,000 m^2)
- Building average height 5 m, 40,000 m^3

7. Manpower and Management

The technical staff required for the proposed plant is :

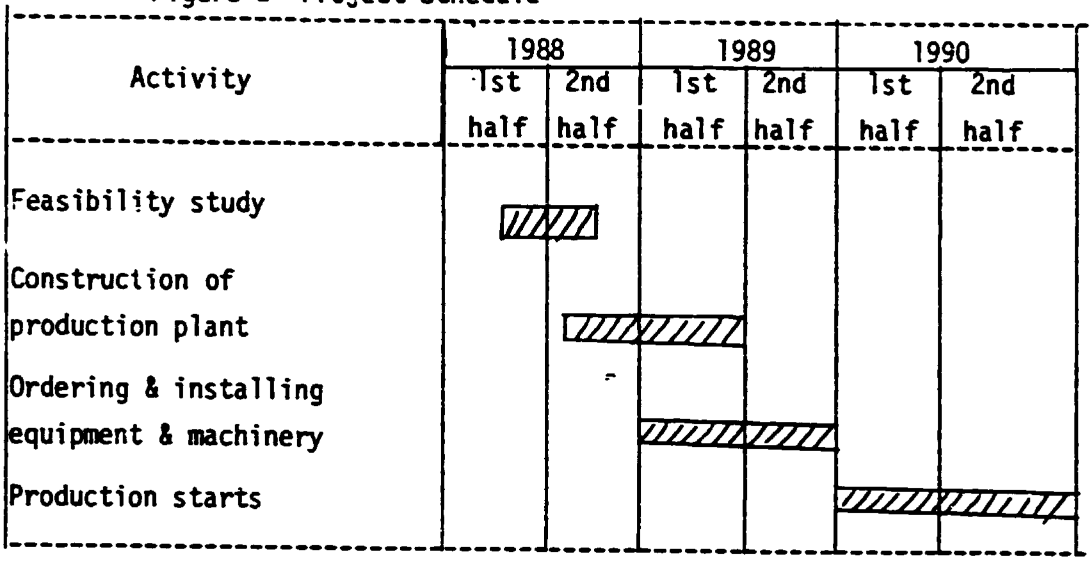
Director	1
Accountant	1
Secretary	1
Foreman	4
Maintenance technicians	4
Production workers	20
Fork lift and crane operator	2
Laboratory technician	1
Drivers	14
Pump operator	2
TOTAL :	50

All staff required can be readily recruited locally.

8. Project Scheduling

The following bar chart illustrates the project scheduling:

Figure 2 Project Schedule



9. Financial Analysis

The financial analysis for the proposed project is based on an average estimate of number of units sold, forecaste over a period of ten years 1990-1999 (section 2). The market forecast in section 2 shows an annual increase of 3% of the market demand in addition to a gradual increase in the firm's projected market share. An averaging process was used to calculate revenue and expenses for financial analysis. Different results will be obtained if calculation is based on yearly forecasted financial statements and cash flows.

9.1. Investment Cost :

Table IV

Investment Cost

Land	$ 540,000
Building	240,000
Machinery,equipment and fixtures	3,300,000
Working capital	1,500,000
Organizational costs	80,000
TOTAL :	$ 5,660,000

The machinery and equipment mostly are imported from outside the West Bank and Gaza; cost of machines includes installation. The working capital includes inventory of raw materials which is calculated at 8% of raw materials used for yearly production , approximately the needed raw material for one month's operation based on average number of units produced. The working capital forms a high percentage when compared to total assets,namely 27%. Organizational cost includes the fees of lawyers and consultants as well as legal incorporation fees calculated at 0.01% of invested capital in accordance with West Bank regulations.

9.2. Financing : The form of organization of the proposed project is that of a private corporation under the articles of Jordanian Corporation Law for 1964. A public corporation can not be formed due to obstacles imposed by the authorities in the West Bank . The capital investment in the proposed project is basically equity capital. No long term loans or debt financing is available to West bank and Gaza residents. Trade accounts are the only means for short term debt financing.

9.3. Production Costs: The estimated production costs were based on the average yearly production and included other period costs. The average quantities used are subtantially below actual operating capacity . The effect of using this average is immaterial since 77% of production costs are direct materials,which is a variable cost .The production costs are summarized in Table V.

Table V

Production Costs and Expenses

Direct materials (cement,iron, aggregates, water, etc.)	$ 11,841,500	77%
Direct labor	301,100	2%
Other factory costs and expenses(semi fixed and fixed costs such as maintenance, supplies,indirect labor,utilities,selling and administrative expenses, etc.)	2,859,000	18.5 %
Depreciation and amortization(10% of property plant and equipment and 20% of organizational cost)	370,000	2.5%
TOTAL :	$15,371,600	100%

9.4. Commercial Profitability: The average revenue for the purpose of calculating net profit was based on Table III section 2 of the study and summarized in Table VI.

Table VI

Estimated Average Revenue

	Item	Quantity sold annually	Unit	Selling price per unit	Amount $
1.	Premixed concrete	7,610	m^3	$ 60	456,600
2.	Light weight concrete blocks	705,387	block	$ 0.50	352,700
3.	Normal weight concrete blocks	250,000	block	$ 0.30	75,000
4.	Sewer pipes	35,000	meter	$16.	560,000
5.	Precast concrete elements	105,808	m^3	$160.	16,929,300
	TOTAL REVENUE :				18,373,600

Net income is calculated as follows :

Table VII

Net Income

			Ratio
Estimated sales revenue	Table VI	$ 18,373,600	100%
Estimated costs & expenses	Table V	15,371,600	84%
Net income before tax		3,002,000	16%
Tax expenses @ 38.5% of net income *		1,155,800	
Net income after tax		1,846,200	10%

* Corporate tax is 35%,and 10% of the total tax expense is levied as a social welfare tax totaling 38.5% .

9.4.1. Rate of Return

The accounting rate of return is calculated as follows :

$$\text{Rate of return} = \frac{\text{Net Income After Tax}}{\text{Total Investment}} \times 100\%$$

$$= (1{,}846{,}200/5{,}660{,}000) \times 100\%$$

$$= 32.6\ \%$$

The rate of return can be calculated using a Dupont System by combining net profit ratio and total investment turn over ratio thus :

$$\text{Rate of Return} = \frac{\text{Net Income After tax}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total Investment}}$$

$$= (1{,}846{,}200/18{,}373{,}600) \times (18{,}373{,}600/5{,}660{,}000)$$

$$= 10.04\ \% \quad \times \quad 3.25\ \text{(times)}$$

$$= 32.6\%$$

9.4.2. Pay Back

The period required to recover the total investment in the proposed project can be calculated as follows :

$$\text{Pay Back} = \frac{\text{Total Investment}}{\text{Net Income After Tax + Depreciation and Amortization}}$$

$$= 5{,}660{,}000/(1{,}846{,}200 + 370{,}000)$$

$$= 5{,}660{,}000/2{,}216{,}200$$

$$= 2.55\ \text{Years}$$

That is the total,investment will be recovered in two years and seven months .

10. Conclusion and Recommendations

10.1. The project is the first of its kind in the West Bank and Gaza. Thus it will fulfil the need for production of light-weight concrete, sewer pipes, and precast elements which are either imported or ineffectively being produced on site. Concrete sewer pipes are not available and are intended to **replace asbestos pipes which can cause a** health hazard and PVC pipes which are very expensive .

10.2. The existence of such a project will be an asset to the construction sector. It is expected to act as an incentive to this sector to develop and become more cost effective by reducing construction time and supplying better quality work to the consumer. The availability of precast concrete elements will make construction modular, thus leading to more economic construction and better utilization of labor and material. The transfer of a big part of the work from the site to the yard will enhance quality as it is more easily controlled. In addition to that, structural elements that are normally sequentially constructed can be produced on a parallel basis, reducing the time of completion of a project .

10.3. The proposed plant can be constructed on a modular basis. The plant can be divided into four profit centers. Each can be set as a different company or can be developed separately on its own. The batch mixing plant, precasting yard, light weight concrete, transportation; for example, the precast yard can purchase premixed concrete from outside. Transportation can also be purchased from a local transportation company, thus reducing the investment costs.

10.4. The primary analysis of the proposed project indicates that this project is a good venture with a rate of return of 32.6% and net income after tax of $ 1,846,200 . Investment turn-over ratio is excellent @ 3.25 times; the pay back time of 2.55 years is also very good .

10.5. We highly recommend that a more detailed feasibility study be conducted in order to give better information for final decision regarding implementation of this project .

AN OPPORTUNITY STUDY

ON

FISH CANNING PLANT IN GAZA

Based on the work of Dr. Said Haifa,
Dr. Atef Alawneh and Hisham Jabr, UNIDO Experts

1. Introduction and Economic Background

1.1. The fishing industry has existed in Gaza for a long period of time as one of the main professions of Gazan people. This industry contributes to both regional income and employment. About 2% of the Gazan people live on this industry, which currently employs more than 1,000 people. 2.5% of the Gazan agricultural income is derived from this industry. The importance of fishing to the Gazan economy has fluctuated from time to time because of changes in the permitted fishing areas. The development of this industry was hindered by many obstacles, due to the fact that Gaza has never had its own development plan. Large fishing areas were permitted before 1948, causing the fishing industry to prosper then. These areas were reduced from 7,500 km^2 to 600 km^2 (less than 8%) after the Israeli occupation of the Gaza Strip in 1967. Israeli occupying authorities imposed several obstacles on the industry such as preventing fishermen from going to sea and enforcing other restrictions to be detailed in this report. All this combined to limit the quantity of catches and cause severe fluctuations in the industry.

Table 1 shows the importance of the fishing industry to the Gazan economy during the years 1968-1983. The table shows that the quantity of catches increased from 2,300 tons in 1968 to 2,600 tons in 1972, then decreased in the mid-seventies, especially after the signing of the peace treaty between Egypt and Israel, according to which the Sinai desert was returned to Egypt. As a result the permitted fishing area decreased, leading to a sharp decrease in catches from 2,250 tons in 1976 to 962 tons in 1983 (60% of which is Sardinella) or less than half the 1976 quantity. This happened in spite of the increased use of technical equipment and more boats.

Table 1

Quantity of Catches During the Periods 1968-1983
and Number of Fishermen in the Gaza Strip

Year	Quantity of Catches (tons)		No. of Fishermen
	Total	of which Sardinella	
1968	2,300	1,600	1,167
1972	2,600	1,900	1,200
1976	2,250	1,700	1,250
1983	962	576	1,060

Source: Awad, Munir: Fish Resources in the Gaza Strip, Rural Research Center, Al-Najah University, Nablus, June 1987, p. 17 (in Arabic).

The number of boats increased from 75 in 1968 to 297 in 1983 (i.e. four times of that of 1968). This increase in the number of boats used, and the decrease in the quantities of catches led to an increase in the cost of catches which affected the marketability of fish.

The obstacles and problems facing the fishing industry in Gaza are summarized below:

a. Restriction on fishing time: Israeli authorities restrict fishing time to night only, from 3 p.m. to 5 a.m. Any violation is subject to punishment.

b. Fierce competition from Israeli fishermen: They are equipped with modern fishing tools and can enter the Gazan permitted fishing area, which is limited to 12 miles of the sea which lacks the rocks and sea grass where fish thrive.

c. High maintenance costs: Boats need maintenance regularly because of the absence of a port to land in, and because they are subject to effects of sun and climate fluctuations which lead to damage. This makes expensive maintenance necessary every three months.

d. Several types of high taxes: These are estimated at about 60% of the value of the catches.

1.2. Labor Force in the Fishing Industry: As a result of the aforementioned obstacles, and the smaller permitted area, number of fishermen has decreased. About 1,400 fishermen were working in 1978, but decreased to about 1,000 fishermen in 1985. Only half of the Gazan fishermen are actually employed in fishing. Since it is mandatory for every fisherman to hold a licence issued by the

Israeli Department of Fisheries, renewable annually, those fishermen who are not actually employed must continually renew their licences in case fishing should prosper again. In the meantime they are either not employed or are employed as casual workers in Israel. Some reduction has occurred in the number of fishermen, but those whose families have been fishermen for generations amounts to 550.

1.3. Fishing Tools and Equipment Used: Another serious problem in the fishing industry in Gaza is the shortage of modern fishing vessels, in 1986 estimated at 409[1]. There is one boat yard in Gaza town capable of building fishing vessels. The yard is located on the coastal cliff, and, as the lease for the land has expired, the yard will most likely close down in the near future. This imposes another serious problem to the fishing industry. Fishing nets are imported and locally mounted either by the fishermen themselves or by skilled workers in town. Fishermen can buy the net from the fishermen's cooperative or from wholesalers, but at a higher price. Net prices range from $20 to $300 depending upon the depth of the gill net.

1.4. Due to the above-mentioned obstacles under which fishing industry of Gaza operates, Gaza fishermen have faced declining catches since in 1978 (see Table 1). The peaks from 1979-1981 were caused by high Sardinella catches. There are no obvious signs of overfishing, neither in the biological nor in the economic sense.

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[1] UNDP, Assistance to the Fishermen, Gaza Strip, Final Report, Study for Fishery Port. Gaza, September 1987, Table 1, Figure 4.3.

The Gaza catch losses cannot then be attributed to depleted resources, but derive from the many constraints and obstacles. Thus, there is potential for increasing catches.

The major species in the catch composition is the Sardinella (Table 1). Total catches were 2,300 tons in 1968 of which 1,600 tons were Sardinella or about 69%. While the total catch declined to less than half in 1983, compared to 1976, Sardinella catches declined to about one third, but still constitute more than 60% of the total.

1.5. Selling of the catch by the fishermen was done on shore through auction. Then a center for fishermen was established to help facilitate the fishing processes. Later a fishermen's cooperative was founded to exercise the following essential activities:

a. Purchasing all needed equipment and tools and selling them to fishermen at reasonable prices.

b. Purchasing a refrigerator to preserve surplus of fish until sold.

1.6. Product Characteristics and Use: Different problems occur with different types of fish. Most types of fish caught in Gaza are not subject to serious marketing problems, due to the fact that the quantities are small, and the need for these types of fish for food as a source of protein and as a substitute for expensive meat. Fish is considered very cheap in comparison with meat.

1.7. Justification for Selecting the Product: Only Sardinella causes marketing problems due to the fact that the quantities of Sardinella are relatively large compared with other types, and there is difficulty in preserving the surplus for several days until is is sold. Storage and marketing problems with Sardinella occur especially in peak seasons where the catch is greater than the quantities sold. During peak seasons, fishermen need cold storage to preserve the surplus,andmust find a permanent channel of distribution in order to sell the daily surplus at stable and profitable prices,bearing in mind the high fishing cost. Operational costs of fishing are estimated at more than $670 per ton; additional fixed costs of about $130 per ton will bring the total cost to about $800 per ton. Considering the fluctuating prices of fish, and the low quantities of catch, fishing under these conditions has become unattractive. Annual income of fishermen in Gaza is estimated at about $260 to $1,500 per fisherman. This very low income is the main reason why many fishermen quit fishing. In order to solve the Sardinella catch problem, a fish canning plant is suggested to absorb the catch of Sardinella, process it, and sell it in small cans. Canned fish at present is imported. Justification for proposing this project is:

- availability of raw material (Sardinella)
- availability of skilled labor (fishermen)
- availability of a market in the West Bank and Gaza.

1.8. Product Specification: Sardinalla is a type of fish which is used as the principal raw material for canned fish. This type of fish is available in Gaza in quantities sufficient to establish this project. Two types of canned fish are expected to be produced: canned fish with tomato, and canned fish with oil.

2. Market and Demand for Specific Product

2.1. Canned fish products in the occupied territories are currently imported from Israel or through Israel from European countries. There is no such plant in these territories. At present, the population of the occupied territories exceeds 1,500,000 people who are in need of fish products for food, which could reduce to some extent the need for more expensive meat. A kilogram of meat is sold currently at about $12. The demand for canned fish in the West Bank and Gaza Strip is estimated at not less than 1,500 tons annually, assuming that one kilogram only is consumed by every person annually. Based on this assumption, the actual demand will be much more than the Sardinella catch, which is estimated at about 600 tons annually, but there is great potential to increase this catch in the future. Moreover, if constraints on fishing in the future are minimized or abolished, there will be an opportunity to increase the catch and thus export some of the canned fish to neighbouring countries such as Jordan where there is no such plant.

2.2. Sales Program and Sales Revenue: Based on the assumed demand, and considering the amount of Sardinella catch at present, the project is expected to produce about 600 tons annually. Thus, the following sales program and sales revenue are suggested:

Type of Product	Quantity in tons	Price per ton in $	Sales Value in $
Canned fish with oil	300	3,000	900,000
Canned fish with tomato	300	3,000	900,000
Total	600	3,000	1,800,000

Sales revenue is expected to be about $1,800,000 assuming that the selling price is about $3,000 per ton. This is much cheaper than imported canned fish at prices exceeding $4,000 per ton. The market for the product is expected to be in the West Bank and Gaza Strip.

3. Plant Capacity

Based on the availability of the raw materials, the plant operation may be determined as 600 tons annually.

4. Supply of Raw Materials and Other Inputs

4.1. Raw Material Availability and Sources: In order to produce about 600 tons of canned Sardinella fish of two types: Canned fish with oil, canned fish with tomato, assuming 300 tons of each following raw materials are needed:

- Sardinella: 600 tons of Sardinella could be obtained easily from Gaza.

- Tomatoes: 30 tons for processing the canned fish with tomato. This quantity is available either from Gaza or the West Bank.

- Vegetable Oil: 30 tons to be used in producing the canned fish with oil. This quantity can be purchased from the local market or imported directly.

- Pepper, Salt and Other Chemicals: About one tone can be bought from the local market.

- Cans: Small cans of about 225 grams each; gross weight will be about 400 grams each. These small cans are available from local can factories in the occupied territories.. About 3,000,000 units are needed, a contract through bidding could be signed with one of the tin factories to supply the plant.

5. Approximate Location and Size

5.1. The issue of locating the canned fish plant is not difficult, since the only suitable and possible alternative is Gaza for the following reasons:

- Proximity to raw materials.
- Availability of skilled labor force needed for the plant.
- Proximity to about one-third of the market. The transportation cost of the canned fish from Gaza to the West Bank market is relatively easy and inexpensive when compared with transportation costs of the raw material which decay in transit.

Therefore, Gaza is the best location.

5.2. The plant requires an area of about 5 dunums, enough for present capacity and future expansion.

6. Project Engineering

6.1. Process and T· ·hnology: In order to can the fish, several processes are to be ..dertaken. Cans have to be made available in small sizes. Other processes are required as: cooling, washing, cutting, mixing, salting, sterilization, filling, packing, etc. The Sardinella fish in quantities of about 200 grams each have to be mixed with either vegetable oil, pepper, and salt, or with tomato and salt. Thus, two lines of production have to be arranged, one for producing canned fish with oil, the other line to produce canned fis' with tomato. Alternatively, multiple purpose machines could be used to produce the two kinds. The latter is preferable.

6.2. The flow sheet of the project may be determined as indicated on Page 11.

6.3. Machines and Equipment Needed: One type of multiple purpose machine is required. This machine can do all the processes of cooling, washing, cutting, mixing, filling, canning, and packing. Alternatively, several small machines could be used each doing one or two processes. However, it is preferable, whether using one multipurpose machine, or several samll ones, to place them in one line, in such a way as to feed each other. Technical consultation fc the type of machines and equipment is needed. Equipment and machineary required to can 600 tons annually is estimated to cost about $600,000.

7. Manpower and Management

7.1. It is expected that the proposed plant will require about 30 employees for management, production and marketing staff in the initial stage. If the capacity of the project is expanded, additional labor and staff will be required.

Operation	Supply Materials	Processing	Finishing
Supply of Fish	⇒		
Wash and Inspect		O	
Cutting		O	
Mixing with tomato sauce or vegetable oil		O	
Adding salt	⇒		
Supply of cans/ containers	⇒		
Filling			O
Sealing			O
Sterilizing			O
Labeling			O

7.2. Availability of Manpower and Training: Three types of employees are required, skilled, semi-skilled, and unskilled. Skilled includes five administrators, a manager, two accountants, and one chemical engineer. Semi-skilled includes one secretary, two assistant technicians, and two workers to operate the machines. Unskilled workers are manual workers and janitors.

The occupied territories have a surplus of all kinds of manpower due to the many unemployed university and community college graduates. Moreover, experienced fishermen are found in Gaza and many are unemployed. The plant can benefit from their experience. However, technical and production training is needed. This could be done through contracts with the suppliers of machines and equipment to do the required training either in the occupied territories or outside.

8. <u>Project Scheduling</u>

8.1. To start the project an establishment team is required to undertake the establishment formalities such as applying for a licence, recruiting staff, choosing a site for the project, collecting the capital neede to build the plant, and doing all the administrative procedures. It requires about two years to build the factory and start operation, assuming that no obstacles and delays from the authorities are encountered.

8.2. The timetable of construction of the proposed plant may be indicated as follows:

tasks \ time period	1,2	3,4	5,6	7,8	9,10	11 12	13 14	15 16	17 18	19 20	21 22	23 24
Formulate groups founders	o	o										
Get licence/Occupied Territories		o										
Acquire the land		o	o									
Get permission for building			o	o								
Communications with Fishermen				o	o							
Communications for technology supply					o	o						
Select equipment						o	o	o				
Get permission to import equipment							o	o	o			
Install equipment									o	o	o	
Arrangement fur training required labor									o	o	o	
Arrangement for containers supply											o	o

9. Financial Analysis

9.1. Investment Costs: According to the suggested capacity and based on consultations with technical people, the following investment costs are estimated:

- Land: It is estimated that 5 dunums are needed for present capacity and for future expansion. Total: $100,000.
- Buildings: It is believed that a one-story plant has many advantages over a multi-story plant, in spite of the fact that it requires a larger land area. It will facilitate production, storage, shipping, control and easy movement and material handling. Buildings required are of two types: A 500 m^2 building for the plant at about $50,000, and a 200 m^2 building for office management, estimated at $40,000, total cost. Estimated Total: $90,000.
- Machines and equipment and fixtures needed for canning: Estimated Total: $600,000

- Furniture	15,000	
- Cars	30,000	
- Establishment Cost	60,000	
- Working Capital	245,000	
Total investment cost needed		1,140,000

9.2. Machines and equipment have to be imported from a European country with experience in producing and expertise in operating such machines, possibly Italy or Portugal. Moreover, training of employees could be done there. The experience of Morocco in this field could also be utilized.

9.3. Financing: The plant could be established in one of the following legal forms:

- Cooperative: Fishermen could be members of this cooperative and help the project by using their experience. The project may be exempted from income tax, since members of the cooperative are not purchasers of the product. Attention should be given to the number of shares, profits should be distributed according to number of shares, and not on a patronage dividends basis. The charter should include this item.

- Corporation: Capital of the project is to be divided into shares of $3 or $10 per share, not more, since the total capital is small. In this legal form of ownership, the corporation has to be subject to income tax which is 38.5% of the net profit.

9.4. Annual production cost and other expenses may be estimated as follows:

a. Raw Materials:

- Sardinella 600 tons at $1000/ton	$ 600,000
- Cans 3 millions units	90,000
- Vegetable Oil 30 tons at $1.5/kg	45,000
- Tomatoe sauce 30 tons	20,000
- Preservatives, pepper and salt	10,000
Total Raw Materials	765,000
b. Labour cost 30 persons/$6,000	180,000
c. Utilities and other factory overhead	50,000

d. Depreciation Cost: economic life of the project to be 10 years: The straight line method of depreciation is used:

	Depreciation for machinery	(10%)	\$ 60,000
	Building	(4%)	\$ 3,600
	Furniture	(20%)	\$ 3,000
	Cars	(20%)	\$ 6,000
	Establishment Cost	(25%)	\$ 15,000
	Total depreciation cost (annually)		\$ 87,600
e.	Marketing expenses		90,000
f.	Administrative expenses		60,400

Total operation cost and expenses will be; 1,233,000

9.5. Commercial Profitability: The commercial profitability of the project is measured by the return on investment (ROI) and the repayment period (pay back method). Net operating profit should be calculated first in order to measure the commercial profitability of the project.

Net profit = Total - Total cost and expenses

Estimated annual revenue 600 x \$ 3,000 = \$ 1,800,000 assuming that the sales price is \$ 3,000 per ton:

\$ 1,800,000 - 1,233,000 = \$ 567,000 net profit before tax.

Net profit after tax = 567,000 - 218,295 = 348,705

a. Rate of return on investmenr (ROI): The annual simple rate of return on investmenr (ROI) is calculated as follows:

$$\frac{\text{Net Profit After Tax}}{\text{Total Investment}}$$

or by using the Dupont system

$$\frac{\text{Net Profit After Tax}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Investment}}$$

Whatever method is used, the same result will be reached.

$$ROI = \frac{\text{Net Profit After Tax}}{\text{Total Investment}} = \frac{348,705}{1,140,000} = 30.6\% \text{ annually}$$

Using the Dupont system:

$$ROI = \frac{\text{Net Profit After Tax}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Investment}}$$

$$= \frac{\$\ 348,705}{\$\ 1,800,000} \times \frac{\$\ 1,800,000}{\$\ 1,140,000} = 30.6\% \text{ annually}$$

b. Repayment period: Pay back method is used to determine the repayment period, which is the period required to recover total investment out of operating profit. It is calculated as follows:

$$\frac{\text{Total Investment}}{\text{Net Operating Profit after Tax + Depreciation}}$$

$$= \frac{1,140,000}{348,705 + 87,600} = 2.61 \text{ years}$$

Thus, total investment is expected to be recovered in about 2.6

10. Conclusions and Recommendations

10.1. The proposed plant is expected to produce about 600 tons of small canned fish of two types, canned fish with vegetable oil, and canned fish with tomato. These two types are highly demanded in the occupied territories, and this project is expected to solve the problem of marketing the Sardinella fish of Gaza.

10.2. The quantities which are to be produced can help meet only a part of the local West Bank and Gaza market demand for this type of product. The demand is in fact much greater than the supply but at present the quantities of raw material (Sardinella catches) are small. Therefore, plant capacity is conservatively projected to handle the quantities of Sardinella currently caught.

10.3. The project is considered economically feasible. A high return on investment is expected from the project, about 30.6% annually. Investment cost is expected to be recovered in the very short period of about 2.6 years.

10.4. About 30 jobs are expected to be available in the factory, and other jobs will be created in related fields. Job opportunities will expand in the fishing industry, and jobs are expected to be created in the transportation, trade, and service sectors.

10.5. Annual sales is expected to be about $1,800,000 resulting in sales yield per employee about $60,000 annually.

10.6. It is expected that the output of this plant will help to substitute for up to $1,800,000 worth of present imports, thus alleviating the burden of deficit in the balance of trade.

10.7. For all the above reasons the project is recommended as feasible socially and economically. Consultation and communication with factories of this type abroad are advised before the implementation stage.

AN OPPORTUNITY STUDY

ON

OXYGEN-NITROGEN PRODUCTION PLANT

Based on the work of Dr. Nidal R. Sabri UNIDO Expert

1. General Economic Data

1.1. Product Characteristics and Uses: This proposed project is planned to produce oxygen as well as nitrogen products. There are several major uses for oxygen;

- It can be used by hospitals and other medical centers for breathing purposes.
- It can be used with acetylene by different workshops for metal welding and cutting purposes.
- It can be used by different factories as an important element in producing chemicals and acids, in producing ingot steel and in cracking of methane.
- It can be used to help breathing in areas where oxygen is lacking, e.g., in scuba diving or mountain climbing.

There are also several uses for nitrogen;

- It can be used in producing ammonia and other chemicals and in the pharmaceutical industry.
- It can be used in canning and soft drinks industries.
- Liquid nitrogen can be used as a coolant to freeze blood and food for example.

1.2. Justification for selecting the product: Both oxygen and nitrogen will be produced simultaneously from the same plant and operations. Both are very useful and are very much needed by workshops, different industries and medical sector.

1.3. There is no Arab oxygen factory in the occupied Palestinian territories. All local market needs are imported from the Israeli factories. This includes buying all filled sizes of cylinders and containers and refilling these cylinders and containers. Therefore, there is an urgent need for such a project to be established in the occupied territories to meet the local needs of oxygen and nitrogen products.

1.4. Establishing the proposed project will solve the problems encountered in importing the needed products of oxygen and nitrogen. Currently, importing these two vital products pass through several marketing channels and many agents.

1.5. Product Specifications: The oxygen and nitrogen products will have the following characteristics and uses:

A. Purity Ratio: The purity ratio of oxygen and nitrogen varies from 90% up to 99.9%. The proposed plant will produce oxygen with a purity ratio of 99.5% and nitrogen with a purity of 99%.

B. Forms of production and distribution: The oxygen and nitrogen products may be produced in two forms:

- Liquid Form: This form is usually marketed in large quantities i.e., in special containers that have a built in automatic converter to convert the liquid into gaseous form as needed.

- Gaseous Form: This is usually filled in strong cylinders under pressure of 150 ATM. The common size of the cylinders is the standard size i.e., 0.04 cum (water volume) and takes 6.9 cum of oxygen (244 cu.ft) measured at atmospheric pressure. The weight of the oxygen is about 6.8 kg (15 lbs). Other small size cylinders may be used and these are about $\frac{1}{5}$ the standard size capacity. In addition, pipelines may be used to distribute the gaseous form directly to the major plants (customers). Producing the liquid form saves weight and space but the cost of producing it is higher than the gaseous form. However, considering the local market, the proposed factory will market the majority of its product in gaseous form using standard cylinders of 150 ATM with a content of 0.04 cum.

C. Uses: The high purity ratio of oxygen and nitrogen as stated above will be suitable for all medical and industrial purposes.

2. Market and Demand

2.1. Current local demand: A market survey was conducted to determine the local demand for oxygen and nitrogen products, distribution forms, sizes of containers, retailing and wholesaling prices, and the marketing channels. The following findings were revealed:

2.2. There are many Arab agents who supply to the local market oxygen and nitrogen from the Israeli plants since there is not a single Arab plant in the occupied Palestinian territories. The retail as well as the wholesale prices vary. Some Arab customers refill their cylinders directly from the Israeli distributors and not through the Arab agents.

2.3. The oxygen and nitrogen products are usually distributed in standard size cylinders and in gaseous form in the local market. However, the small size cylinders are only used by ambulances. The soft drinks companies buy the nitrogen products in liquid form and in tons.

2.4. The oxygen products are used for the following purposes:

A. Medical Purposes: There are about twenty three hospitals in the occupied Palestinian territories, which perform a total of 70,000 operations per year. Besides this, there are several small medical centers and ambulances. The current annual average consumption in the occupied territories is about 85,000 standard cylinders and about 9,000 small cylinders used by ambulances. In advanced countries, the oxygen is stored as a liquid, converted to gas and then piped to the hospital rooms to be used in tents or masks. However, in the occupied territories, the gaseous oxygen is used directly from the cylinders to be administered to the patients through special pipes using the masks.

B. Workshop Purposes: There are about 500 workshops in the occupied Palestinian territories which are either garages or simple metal manufacturers. Most of these workshops use oxygen products for metal cutting and welding purposes. The current annual market of oxygen product for this segment is about 35,000 standard cylinders.

C. Factory Purposes: There are several different factories in the occupied territories that use the oxygen for cutting and welding operations, for chemical operations and for producing different steel and metal products. However, the use of oxygen in this area is still limited but increasing rapidly. The current annual demand for oxygen is about 45,000 standard size cylinders.

2.5. The nitrogen products are used for the following purposes:

A. The nitrogen product may be used for soft drinks and canning companies in relatively large quantities. Therefore, these companies buy the nitrogen in liquid form, as it is more economical, and then convert it into gas when needed. The current demand for this segment is about 1000 tons a year.

B. Medical companies and other small canning companies use nitrogen, but in small quantities. Therefore, these companies prefer to buy the nitrogen product in gas cylinders.

C. The nitrogen product may also be used by educational institutions for laboratory purposes, for cooling purposesand by food companies to freeze food. This segment or area is still limited in the occupied territories.

The current demand for the second and third segments may be estimated at 10,000 standard size cylinders and 1,000 small size cylinders of nitrogen.

2.6. There is no possibility to export the proposed products outside the occupied Palestinian territories.

2.7. The local demand is expected to increase annually with the increase of population and with the increase of those industries that use oxygen and nitrogen products.

2.8. Sales Program: According to the above market findings and the local needs, the annual sales program and revenue may be projected as follows:

The annual projected sales program of the proposed plant

Type/Form	Size	Uses	Quantity in Units — cylinders —	Wholesale Price/Unit in $	Sales Value in $
Oxygen (Gaseous)	Small	Medical	9,000 units	5	45,000
Oxygen (Gaseous)	Standard	Medical	85,000	10	850,000
Oxygen (Gaseous)	Standard	Industry workshops	80,000	10	800,000
Nitrogen (Gaseous)	Small	Multi-uses	1,000	5	5,000
Nitrogen (Gaseous)	Standard	Industry	10,000	14	140,000
Nitrogen (Liquid)	Per ton	Industry	1000 tons	160	160,000
Total Budgeted Sales Value					$ 2,000,000

2.9. The total sales value is expected to be $2,000,000 and that is by selling 175,000 standard size cylinders, 10,000 small size cylinders of both oxygen and nitrogen and about 1000 tons of liquid nitrogen. Considering the prices of the products, the proposed factory is expected to deliver its products directly to its customers .

3. Plant Capacity

3.1. The proposed plant is expected to produce (according to the sales plan) 1,151,000 cum (equivalent to 40,647,200 cu.ft) of oxygen and 1,086,000 cum (equivalent to 38,357,000 cu.ft) of nitrogen a year.

3.2. The oxygen products will be filled and distributed in 165,000 gaseous standard size cylinders (i.e., 6.9 cum or 244 cu.ft.) and 9000 gaseous small size cylinders (i.e., 1.38 cum or 48.8 cu.ft).

3.3. The nitrogen products will be filled and distributed in 10,000 gaseous standard size cylinders (i.e., 6.9 cum or 244 cu.ft) and 1000 gaseous small size cylinders (i.e., 1.38 cum or 48.8 cu.ft) and 1000 tons of liquid nitrogen.

3.4. This means that the capacity per hour will be about 894 cum of oxygen and nitrogen products (equivalent to 31,500 cu.ft per hour) Assuming there are 313 working days a year and 8 hours a day.

4. Supply of Raw Materials and Other Inputs

4.1. This project does not need any raw material since the oxygen and nitrogen will be produced from the air. Therefore, air is the raw material needed in this project.

4.2. Special containers are needed to distribute the oxygen and nitrogen products of the proposed project. These containers are cylinders and are made of strong steel. The standard size has a content of 7 cum. It is very heavy and weighs about 90 kg., while the small size has one fifth the standard size capacity. The prices of the cylinders vary according to quality and may range between $50 to $200. And they have to be imported.

4.3. Electricity. Electricity is an important factor in the production process of the proposed project. The process needs high electrical loads from fixtures and equipment. For example, the general electrical load of the compressor motor should be 100 HP of 3 phase.

4.4. Other materials and utilities are needed include fuel oil, lubricants, cleaning materials, equipment parts, water, and office supplies.

5. <u>Location and Site</u>

5.1. There are four major factors that should be considered in selecting the site of the proposed project. These factors are:

- sufficient power supply
- safety and security conditions
- transportation facilities
- close to market (i.e., workshops, factories and hospitals)

5.2. Therefore, Ramallah industrial zone could be a proper location for the proposed project, since it meets all the above factors and since it has the advantage of being at the center of the West Bank.

6. <u>Project Engineering</u>

6.1. There are several commercial methods, models and volume scales of producing oxygen and nitrogen. The proposed project will use the air liquifying method using refrigeration of compressed air. The proposed plant will produce oxygen and the needed quantity of nitrogen. The rest of the nitrogen will be released. The oxygen production will be confined to gaseous form, while nitrogen will be produced in both gaseous and liquid forms.

6.2. According to the sales program the proposed project will be a small scale plant. It will include all major equipment such as the Air Separation Assembly, the Air Refigeration Assembly, the Air Drier Assembly and other related equipment.

6.3. The production process may be divided as follows:

- Purification: The production process starts by compressing the air and cleaning it from dirt , dust, moisture, carbon dioxide, and water vapor. The commercial advanced method of purification is the mechanical way and that is done by using air purifier equipment connected to heaters and control valves.

- Refrigeration: The incoming air going to the heat exchanger sections (air expansion) will be strongly cooled in order to be ready for liquifying. Several ways may be used for the cooling purpose such as the expansion engine cycle.

- Rectification (or fractional distillation): After liquifying the air, the liquid air will be heated for process. The boiling point of nitrogen is $^{-}196^{0}C$ while that of oxygen is $^{-}183^{0}C$. The nitrogen will evaporate using a double column distillation, one column with low pressure while the other with high pressure with the heat exchanger between the two columns. This operation will leave air containing 40% of oxygen. The process continues until a high purity (99.5%) of oxygen is produced. Concerning the nitrogen, the desired quantity of pure nitrogen (99.5%) will be filled in cylinders through nitrogen gauges or will be liquified and stored. The rest of the unwanted nitrogen will be released.

- Filling: The gaseous oxygen and nitrogen products may be filled directly in the cylinders through pipes or cylinder outlets under pressure. However, if there is a need to store large quantities, it should be stored in liquid form then filled in cylinders using special converters (vaporizers).

6.4. Therefore, the proposed project needs the following production equipment:

- Air separation assembly which includes the following equipment:

  - heat exchanger sections
  - expansion valves
  - double column distillation (low and high pressure)
  - indicator instruments

- Air Drier-Heater with different pressure gauges
- Air refrigeration assembly
- Air purifier
- Control panel equipment
- Inlet and outlet cylinders
- Dial thermometers

6.5. The above production equipment needs the following auxiliary equipment:

- Oxygen pump gear motor
- Air refrigeration motor (15 HP)
- Air purifier pump motor
- Compressors (100 HP)
- Pully (to drive air compressor)
- Air circuit breaker

6.6. In addition to the production and auxiliary equipment, the following service equipment is needed:

- Laboratory equipment
- Plant security equipment and fixtures
- Containers (steel cylinders - standard size - 2000 units)*
- Containers (steel cylinders - small size - 200 units)*
- Forklifts
- Trucks and special truck container
- Storage and warehouse equipment
- Emergency power equipment
- Electric and water fixtures

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* It should be noted here that the majority of customers use their own containers.

6.7. The flowsheet of the production plant: The major processes, operations, suboperations and tasks of the proposed plant may be classified as indicated in the following table (⇒ denotes transportation, ○ operation, □ inspection, D Delay, Δ storage):

Operations \ Processes	Purification	Refrigeration	Fractional Distillation (Rectification)	Filling and Storing
- Air in	⇒			
- Compressed air	○			
- Filter from dust and moisture	○			
- Remove water vapor	○			
- Pass through heat exchanger	⇒			
- Remove carbon dioxide	○			
- Air in for separation		⇒		
- Cooling of presure air		○		
- Liquifying of air		○		
- Warming of air		○		
- Nitrogen evaporation: $-196^{\circ}C$			⇒ ○	
- Distilling oxygen under atmospheric pressure			□	
- Examining oxygen purity (99.5%)			⇒	
- Release unwanted (waste) nitrogen				○Δ
- Filling gaseous nitrogen				○Δ
- Filling gaseous oxygen				○Δ
- Filling liquids				□
- Convert liquids into gaseous using vaporizers when needed				⇒Δ

7. Manpower and Management

7.1. Despite the fact that the proposed project is a small scale plant, yet most of its operations need advanced technology.

7.2. The manpower needed for this project is about 55 persons distributed as follows:

Operation	Characteristic	No. of Employees
1. Handling, loading, cleaning	Unskilled	7
2. Air separating assembly line operations	High skilled	15
3. Operating the auxiliary and service equipment	Middle skilled	12
4. Loading/unloading and filling operations	Middle skilled	6
5. Supervisors, inspectors, and safety officers	High skilled	3
6. Maintenance engineers and technicians	High skilled	4
7. Marketing, finance and administrative staff	Qualified staff	8
Total labor and staff required		55

7.3. Those who will operate the main assembly production line, supervisors and engineers, need to be trained.

8. Project Scheduling and Constructing Periods

8.1. The construction of the proposed plant may be carried out in about 18 months. The time table of the subactivities is as follows:

Time (18 months)

Tasks	1,2	34,	5,6	7,8	9,10	11,12	13,14	15,16	17,18
- Establishing of founders	o								
- Apply for registration	o								
- Get a licence	o	o							
- Collect installment shares as stated		o	o	o	o	o	o	o	o
- Primary communications with health sectors			o	o					
- Primary communications with industrial sectors			o	o					
- Primary communications with workshop owners			o	o					
- Purchase of land		o	o	o					
- Design and draw blue prints				o	o				
- Get a permit for building					o	o			
- Arrangement for technology supply				o	o	o			
- Select equipment						o	o		
- Arrangements for training						o	o	o	
- Arrangements for power supply							o		
- Install equipment							o	o	o
- Final arrangement for marketing								o	o
- Build management								o	o
- Test the system									o
- Start operations									o

8.2. The above estimated time table assumes that there will be no obstacles, objections and/or delays from the side of the occupying authorities with regard to registration, licence and importing of equipment and other related activities.

9. Financial Analysis

9.1. Investment Cost: The proposed project is considered a small scale project, therefore, it is expected that it will need relatively low investment requirements. Based on a preliminary study the following investment cost is estimated:

Land	$ 80,000
Building, fixtures and funiture	400,000
Plant equiment (production, auxiliary trucks and truck container)	1,120,000
Cylinders	150,000
Working capital	100,000
Organization costs	50,000
Total Investment Cost	$ 1,900,000

The plant equipment may be imported from the U.S.A. or Switzerland. Containers may be imported from the U.S.A. or Japan. Other furniture and service equipment may be purchased from the local market.

9.2. Financing: The total investment cost as shown above is $1,900,000. The proposed project may be implemented by either establishing a public or a private corporation. The capital may be distributed into 76,000 shares as follows:

Founders Stockholders (10% i.e., 7600 shares at $25/share)	$ 190,000
Other Stockholders (90% i.e., 68,400 shares at $25/share)	1,710,000
Total Stockholders Equity	$ 1,900,000

Jama Company located in Ramallah and other businessmen are interested in investing in the project. Industrial companies and workshops who will be the buyers of the oxygen and nitrogen products should be encouraged to become shareholders.

9.3. Production Costs: The annual production cost and period expenses of about 2,237,000 cum of oxygen-nitrogen products may be estimated as follows:

A. Production Costs:	Ratio	Value
1. Direct labor	31%	$ 340,000
2. Depreciation and amortization (10% of fixed assets except land and 20% of organization costs)	16.1%	177,000
3. Other factory overhead including utilities, insurance, property tax	32.5%	358,000
Total Production Costs	79.6%	875,000
B. Marketing and Administrative Expenses:		
4. Variable (5% of total sales)	9.1%	100,000
5. Fixed	11.3%	125,000
Total Production Costs and Period expenses	100%	$ 1,100,000

9.4. The above table indicates that the estimated annual production cost is about $1,100,000 which is about 55% of the total sales value. This relatively low production cost ratio is due to the fact that the proposed project uses no raw materials. The total factory overhead costs form about 48.6% of the total cost, while the direct labor cost forms about 31%.

9.5. Commercial Profitability: Based upon the estimated data related to the investment cost requirements, sources of financing, sales revenues, production costs and period expenses, the following financial analysis may be calculated:

	Reference/ section	Ratio	Amount in $
Estimated Sales	2 · 8	100%	2,000,000
— Production costs and period expenses	9 · 3	55%	1,100,000
= Profit before taxes		45%	900,000
— Corporate income taxes (38%)	Local laws		342,000
= Net profit after taxes		28%	558,000

The above calculation indicates that the suggested project is expected to generate an annual profit before taxes of $900,000 and an annual profit after taxes of $558,000, considering the fact that the corporate income tax rate in the area is 38%.

9.6. The Simple Rate of Return: The expected rate of return for the suggested project may be calculated by dividing the net profit after taxes over the total investment value i.e.,

$$\frac{558,000}{1,900,000} = 29.4\%$$

OR, it may be calculated using the DU PONT fomula i.e.,

Investment Turnover x Profit/Sales Ratio i.e.,

$$\frac{\text{Sales}}{\text{Total Investment}} \times \frac{\text{Profit}}{\text{Sales}} =$$

$$\frac{2,000,000}{1,900,000} \times \frac{558,000}{2,000,000} =$$

$$1.05 \text{ times} \times 28\% = 29.4\%$$

9.7. Payback Period: The period required to recover the initial investment cost for the proposed project may be calculated as follows:

$$\frac{\text{Investment Cost}}{\text{Profit Tax + Depreciation}} = \frac{1,900,000}{558,000 + 177,000} = \frac{1,900,000}{735,000}$$

$$= 2.6 \text{ years}$$

This means that the payback period of the total investment is expected to be in 2.6 years.

10. Conclusion and Recommendations

10.1. The proposed plant is intended to produce oxygen and nitrogen products in order to meet the local needs of the industrial and medical sectors. The estimated annual volume will be about 1,151,000 cum of gaseous oxygen and 1,086,000 cum of liquid and gaseous nitrogen measured at atmospheric pressure. All the plant production will be sold in steel cylinders except the liquid nitrogen which may be distributed using special container trucks. This project is very important since it will produce two vital products.

10.2. Additional production lines may also be considered, especially the acetylene gas. Acetylene is used for metal welding purposes. Acetylene may be produced by processing calcium carbide at high temperature. Additional equipment at $100,000 is needed if acetylene is to be considered. The market needs of acetylene is expected to be equivalent to the market needs of oxygen for metal welding purposes.

10.3. The sales value of the proposed project is about $2,000,000 and requires an investment of $1,900,000. The preliminary financial analysis indicates that this project will generate an annual net profit before taxes of $900,000 and an annual net profit of $558,000 after taxes. The net profit to sales ratio is around 28% while the investment turnover is about 1.05times,which produces a simple rate of return of about 29.4%. And the payback period is estimated to be in 2.6 years.

10.4. This project has economic as well as social benefits. The project will produce two vital products which have medical uses as well as inter-industrial linkages. In addition, the project will create 55 job opportunities with annual wages of $340,000 for production labor and $60,000 annual salaries for marketing and administrative staff.

10.5. It should bear in mind that the above estimations are based on the assumption that the health sector as well as the major factories in the occupied Palestinian territories will buy their needs from the proposed plant and not from Israeli plants.

10.6. However, later development of the intifada (uprising) gradually disconnected the West Bank and Gaza Strip markets from the Israeli markets which make this project justifiable and more needed.

AN OPPORTUNITY STUDY

ON

DRIED AND JAMS FRUIT PLANT

Based on the work of Dr. Nidal R. Sabri, UNIDO Expert

1. <u>General Economic Data</u>

1.1. Product characteristics and uses: In this suggested project varieties of fresh fruits are to be processed to produce several forms of jams, dried fruits, fruit salads and cooked fruits in different containers and sizes. In order to meet the local and foreign market needs. The processed fruits produced by this suggested project may be marketed through three market segments for home consumption, commercial consumption such as hotels and for sweets manufacturing such as desserts, pies, cakes, biscuits and others. Therefore, this project is intended to meet the local and foreign market needs and to serve as inter-industry linkages.

1.2. Justification for selecting the product: All of the local needs of processed fruits including jam, dried and salad fruits are imported from Israel and other foreign countries. Therefore, the aim of this project is to preserve these perishable fresh products to be available in all seasons. Also, this project as agri-industrial, will have the advantage of using local raw materials, i.e., local fresh fruits.

1.3. Fruits are considered as major sources of minerals, carbohydrates and most of the vitamins. Therefore, this suggested project would have economic as well as social and health benefits.

1.4. To process a part of the local fruits surplus will lead to a higher value added than to sell the fruits fresh. This can be done by increasing the selling price as well as by stabilizing the prices of the local fruit products. In the occupied Palestinian territories there are several fruits that face the problem of marketing their surplus. For example, oranges have an annual average surplus of 170,000 tons per year, grapes have an annual average surplus of 18,000 tons per year. Figs, dates, apricots, peaches and plums have less surplus, but still meet the suggested project needs. Therefore, this project may lead to revive the fruits farming.

1.5. The proposed project will process several fruits including citrus, grapes, dates, figs, apricots, peaches and plums which allow it to operate almost through the year. It is recommended to work 10 months from May to February.

1.6. Product Specification: The proposed plant is planned to produce various types of processed fruits for home consuming purposes, for commercial purposes and for sweet factories. There will be five major processed types of fruits. These types are: First; dried-based fruits of figs, dates and raisins. Second; jam-based fruits of grapes, oranges and apricots. Third; salad syrup based fruits of mixed type. Fourth; dried syrup based fruits as oranges and peaches. Fifth; sheet cooked based fruits as grapes (Melban) and apricots. There will be different packages, sizes and containers. It is assumed that small sized packages will be for home consumptions, middle sized packages for hotels and restaurants, while large packages will be for dessert manufacturing purposes.

2. Market and Demand

2.1. Current Local Demand: A market survey concerning the local consumption of processed fruits was conducted and revealed the following facts:

First; the processed fruits including dried, jam, fruit salads and other canned fruits are consumed by three major groups or markets. These markets are the home consuming market, the commercial consuming market including hotels, restaurants, educational and non-profit institutions and the sweet manufacturing market such as the dessert and sweet factories. Concerning the dried fruits such as the dates, raisins and figs, these products are consumed by both the home consumption market and by the sweet manufacturing market while other dried fruits are consumed by the home consumption market only. Some cooked fruits such as the Melban and the starched apricots are used by the home consumption market only in special seasons and on special occasions, e.g., in the month of Ramadan. Dried-syrup based fruits,jam, and fruit salads are used mainly by the sweet manufacturing market, home consumption market and the commercial consuming market. There is a very little demand for powder – based fruits.

Second; dates rank number one among all dried fruits as the most demanded product;then, raisins, figs, apricots and pears in that order of importance.

Third; apricot jam ranks number one among all jam products as the most demanded, then strawberry, orange and grapes in sequence.

Fourth; package sizes of 330, 500 and 850 grams rank the first among all sizes for home uses, while containers of 12 kg. are mostly used by factories (i.e., sweet manufacturing market). The 0.25, 0.50 and 1 kg. sized packages of dried fruits are mostly needed by the home consumption market.

Fifth; different types of packages are used including glass jars, cans, plastic containers, cartons, paper, nylon, cotton, fibers, and wood.

2.2. The estimated annual local consumption of dried fruits in the occupied Palestinian territories is about 1000 tons, while the estimated annual local consumption of jam and fruit salads is about 1800 tons.

2.3. There is no factory to process dried fruit productsor jam in the occupied Palestinian territories. At the same time there are many Israeli and foreign companies which market their dried fruit, jam, fruit salads and cooked dried fruit products, in the occupied Palestinian territories. Some of these companies are: Hero Conserven Lenzburg-Switzerland, James Robertson & Sons Ltd.,-England, Cina Skourtopolulos - Greece, Balis Ulysses-Greece, Pazargik Pazargik-Bulgaria, All Gold Foods Ltd. - South Africa, Assis-Israel, Supri Ltd. - Israel, Galilee Fruits Ltd. - Israel, Taim-Mazada Food - Israel, Tnuva-Israel, Ardi Ltd. - Israel. The prices of the dried fruits and jam are varied and the prices of the foreign products are twice the Israeli products.

2.4. Sales Program and Sales Revenues: Based on the above market findings and the available surplus of fruits in the occupied Palestinian territories, the sales program may be stated at about 70% of the local market share.

2.5. The following sales program is projected in a way to balance betweenthe market demand and the available surplus of fruits. As an example, the strawberry jam is highly demanded but there are not enough strawberries locally:

The suggested annual sales program and revenue

Products	Sizes in Kg.	Uses	Packages	Planned Quantity	Competition Price in $	Sales Value in $
Dried Based Fruits				in Kg.	per Kg.	
1. Raisins	0.25,0.50, 1 Kg.	home	Nylon,Plastic	100,000	$ 3.90	$390,000
	5, 10 kg.	factory		50,000	3.20	160,000
2. Dates	0.50,1 kg	home	Nylon,Carton	60,000	5.20	312,000
	10 kg	factory		50,000	4.60	230,000
3. Figs	0.25,0.50	home	Nylon,Carton	100,000	2.60	260,000
Dried Syrup Fruits						
4. Orange	0.50,1 kg	home	Plastic	50,000	3.40	170,000
	5 kg	factory	Carton	50,000	2.30	115,000
5. Apricot	0.25,0.50	home	Plastic	50,000	5.80	290,000
6. Cocktail (orange, peaches,plums)	0.25,0.50	home	Plastic	20,000	3.10	62,000
	5 kg	factory	Carton	30,000	2.50	75,000
Starched Cooked Fruits						
7. Grapes (Melban) sheets	0.50,1 kg	home	Nylon,Carton	100,000	2.93	293,000
8. Apricot sheets	0.50,1 kg	home	Nylon,Carton	75,000	3.00	225,000
Sub total				735,000 Kg.		2,582,000
Jam Based Fruits				in units	per unit	
9. Grapes	0.33 kg	home	Jar	50,000	$ 1.00	$ 50,000
	0.50	home	Jar	50,000	1.30	65,000
	0.85	home	Jar	50,000	1.80	90,000
	5.00	commer.	Can/Plastic	20,000	5.20	104,000
	12.00	factory	Can/Plastic	10,000	7.50	75,000
10. Oranges	0.50 kg	home	Jar	50,000	1.00	50,000
	0.85	home	Jar	80,000	1.20	96,000
	5.00	commer.	Can	20,000	4.00	80,000
	12.00	factory	Plastic	20,000	7.80	156,000
11. Apricots	0.33 kg	home	Jar	50,000	1.50	75,000
	0.50	home	Jar	50,000	2.10	105,000
	5.00	commer.	Can	10,000	7.20	72,000
12. Mixed (oranges, apricots,peaches)	0.50	home	Jar	100,000	1.50	150,000
Salad & Syrup Based Fruits						
13. Mixed (grapes, plums, apricots and peaches)	0.85 kg	home	Can	100,000	1.50	150,000
	5.00	commer.	Can/Plastic	50,000	5.00	250,000
Sub total	(equivalent to 1,214,000 kg.) ←			710,000 units		1,568,000
Total				1,949,000 kg.		$ 4,150,000

3. Plant Capacity

3.1. The capacity of the proposed project is planned to produce about 1,949 tons of processed fruit products annually of which 38% are dried fruit products and the rest (62%) are jam products, cocktails and fruit salads.

3.2. Assuming that there will be 265 working days, (10 months a year) this means that the plant capacity per day will be 7.35 tons of output i.e., of finished products.

3.3. As input, it is expected to process a total of 5,975 tons of fresh fruits of which 33% is grapes, 27% oranges, 16.4% apricots and the rest is dates, figs, peaches and plums. These amounts are calculated based on the following average yield ratios (i.e., input fresh fruits to output finished products ratio):

- Dried and starched cooked fruits products yield ratio is 25% i.e., for every one ton of finished products (output), four tons of fresh fruits (input) are needed.
- Jam and fruit salads, yield ratio is 40%, i.e., for every one ton of finished product, 2.5 tons of fresh fruits are needed.

3.4. The working period of the proposed project is expected to be 10 months a year from May to February.

4. Raw Materials and Other Inputs

4.1. Raw Materials: The raw materials needed for the proposed plant are various fresh fruits including, oranges, grapes, dates, figs, apricots, peaches, and plums. All of these fresh fruits are available in the occupied territories. Oranges and grapes have very high surplus quantities while the other fresh fruits have enough surplus to meet the needs of the proposed plant.

4.2. The fresh fruits needed should be adequate for processing. This means that the fresh fruits should be deeply colored, mature, with firm ripe and smooth skin, and should be free from bruises, decay, toxic substances, bacteria and skin punctures. However, a sound quality of fruits for processing is available locally. In addition, fruits should be handled carefully through picking, transporting and storing. Refrigerated trucks may be used to transfer fruits to the factory in some cases.

4.3. The average purchase prices of the fresh fruits are estimated as follows:

Oranges	$ 130 per ton
Grapes	$ 308 per ton
Dates	$ 560 per ton
Figs	$ 400 per ton
Apricots	$ 300 per ton
Peaches	$ 321 per ton
Plums	$ 250 per ton

4.4. According to the sales program stated earlier the following annual quantities of fresh fruits are needed:

FRUITS	QUANTITY PER TON PER YEAR	RATIO
A. Grapes	1970	33%
B. Oranges	1590	26.6%
C. Apricots	980	16.4%
D. Dates	440	7.4%
E. Figs	400	6.7%
F. Peaches	318	5.3%
G. Plums	277	4.6%
Total	5975 tons	100%

4.5. Other materials and chemicals that are needed in the fruits processing are citric acid, pectin, natural and synthetic colors and other stabilizer materials. For every 1 kg of fruits 2 grams of pectin (i.e., 0.2%) is needed. Starch is needed when cooking fruits, and sulfur dioxide is needed when drying fruits. Most of these materials and chemicals are to be imported.

4.6. In order to process the planned quantity about 1,200 tons of sugar are needed yearly.

4.7. Different containers, packages and labeling materials are needed. Some of these are:

Types	Quantity
Glass jars for jams (330 gs, 500 gs, 850 gs)	480,000 units
Cans (Tins) for fruit cocktails (850 gs)	100,000 units
Plastic containers (12 kg)	30,000 units
Cans (Tins 5 kg)	100,000 units

4.8. Other indirect materials and utilities are needed include water, fuel oil, cleaning materials, office supplies and others, in addition to paper and carton packaging.

5. Location and Size

5.1. Four possible locations may be considered for this project. Each of these locations has the advantage of growing one or more of the needed fruits. These four locations are the Gaza Strip, Hebron district, Qalqilya district, and Jericho.

5.2. Water, power supply, proper transportation and waste disposal facilities should be considered in selecting the location for the proposed project.

5.3. Being an agri-industrial project, it is recommended that it will be located in a rural area rather than an industrial area. In this case the price of the land will be cheaper and the selected area will be revived.

6. Project Engineering

6.1. Process and Technology: The following steps or operations are needed to process fresh fruits:

6.2. Preparation of Fruits: As a first step, fruits are picked from the fields and then transported carefully to the factory. After being received by the factory, fruits should be graded according to size, maturity and firm ripe. After that, the fruits should be washed, cut, pitted, peeled, sliced, corned and any other related operations. This step is similar for almost all of the suggested production lines.

6.3. Major Operations: The major operations for the proposed project differ with different production lines. The suggested project will include five production lines:

A. Dried Fruits Production Line: The dried fruits are produced by what is known as the Dehydration Process. The dehydration process is the most traditional way of preserving foods by removing the water from the fruits. The drying process may be accomplished through sun drying or any other artificial way. The sun drying is a very simple method but needs much time and space (i.e., a large area). The other artificial drying methods may be accomplished by using heated drums, or vacuum dehydrators or tunnel dehydrators. Considering the suggested project it is recommended to use artificial drying through tunnel dehydrators in order to generate heat under specific conditions of air flow, humidity and temperature. The suggested method has reasonable cost and quality controls. The detailed steps of dehydration differ from one kind of fruits to another, but generally the following are the common steps for drying fruits, of course, with minor variations from one kind to another:

- Dipping and sulfuring (only if required)
- Spreading in dehydrating trays
- Placing trays in dehydrating tunnels
- Inspecting for moisture
- Steaming or heating to soften fruits

B. Dried Syrup Fruits Production Line: This is very similar to the above production line except that syrup is added before dehydrating.

C. Jam Fruits Production Line: The preparation of jam needs the following steps:

- Preparing the fruits, as indicated above
- Boiling the fruits using small quantities of water
- Adding sugar, 40% to 70%
- Continue boiling
- Skimming the coagulated materials
- Adding pectin and acid (only if required) to assure uniformity, appearance and consistency
- Stop boiling at the end point using the refractometer
- Transfer for filling

D. Fruit Salads Production Line: Processing of fruit salads may be done in a simple way as follows:

- Halving, peeling, corning (each type as required)
- Cutting to diced pieces
- Steaming for a short period of time
- Adding the fruit syrup
- Filling using special cocktail filling machines

E. Starched Cooked Fruits (Sheet Fruits) Production Line:

These products are popular in Palestine and may be prepared as follows:

- Extracting juices from grapes or crushing apricots
- Boiling the grape or apricot juices
- Adding starch 10% and continue boiling up to the end point
- Spreading on cloth surfaces for drying

6.4. Finishing and Packing Operations: This step includes the following operations:

- Inspection of quality, uniformity, flavor and color
- Filling, sterilizing and cooling process
- Labelling, wrapping and casing
- Finishing process for dried fruits needs different operations such as steaming the fruits to soften, fumigating, sorting, grading, final dipping and packaging

6.5. Machines and Equipment: In order to process about six thousand tons of fresh fruits the project needs different equipment . It needs production as well as auxiliary and service equipment. The following are the machines and equipment needed:

A. Equipment needed in the preparing fruits process:

- Trucks and lift trucks
- Washing equipment units
- Refrigerating units (30 tons) for fresh fruits
- Trimming and cutting equipment
- Sorting equipment
- Peeling and corning equipment

B. Equipment needed for preparing jam and fruit syrups:

- Pulping and heating equipment
- Jam thermometer
- Refractometer
- Pasteurizing stainless steel tanks
- Steam jacketed stainless steel kettles
- Fruit cocktail filling machines
- Stainless steel containers

C. Equipment needed in processing dried fruits:

- Tunnel drying equipment
- Fans
- Dehydrator trays (60 cm. by 90 cm.)
- Sulfuring equipment and sulfur house
- Shelves trays
- Air compressor

D. Equipment for filling and packing:

- Filling equipment
- Cooling containers
- Pipes and pumps
- Sealing equipment
- Wrapping machine
- Casing machine
- Labelling machine

E. Other auxiliary and service equipment:

- Storage shelves and warehouse equipment
- Laboratory and control equipment
- Emergency power equipment
- Conveyors
- Stainless steel containers
- Water - power fixtures
- Boilers
- Insulators

6.6. Flowsheet Production: The flowsheet of fruits processing for the proposed project may be classified as follows: (Using the symbol $\Rightarrow$ to denote transportation, O to denote operation, □ to denote inspection, D to denote delay and Δ to denote storage).

Operations \ Processes	Preparing	Processing (Major Operation)	Finishing & Packaging
First: Dried Fruits			
- Cleaning	Δ ⇒ ○		
- Inspecting	○		
- Dipping and sulfuring	○ ⇒	D	
- Spreading in trays		○	
- Placing trays for dehydration		○	
- Dehydration		D ○	
- Inspection for moisture content		□	D
- Steaming or heating to soften			○
- Fumigating final products			○
- Transferring for packaging			⇒ Δ
- Grading and sorting			○
- Packaging and casing			□ ○ Δ
Second: Jam Fruits			
- Washing	○		
- Sorting	○		
- Corning	○		
- Peeling	○		
- Inspecting	□		
- Boiling		○	
- Adding sugar		○	
- Skimming		○	
- Adding pectin		⇒ ○	
- Continue boiling		○	
- Finishing		□ ⇒	Δ
- Inspecting by refractomer			
- Filling			○
- Sterilizing			○
- Cooling			○
- Sealing/casing			○ Δ ⇒

7. Management and Manpower

7.1. It is expected that 70 employees are needed for this project including production labor, food specialists, maintenance, marketing and administrative staff.

7.2. The distribution of manpower and management staff among the different operations of the project is expected to be as follows:

		Characteristic	No. of Employees
1.	Materials handling and unloading activities	Unskilled	14
2.	Main Production Process	Skilled	30
3.	Finishing Process	Skilled	9
4.	Food Specialists and Laboratory Chemists	Experts	2
5.	Maintenance Engineers and Staff	High Skilled	3
6.	Supervisors	High Skilled	2
7.	Marketing and Administrative Employees	Qualified Staff	10

7.3. All of the production labor and administrative staff are available. However, food specialists, engineers and maintenance staff need to be trained.

8. Project Schedule and Construction Periods

8.1. The schedule and construction periods for the proposed project may be estimated as follows:

Activities	Time (22 months)										
	1,2	3,4	5,6	7,8	9,10	11 12	13 14	15 16	17 18	19 20	21 22
- Establishing of founders group (Corporation or Cooperative)	o										
- Apply for registration (Occupied Authorities)	o	o									
- Apply for registration (Jordan)	o	o									
- Collect instalment shares		o	—	o	—	o	—	o	—	o	
- Primary communications with the fruit farmers		o	o								
- Land Purchase			o								
- Building and civil work			o	o	o	o					
- Design factory layout					o	o					
- Detailed marketing study	o	o	o	o							
- Arrangements for technology supply				o	o	o					
- Tendering, bids evaluation and equipment selection						o	o				
- Install equipment							o	o	o		
- Build management and recruit labor									o	o	
- Final arrangements with Fruit Suppliers										o	
- Arrangements for training							o	o	o	o	
- Arrangements for local marketing										o	o
- Arrangements for Arab countries markets										o	o
- Test the system										o	o
- Start operations											o

8.2. Therefore, the proposed project needs about 22 months to be completed assuming that there will be no obstacles and/or delays from the authorities.

9. Financial Analysis

9.1. Investment Cost: The proposed project, being a low scale project, is expected to have middle investment requirements. These requirements may be estimated as follows:

Land	$ 100,000
Building	500,000
Production Equipment	1,000,000
Auxiliary and service equipment	300,000
Working capital	250,000
Organization and establishment costs	50,000
Total Investment Cost	$ 2,200,000

9.2. Most of the needed production, auxiliary and service equipment are to be imported from either Italy, England or the United States of America.

9.3. Financing: Based on the estimated investment requirements data, it may be concluded that $2,200,000 are needed to finance this project. This project may be carried out either by forming a public corporation or a farming cooperative. In case of forming a public corporation 88,000 shares should be sold at $25 a share as follows:

Founders stockholders	10% (8,800 x 25)	$ 220,000
Other stockholders	90% (79,200 x 25)	$ 1,980,000
Total Owner Equity		$ 2,200,000

However, if a cooperative firm is to be formed then the farmers will be the members of the cooperative. In this case a minimum of 550 members are required with each investing $4,000, unless they get a grant to finance part of this project.

9.4. The annual production costs and period expenses to produce 1949 tons of processed fruits may be estimated as follows:

Item	Ratio	Value
A. Production Costs:		
1. Variable Costs		
- Direct Materials (Fruits:5975 tons)	54.6%	$ 1,762,000
- Direct Materials (Sugar pectin and containers)	10.5%	338,000
- Direct Labor	14.2%	460,000
2. Fixed and semi-fixed costs		
- Depreciation (10% of fixed assets except land and 20% of organization costs)	5.9%	190,000
- Other factory overhead costs	4.3%	140,000
Total Production Costs	89.5%	$ 2,890,000
B. Marketing and Administrative Expenses:		
1. Variable (4% of sales value)	5%	160,000
2. Fixed	5.5%	180,000
Total	100%	$ 3,230,000

It is clear that the direct materials form a very high percentage (65%) of the total production cost and period expenses which at the same time forms about 50% of the total sales value. The other production cost elements are expected to be low since the project does not require sophisticated operations, but simple ones.

9.5. Commercial Profitability: Based on the suggested sales program, estimated revenues, estimated total investment cost, sources of financing, and the estimated annual production and period expenses, the following financial measures may be concluded:

9.6. Net Profit after Tax: The estimated annual net profit after tax for the suggested project is calculated as follows:

	Source	Ratio	Amount
Estimated total sales	paragraph 2.5	100%	$ 4,150,000
— Estimated production costs and period expenses	paragraph 9.4	77.8%	3,230,000
= Net profit before taxes		22.2%	$ 920,000
— income taxes (38%)			349,600
= Net profit after taxes		13.7%	570,400

9.7. The Simple Rate of Return: The simple rate of return for the suggested project may be calculated by dividing the accounting after tax profits by the total investment cost (cash outflow) i.e.

$$\frac{\text{Net profit after tax}}{\text{Total Investment Cost}} = \frac{570{,}400}{2{,}200{,}000} = 25.9\%$$

OR, it may be calculated by using the DU PONT formula, i.e., by multiplying the net profit to sales ratio by the investment turnover ratio:

$$\frac{\text{Net profit after taxes}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total Investment}}$$

$$\frac{570{,}400}{4{,}150{,}000} \times \frac{4{,}150{,}000}{2{,}200{,}000}$$

$$13.7\% \times 1.89 \text{ times} = 25.9\%$$

This indicates that this venture is expected to have a fair profit ratio and a good investment turnover.

9.8. Repayment Period: The repayment period of the total investment cost (cash outflow) of the proposed project may be calculated as follows:

$$\frac{\text{Investment Cost}}{\text{After tax profit + depreciation}} = \frac{2,200,000}{570,400 + 190,000} = 2.9 \text{ years}$$

This means that the total investment of the proposed project may be recovered in less than three years.

10. Conclusions and Recommendations

10.1. The proposed project is planned to process about six thousand tons of surplus fruits available in the Occupied Palestinian territories. It is intended to produce five different processed fruit products to meet the local market needs (home, commercial and factory needs).

10.2. The proposed project is expected to produce 1949 tons of final products with a sales value of $4,150,000 a year.

10.3. The financial analysis indicates that an annual net profit of $ 920,000 before taxes and $ 570,400 net profit after taxes may be generated from this project. Also, a simple rate of return of 25.9% is expected and that the investment cost of the project will be recovered in less than three years (2.9 years). These figures show that this project will be a profitable venture.

10.4. This is a small scale project which will use advanced but not sophisticated technology with available semi-skilled labor. The sales revenue is expected to be about $60,000 per employee and asset ratio of $31,000 per employee. These ratios are close to standard ratios for similar food processing industries in the developed countries.

10.5. Social and economic benefits may be attained by establishing the proposed project. For example 70 jobs may be created with annual wages of $460,000 for production labor and annual salaries of about $100,000 for marketing and administrative staff. Also this project may help in reviving the fruit farming in the occupied Palestinian territories.

10.6. Therefore, it is recommended to carry out the proposed project. However, primary communications and further investigations may be useful before having the final decision. This includes the following:

- To conduct preliminary discussions with fruit-growing farmers on the conditions for supplying the fresh fruits.
- To carry out a detailed marketing study related to the Jordanian and other Arab countries markets.

10.7. Additional production lines and/or fruits may be considered. For example, the strawberry jam which has a high demand. However, this may need an extension of the current cultivated area of the strawberry.

AN OPPORTUNITY STUDY

ON

A PRECISION ENGINEERING WORKSHOP

Based on the work of Michael Seely ,
Abdel-Hafiz Abu-Isneineh and Hanna Quffa ,
UNIDO Experts

I. General Economic Data

I.a. Product Characteristics and Use

This engineering workshop will produce industrial tooling and provide machine maintenance and repair services for local industries . This establishment will also produce certain items of medical equipment for the local market and for export. Work related to industrial tooling and machinery would be performed on a job-order basis while the medical equipment would form a regular line of production. Specifically, the products and services to be offered are :

1. Industrial Tooling - The design and fabrication of industrial tools : primarily forms, punches and dies for metal press forming and molds for plastic injection or extrusion molding. These tools are used by light manufacturing industries. Presses and plastic molding machines must be fitted with such a tool in order to produce a particular product . These tools involve moving parts which must be machined to close tolerances .
2. Machine Maintenance and Repair - The maintenance and repair of industrial machines, including electrical as well as mechanical repair work. Mechanical repair work frequently involves the fabrication of replacement parts. This workshop would also engage in the custom design and fabrication of relatively small industrial machines, work-stations and assembly lines as well as the modernization of industrial machines.
3. Engineering Consulting Services - The consulting services to be offered would include engineering design work as applied to tools, machines or products and advising clients

on technical matters such as machine maintenance procedures, manufacturing techniques, the selection of machinery, etc. The production of models or prototypes for product development or promotional purposes would also be undertaken.

4. Surgical and Micro-Surgical Instruments, Medical Containers and Orthopedic Implants - The surgical instruments produced would consist of the most commonly used types of surgical scissors and forceps as well as simpler implements such as probes and blade holders. These instruments are used in hospitals and clinics. Micro-surgical instruments are similar to surgical instruments but are designed for very fine work. The micro-surgical instruments produced would include scissors, forceps , and a variety of simpler implements such as blade holders and needle holders. Micro-surgical instruments are used by hospitals, primarily in ophthalmic and neural surgery. Containers for medical use would include stainless steel boxes and trays of various shapes and sizes. These containers are used in hospitals and clinics. The orthopedic implants to be produced would include stainless steel plates, pins and screws. These implants are used by hospitals in orthopedic surgery.

I.b. Justification

The establishment of this engineering workshop is intended to improve the technical infrastructure and support services available to local industries and to provide opportunities for advanced technical training. In this workshop, recent graduates of polytechnics and university engineering programs will work under the direction of experienced senior engineers and craftsmen. The apprenticeship is regarded as a crucial phase in the training of technical personnel in the West . Similar training programs are urgently needed here. Expanding the local pool of highly trained, experienced technical personnel is of great importance both to existing industries and to future development efforts.

There are also more specific justifications for each of the products and services to be offered. Import substitution is a major justification for the industrial tooling aspect of this operation. Presently, a great deal of industrial tooling is being imported by industries in the West Bank . In addition to the creation of jobs in the local economy, the establishment of a local facility for tool design and production would enable local factories to obtain their tooling more quickly and at lower cost. The lead time and cost of developing new products would be reduced.

The machine maintenance and repair services presently available from sources within the West Bank and Gaza are limited. Some local companies have turned to sources outside the West Bank and Gaza for repair and maintenance services and for the fabrication of spare parts. Many local firms have been unable to secure satisfactory machine repair and maintenance services at an affordable cost. The lack of such services has resulted in reduced productivity, products of poor quality and the premature retirement of some machines. The establishment of this engineering workshop would make timely and professional repair and maintenance services more readily available to local industries. Services now being obtained from sources outside the West Bank and Gaza would be supplanted by a local service industry. The machine design and fabrication services offered by this establishment would , in some cases, allow machines produced locally to be used in place of machines that would otherwise be imported. The existence of a local facility for machine modernization and the fabrication of specialized machines, production lines and work-stations would make it easier and less costly for local factories to upgrade their operations.

The medical equipment produced by this firm would be intended primarily for export but would also be marketed locally in order to replace imports. Given the size of the local market, it is important to develop export-oriented manufacturing industries here. There are a number of reasons for joining the medical equipment production effort with the engineering workshop. It is desirable for the workshop to have a regular line of production so that workers and machinery may be shifted between production and job-order work according to demand. The production of most of the medical products would require the same equipment and skills as the tool and machine related work. Duplication of equipment and effort in worker training is avoided by placing these two operations under one roof. Medical equipment was selected as the line of production for several other reasons. These are relatively specialized items which are generally purchased by large institutional customers, which simplifies marketing efforts. Furthermore, the production of these medical instruments is labor intensive and relies heavily on skilled hand-work. Labour in this area is abundant and can be trained to the required level of skill.

I.c. Product Specifications

The design and fabrication of tooling, maintenance and repair of machinery and the associated engineering services are one-off jobs performed according to the customer's specifications.

All items of medical equipment would be fabricated from stainless steel (type 316 in the case of orthopedic implants). The exact designs of surgical and micro-surgical instruments would be developed through consultation with surgeons. It is important that these instruments have a comfortable feel and proper balance. These must be developed by producing prototypes for evaluation by surgeons. The product line would consist of approximately forty individual items, including several types and sizes of surgical and micro-surgical scissors and forceps as well as surgical and micro-surgical blade holders, needle holders, hooks and probes. The medical containers to be produced would include perforated boxes with hinged lids, for storing and sterilizing surgical instruments, as well as round , rectangular and kidney trays. Each of these containers would be produced in two to four sizes. The exact designs and dimensions of the orthopedic implants would be developed through consultation with orthopedic surgeons. The product line would include approximately twelve types of orthopedic plates, each in two to four sizes, six types of orthopedic screws, each in fifteen lengths, and orthopedic pins in approximately twenty different sizes.

II. Market and Demand

II.a. Current and Projected Demand, Foreign and Domestic

II.a.1. Method of Assessing Demand

A survey was conducted in order to assess the local demand for industrial tooling, machine maintenance and repair work, machine design, fabrication and modernization and engineering consulting services. Personal interviews with factory owners, plant operators and maintenance personnel were conducted to obtain information on a sample of West Bank industries. Twelve firms, representing seven major types of industry, participated in this survey. The information obtained for this sample was scaled to obtain estimates for the entire industry. This survey has yielded a lower limit on the potential market for machine and tool related work, not an actual estimate of the market. Several major categories of industry (textiles, jewelry and utilities, for example) were not included in the survey.

Discussions with the owner of an existing small engineering firm were also useful in assessing the demand for tooling. Interviews with surgeons and hospital personnel provided the information used to estimate the local demand for medical equipment.

II.a.2. Demand for Tool and Machine Related Services

An estimate of the average annual expenditure for tooling by local industries is given in Table 1. The local shoe and plastics industries are currently placing large tooling orders with firms overseas. Many small and medium size tooling jobs are being sent to workshops in Israel. Companies requiring small and medium size tooling jobs were not included in the survey. The estimate of medium size tooling jobs currently being sent to Israeli firms by local industries is based on the activity of a small producer of industrial tooling recently established in Ramallah. With no marketing efforts, this workshop received five orders for medium size tooling jobs in 1987.

Table 1

Average Annual Expenditure for Industrial Tooling(Imported) by Certain West Bank Industries.

Item	Value $(US)
1. Major Tooling Orders	
a. Shoe Industry	625,000
b. Plastic Household Articles	50,000
2. Medium Size Tooling Orders	
a. Assorted Manufacturing Industries	25,000
TOTAL :	700,000

Estimates of the current annual expenditure on maintenance and repair work by seven West Bank industries are presented in Table 2. Repair and maintenance work performed in-house (by company staff) is not included in these figures. The segment of the market now being served by Israeli or overseas companies (last column) represents the potential market for the proposed engineering workshop.

Table 2

Current Annual Expenditures for Maintenance and Repair
Work for Seven Major Industries in the West Bank

Industry	Total Repair and Maintenance Work Sent Out $(US)	Share of Local firms		Share of Foreign firms	
		%	Amount $	%	Amount $
Pharmaceutical*	120,000	60	72,000	40	48,000
Food Processing*	178,000	90	160,200	10	17,800
Shoe*	90,000	0	---	100	90,000
Tobacco*	150,000	90	135,000	10	15,000
Plastic Household Articles*	40,000	0	---	100	40,000
Metal Products** (including furniture)	157,000	80	125,600	20	31,400
Olive Oil Extraction***					10,000
TOTAL :					252,200

* Scaling based on estimate of their market share provided by factory representative.

** Scaling based on number of employees.

*** Labor cost only, foreign firm serving 120 local olive presses

Nine of the twelve firms surveyed expressed an interest in obtaining engineering services, including machine and tool design, consulting services and the fabrication of prototypes. The anticipated annual expenditure on such services, should they become available, was $20,000 per firm. With no scaling, this survey indicates a market of $18C,000 per year for engineering services which are not presently available from sources in the West Bank and Gaza .

The current local demand for machine and tool related services is summarized in Table 3. Again, this should be taken as a lower limit on the potential market because not all areas of industry were surveyed. It should also be emphasised that the potential market indicated here is based on import substitution and new services, not on the displacement of existing local firms.

Table 3

Summary of the Demand for Tool and Machine Related Work, West Bank and Gaza (Current Average Annual Expenditure in $(US)

Tool Design and Fabrication	700,000
Machine Maintenance and Repair	252,200
Engineering Services	180,000
TOTAL :	1,132,200

The proposed engineering workshop would require a 16% share of this market in order to operate at full capacity. No attempt was made to estimate the growth of this market because the current demand is already much larger than the plant capacity.

II.a.3. Demand for Medical Equipment

The local market for medical equipment, private hospitals, UNRWA hospitals and UNRWA clinics, could absorb only ten to twenty percent of the production of the proposed establishment. (Government hospitals are not under local control and have not been considered a potential market). The marketing of medical equipment would therefore be export oriented. The hospitals and clinics in the Arab world represent a vast market(in comparison with the anticipated production) which could be reached by exporting via Jordan. Large institutional users of medical equipment, such as certain agencies of the United Nations, also represent a large potential market, and one that could be reached without necessarily exporting via Jordan.

II.b. Sales Program and Sales Revenues

II.b.1 Machine and Tool Related Work

To arrive at the revenues for tool and machine related work, an average hourly charge of $15/hour has been assumed. This is considerably less than the rates presently being charged to local industries for these services, and provides a worst-case scenario for the financial analysis. At full capacity, the plant would produce 12,000 chargeable hours of tool and machine related work per year , yielding an annual revenue of $180,000 . This figure will be lower during the first two years of operation because allowances must be made for plant commissioning and worker training.

II.b.2. Medical Equipment

The sales program for medical equipment is given in Table 4. Revenues from the sales of medical containers and orthopedic implants have been neglected. The production of medical equipment would begin near the end of the first year of operation. To allow for the development of export markets, and additional year should be allowed for sales to equal the plant capacity.

Table 4

Sales Program for Medical Equipment (at Full Capacity)

Item	Quantity units/year	Price $(US)	Annual Revenue $(US)
Surgical Scissors	700	30	21,000
Surgical Forceps	800	20	16,000
Other Surgical Instruments	500	5	2,500
Micro-Surgical Scissors	100	100	10,000
Micro-Surgical Forceps	300	80	24,000
Other Micro-Instruments	300	10	3,000
Medical Containers	1000	--	-----
Orthopedic Implants	1200	--	-----
TOTAL			$ 76,500

II.b.3. Total Sales Revenues

The anticipated total sales revenues at full production are given in Table 5.

Table 5

Total Annual Sales Revenues

Source of Revenue	Annual Revenue, $(US)
Machine/Tool Work	180,000
Medical Equipment	76,500
TOTAL	256,500

III. Plant Capacity

III.a. Tool and Machine Related Work, Engineering Services

Due to the diverse nature of this work, the plant capacity will be specified in terms of effective hours; hours of work that may be billed to a customer. At full capacity, the ten full-time staff members involved in tool and machine related work(including electrical repair) will produce approximately 20,000 hours of work per year . However, not all of this time may be billed to a customer. Allowances must be made for factors such as :

- consultation with customers and potential customers
- consultation between staff members, including instruction and training
- repair and maintenance of workshop equipment
- errors in fabrication work which require a piece to be remade
- administrative work
- breaks, sick-leaves, etc.

With proper administration, approximately 60% of the total working hours should be spent on work which can be charged to a customer. The plant capacity for tool and machine design, fabrication, maintenance and repair work and engineering services will be approximately 12,000 hours per year .

III.b. Medical Equipment

With four full-time employees working on the production of medical equipment, the production levels that can be expected when the plant reaches full capacity are :

Surgical Scissors	700 units/year
Surgical Forceps	800
Other Surgical Instruments	500
Micro-Surgical Scissors	100
Micro-Surgical Forceps	300
Other Micro-Surgical Instruments	300
Medical Containers *	2000
Orthopedic Screws and Pins*	1500
Orthopedic Plates*	400
Instrument Repair, Custom Fabrication**	20 jobs/year

* Actual production expected to be below capacity, limited by demand

** Estimated demand

IV. Supply of Raw Materials and Other Inputs

IV.a. Metal Stock and Hardware

The products and services to be offered by this establishment are labor intensive and the consumption of raw materials would be relatively small. The primary raw material is metal stock. Springs , fasteners (screws, bolts, etc.), replacements for cutting tools and electrical components are also required. These materials could be purchased in Israel. It would also be possible to import some of these materials from Jordan if it proves to be desirable to export medical equipment via Jordan. The estimated consumption levels of raw materials at full capacity are given in Table 6. Due to the diverse nature of tool and machine related work, the material requirements indicated are necessarily rough estimates.

Table 6

Annual Raw Material Requirements

Machine and Tool Related Work	
Steel, various types	3000 kg/year
Brass, Aluminum and Other Metals	200 kg/year
Springs, Fasteners	1000 units/year
Cutting Tools(replacement)	400 units/year
Electrical Components	1500 units/year
Medical Products	
Stainless Steel, type 316	700 kg/year
Screws, etc.	2000 units/year

IV.b. Utilities

Three phase electrical service is required. The anticipated electrical consumption is approximately 15,000 KWH/year. The water consumption will be negligible. The required utility services are readily available in the industrial areas of the West Bank .

V. Approximate Location and Site

V.a. Location

The industrial zone of either Ramallah or El-Bireh would probably provide the most suitable location. This would place the workshop in close proximity to customers in the Ramallah/El-Bireh area and would be fairly central to the other major commercial centers of Hebron, Nablus and Jerusalem .

V.b. Site

This operation would require approximately 400 square meters of factory space and approximately 40 square meters of office space. The factory area should be located on the ground floor and should have garage type doors to allow the entry and exit of machinery. The office area should be separate or partitioned from the factory area. There are no other particular requirements on the site or the premises. The nature of this work does not dictate any particular lay-out of the machinery or the site . The workshop space is to be rented .

VI. Project Engineering

VI.a. Process and Technology

The fabrication of industrial tooling and spare parts for machines will generally involve milling.,turning and/or grinding followed by hand fitting. Welding or brazing are sometimes required in machine repair and fabrication work. The use of spark erosion or CNC(computer numerical control) machining may be desirable or necessary for some tooling jobs.Measuring equipment, including a surface table, is required to check the work. The production of industrial tooling requires engineering design work as well as the actual fabrication work.

Surgical and micro-surgical instruments would be produced by milling and/or grinding followed by hand fitting. In the case of micro-surgical instruments, some of the hand finishing would be carried out under a microscope. CNC milling and milling with the aid of a copy attachment would be employed in producing the rough forms. Stainless steel containers would be produced by pressforming or by folding and argon arc welding, depending on the type of container. Orthopedic plates would be produced by press forming or, in some cases, by milling. Orthopedic screws and pins would be turned on a lathe.
The fabrication techniques to be employed in this operation-turning, milling,grinding,spark erosion, welding and press forming are all conventional metal-working techniques. There are no licensing requirments associated with any of these processes.

VI.b. Machines and Equipment

The machines and equipment required are listed in Table 7 along with their estimated costs. The quantities are one/each unless otherwise indicated. Used equipment has been specificed in those cases where suitable second-hand machines are available.

Table 7

Machinery and Equipment

1. Mechanical	Est. Cost $
Lathe, Engine	$ 6,000
Lathe,Engine,used,(2/each)	6,000
Lathe,Model Makers	10,000
Lathe Tooling and Accessories	6,000
CNC Machining Center (used)	20,000
Milling Machine w.copy attachment	11,000
Milling Machine w. digital readout, used (2/each)	9,000
Mill Tools and Accessories	8,000
Surface Grinder (used)	10,000
Universal Grinder (used)	12,000
Spark Erosion Machine	35,000
Press, 50 ton, used	5,000
Drill Press, Bench Grinder	500
Sheet Metal Shear, Bender	800
Band Saw	5,000
Hand Tools	6,000
Surface Table	10,000
Measuring Tools	4,000
Welding Equipment	2,000
Microscopes (2/each)	1,000
Material Stock, Fasteners, Supplies	3,000
Drawing Boards, Drafting Equipment	1,500

2. Electrical/Electronic

Instruments(oscilloscope,meters, etc.)	$ 3,000
Tools,soldering and assembly	1,000
Electronic Components(Stock)	3,000

3. Common

Benches, Cabinets, Electrical Fitting	2,000
Vehicle, light Truck, used	6,000
Office Equipment	3,000
TOTAL :	$ 189,800 ($190,000)

VII. Manpower And Management

VII.a. Staff, Availability and Training

The staff of this establishment would consist of :

- Operations Staff :

1 Senior Mechanical Engineer

1 Tool Maker

1 Senior Electronics Technician/Engineer

2 Design Engineers (trainees)

7 Machinists (trainees)

2 Electronics Technician/Engineers (trainees)

1 Lathe Operator

1 Helper

- Administrative Staff:

1 Administrative Assistant (Secretary and book keeper)

1 Business Manager

Nominally three of the machinists would be involved in tool and machine related work and the remaining four machinists would work full-time on medical equipment production . Additional trainees could be added to the staff after the first year of operation. In the course of the first year of operation, a number of consultants would be employed to assist in worker training and product development . These would include a CNC machining center operator (80 hours), a watch-maker (450 hours), an ophthalmic surgeon (250 hours) and an orthopedic surgeon (100 hours).

Worker training is an important aspect of this project. Workers will receive on-the-job training by working under the direction of experienced senior personnel. All trainees should achieve a reasonable level of training after working for one year and would be considered fully trained(apprenticeship completed)after working for approximately five years. Potential trainees are readily available as there are a number of polytechnics and universities in the area. It would probably be necessary to recruit one or more of the senior staff members abroad .

VIII. Project Scheduling

Once the premises is secured, tool and machine related work could begin on a limited scale within a relatively short period of time(1 month) because much of the required machinery is in stock locally. The hiring of trainees would be staggered over a period of approximately ten months. The development of medical products would take place during the first year of operation and actual production of medical equipment would be underway by the end of the first year. In considering the time required for the plant to reach full capacity, allowances must be made for worker training. It is estimated that the plant would reach full capacity near the end of the second year of operation .

IX. Financial Analysis

IX.a. Investment Costs

The investment costs are detailed in Table 8. The costs of the individual items of equipment and machinery are given in Table 7.

Table 8

Investment Costs

Working Capital	$ 44,000
Machinery and Equipment	190,000
Organizational Costs	4,400
TOTAL	$ 238,400

Working Capital includes inventory of a materials(medical equipment) and cash for consultants' fees. Promotion and marketing (medical equipment), rent and salaries, in addition to a contingency fund of $ 10,000.

Consultants' fees are incurred in medical product development and worker training. These are one-time-only expenses incurred during the first year.

The figure; for inventory of a materials, rent, salaries and other operational expenses was obtained by considering the cumulative income and expenses that could be expected under a reasonable start-up plan.

IX.b. Financing

It has been assumed that the source of financing for this project would be local investors and that the financing would be in the form of capital stock in a private corporation, as defined by the Jordanian Corporate Law Number 12 for 1964. Financing in the form of a long-term loan was not assumed because such loans are not readily available to residents and businesses in the West Bank and Gaza and because the funds required are relatively small. Financing in the form of credit extended by the suppliers of machinery and equipment was not considered. In general, such credit is very short-term and would not have a significant impact on the financing of this project .

IX.c. Production Costs

For the purposes of performing the financial analysis , it is conveinent to consider the tótal annual operating expenses of the establishment. The cost of raw materials employed in tool and machine-related work does not enter into the financial analysis because these costs are billed directly to the customer. The total annual operating expenses are detailed in Table 9.

Table 9

Operating Expenses (Annual) at Full Capacity

Salaries :	
Senior Mechanical Engineer	$ 14,400
Tool Maker	14,400
Design Engineers, 2 x $ 4,800/ea.	9,600
Machinists, 7 x $ 4,200/ea.	29,400
Senior Electronics Technician/Engineer	12,000
Electronics Tech./Engineers, 2 x 4,800	9,600

Lathe Operator	4,300
Helper	3,960
Administrative Assistant	5,040
Business Manager, ½ time	7,200
SUBTOTAL :	$ 109,900
Rent	10,800
Vehicle Operation	6,000
Utilities, Insurance	2,400
Cutting Tools(Replacements)	8,000
Materials(Medical Equipment)	3,000
Promotion and Marketing(Medical Equipment)	5,000
TOTAL :	$ 145,100

The production cost of tool and machine related work would be approximately \$9.50 per effective (chargeable to customer)hour of work. This figure is obtained by dividing the portion of the operating expenses that can be attributed to tool and machine related work (\$114,000) by the number of effective hours of work produced annually (12,000 hours). The production costs of medical equipment would vary from approximately \$50/unit for micro-surgical scissors and \$20/unit for micro-surgical forceps to approximately \$1/unit for medical containers and orthopedic implants. The production costs of standard surgical scissors and forceps would be approximately \$8/unit. In obtaining these estimates, it was assumed that 75% of the overhead expenses can be attributed to tool and machine related work and 25% to medical equipment production.

IX.d. Commercial Profitability

A proforma income statement in condensed form for a typical year of operation is given in Table 10. This statement would apply to the third year of operation and beyond. The figures given were obtained from Table 5 and Table 9. As discussed in section II, the assumption of an average charge of $15/hour of labor yields a conservative estimate for the income that can be expected from tool and machine related work.

Income in the West Bank is subject to income tax in accords with income Tax Law Number 25 for 1964 as amended by the Israeli occupation authorities. Article 25:1 of the income tax law states that the tax rate for corporations is 35% of the taxable income. An additional 10% of the tax amount is levied in the form of the Social Welfare Tax. The aggregate of both yields a 38.5% tax rate for corporations.

Table 10

Proforma Income Statement

Revenue:		
Tool and Machine	$180,000	
Medical Equipment	76,500	
TOTAL REVENUE :		256,500
Operating Costs:		
Salaries,factory	97,660	
Salaries,Administrative	12,240	
Rent	10,800	
Utilities	2,400	
Tools	8,000	
Material(medical equip.)	3,000	
Marketing and Promotion(medical equip.)	5,000	
Transportation	6,000	
TOTAL OPERATING COSTS		145,100
Depreciation*		19,000
Gross Profit Before Tax		92,400
38.5% Corporate Tax		35,600
NET PROFIT		$56,800

* Depreciation is calculated on a straight time base at 10%,which is an aggregate percentage for different catagories of items as provided for in Income Tax Law Number 25 for 1964 .

The rate of return and the repayment period are :

$$\text{Rate of Return} = \frac{\$\ 56{,}800}{\$238{,}400} \times 100\% = 24\%$$

$$\text{Repayment Period} = \frac{\$238{,}400}{\$56{,}800 + \$19{,}000} = 3.1 \text{ years}$$

Detailed considerations of the start-up period indicate that no net profit or loss is expected at the end of the two year start-up period If this start-up period is included the repayment period would be approximately five years.

X. Conclusions and Recommendations

The proposed engineering workshop represents a sound business venture. The required investment of $238,400 is relatively small. The rate of return and the repayment period are favorable. In addition to being a commercially profitable business venture, this project would offer a number of benefits to the local economy. Certain imports would be replaced by local products, the technical infrastructure supporting local industries would be improved and important opportunities for training would be created. The experience gained in the export of medical equipment would be of value in establishing other export-oriented industries here. It is therefore recomended that this project be pursued.

AN OPPORTUNITY STUDY

ON

A PLASTIC PLANT

Based on the work of Dr. Said Haifa, Dr. Atef Alawnah and
Mr. Hisham Jabr, UNIDO Experts

1. General Economic Data

The occupied territories are considered as an agricultural area. The agricultural sector plays a significant role in the national income; it contributed about 33% of the national income in 1986, and about 37,100 persons were employed in this sector, or about 26% of the labor force. Vegetables play a special role in the agricultural sector. In 1985, about 171,000 dunums were planted with vegetables producing 226,000 tons, which constituted about 17% of the agricultural products of that year. As a result of using modern agricultural methods, vegetable growing in the territories has passed through several stages, so that vegetables such as tomatoes, cucumbers, eggplant, peppers, melons and water melons and other kinds of vegetables are being planted under plastic. Three different types of planting under plastic have been used.

1.1. Product Characteristics and Use: The proposed plastic films are to be produced through a mixture of ethylene with some chemicals, and, through extruding the mixture, the films are to be produced in different densities and width according to the usage. Plastic films are to be used for the following purposes:

- plastic houses for agriculture
- plastic bags for packaging vegetables, fruits and other things
- other plastic products.

Through using plastic films for the above purposes, the proposed project will serve different segments of the market: home consumption segment, agricultural market segment, commercial and industrial market segment. The proposed project is intended to meet the local and foreign market needs.

1.2. Justification for selecting the project: Using plastic for agricultural purposes allows farmers to harvest agricultural products early in the season when prices are high. Thus, it will increase the profitability of farming, which makes plastic highly in demand by farmers. Tulkarim, Jinin, Al-Aghwar, and Gaza Strip are potential local markets for plastic to be used for agricultural purposes. Therefore, there is a need for establishing such a project, as it is not found in the occupied territories which depend mainly on agriculture.

1.3. Product specification: The proposed plant is planned to produce plastic films which are needed for agricultural use, and to produce plastic bags and other plastic materials needed in the local market, with a potentiality to produce quantities for export in the future. Through a moulding process, ethylene is to be mixed with some other chemicals to produce two types of ethylene: low density poly-ethylene and high density poly-ethylene. These products are to be used for the production of plastic films and all other kinds of plastic materials. Through extruding the low density poly-ethylene and the high density poly-ethylene, plastic films of different kinds of density and width according to the usage purpose will be produced.

2. Market and Demand for the Product

2.1. Current and projected demand: A market study was conducted to estimate the expected local demand for the products of this proposed project. Results of the market study are as follows:

- Demand in the West Bank: The demand for plastic films to be used for agricultural purposes was estimated at about 240 tons of plastic annually, and the demand is increasing at about 15% annually. The estimate of the 240 tons was based on the fact that agricultural areas planted under plastic houses was two dunums only in 1976,which increased to about 800 dunums in 1987. The 800 dunums require 240 tons of plastic to build plastic houses assuming that each dunum requires 300 kilograms of plastic.

- Demand for plastic to build high bridges: Planted areas which use this kind of plastic films for building high bridges increased from 49 dunums in 1979 to 1,200 dunums in 1987, with an estimation of 20% annual increase. The 1,200 dunums planted using this kind of plastic films in 1987 require 180 tons of plastic, assuming each dunum needs 150 kilograms of plastic. This means that 180 tons are demanded annually.

- Demand for use to build low normal bridges: Planted areas which use plastic for this purpose reached 18,241 dunums in 1986. Each dunum requires about 50 kilograms of plastic films, which means that about 912 tons are needed annually with an annual estimated increase of about 10% on the average. Thus, the total demand for agricultural use in the West Bank is estimated to be: 240 + 180 + 912 = 1,332 tons.

- Demand in Gaza Strip: The estimate is about half the quantities demanded in the West Bank i.e., 666 tons. Thus, the total demand for plastic films for agricultural use in the occupied territories is estimated at about 1,998 tons annually, with an average increase of about 15% annually.

- The demand for producing plastic bags of different types, shapes and sizes: In the last ten years, an accelerated development took place which led to replacing paper bags with plastic bags to be used in daily packaging and marketing. This led to a continuous increase in the consumption of plastic bags. The demand is increasing because plastic bags are usually used only once. This fact led to the establishment of many small factories producing these types of plastic bags. The needed plastic film as raw material for these small workshops to produce the bags is imported from Israel. Demand for these plastic films for this purpose is estimated at about 25 tons annually.

2.2. Sales program and sales revenue: Based on the above results in estimating demand, the following sales program and sales revenue is suggested:

Purpose	Quantity in tons West Bank	Gaza	Total	Price per ton in $	Sales Value in $
for building plastic houses	240	120	360	1,700	612,000
to build high bridges	180	90	270	1,700	459,000
to build low normal bridges	912	456	1,368	1,700	2,325,600
to produce plastic bags	15	10	25	1,700	42,500
other purposes			2	1,700	3,400
Total Sales			2,025	-	3,442,500

It is estimated that the present demand will be met by the proposed project for two main reasons:

a. The capacity of the proposed project will be enough to meet such a quantity of demand.

b. The Palestinian people are interested in using local products and boycotting Israeli products. This product, which might substitute for Israeli ones, is encouraged. Therefore, it is expected that the proposed project will have 100% share especially as the trend nowadays is to reserve 100% of the market share solely for national Palestinian projects.

From the above table, one can notice that the total expected demand is about 2,025 tons annually, expected to be sold at about $1,700 per ton; this makes the total sales revenue to be about $3,442,500 annually.

3. Plant Capacity

Plant capacity would be 2,880 tons per year, based on an eight-hour working day and the ability to produce two types of plastic films with width of 65 and 80 cm. However, 2,880 tons is more than the annual expected demand at present, so it is suggested to operate at about 70% of capacity at the beginning, and to utilize the idle capacity (30%) within two years, according to our projections. If the projections prove to be correct and demand continues to increase, the demand could be met by overtime work or working in two shifts. Increasing production depends on greater demand locally as well as on finding new markets in the Arab World.

Production of the two types of plastic films is expected at the beginning to be as follows:

- Type 80 cm = capacity is 900 kilograms per hour, total annual capacity will be 900 x 8 x 6 x 48 = 2,073,600 kg = 2,073.6 tons, assuming 8 working hours a day, six working days a week and 48 working weeks annually. About 70% of the capacity of this type is expected to be utilized. This makes production of this type to be about 1,460 tons.

- Type 65 cm = 350 kilograms per hour. Total annual production 70% of the capacity = .7 x 350 x 8 x 6 x 48 = approximately 565 tons.

4. Supply of Raw Material and other Inputs

4.1. Raw material, availability and source: In order to produce the 2,025 tons annually ethylene and some other chemicals are needed and moulded from Israel or, if circumstances permit, from outside (i.e., European countries), as these raw materials are not found in the occupied territories.

4.2. Low density poly-ethylene (LDPE) and high density poly-ethylene (HDPE).

5. Appropriate Location and Size

The best possible location for the proposed project is in the north of the West Bank (i.e., in Tulkarim area or Jinin) for the following reasons:

- More than 80% of plastic demand for agricultural use is concentrated in the north; this demand represents about half of the total demand for plastic.

- Nearness of this area to Haifa port through which raw material could be imported reduces transportation costs and decreases the raw material costs as a result.

- Nearness of the market (i.e., farmers) helps in gathering market information which will help in satisfying customers' needs in a more efficient way.

6. Project Engineering

6.1. Process and technology: In order to produce plastic films, the following two processes are needed:

A. Moulding process: In this process, ethylene is to be mixed with some chemicals to produce a solid plastic material with different elements. Two types of poly-ethylene will be the output of this process:

- Low density poly-ethylene (LDPE): which can be obtained through radical polymine.

- High density poly-ethylene (HDPE): which is more crystalline material obtained by the use of Ziglar or Nata method. The output of this process could be used in the production of plastic films and all kinds of plastic materials such as home utensils, electricity and irrigation pipes, and other materials.

B. Extruding process: The production of plastic films is derived through extruding the raw materials of LDPE or HDPE by the use of extruders through which plastic films of different kinds, ranging from a density of 10 - 100 micron, can be produced; the width of the plastic film differs according to usage.

6.2. Machines and equipment: Two types of machines are required.

- Machine to produce plastic films of two types: 65 cm and 80 cm. This machine is called an extruder.
- Machine for bag-making in order to produce the plastic bags.
- In addition, lifters and other equipment are needed to help in the production processes.

<u>In detail the following Machinery and Equipment is needed:</u>

* <u>One extrusion system CM65</u>

  for the production of rigid-and soft-PVC pellets;

* <u>One extrusion system CM 80SC</u>

  for the production of rigid-and soft-PVC pellets;

* One twin-screw extruder CM 65 with conical screws and screw core-thermo-regulation;

* One horizontal dose feeder;

* One hopper stuffing device TS120;

* One universal inlet E2/65, one hole insert, and a set of breaker plates;

* One pelletizing head GK120 with a set of perforated plates for rigid-and soft-PVC;

* One set of conveying equipment 600;

* One set of pellet cooling equipment 600;

* A manual bagging device 600;

* a dust separating unit;

6.3. Design of the project: Two processes are required for the moulding and the extruding. Technical consultations indicate that the first process (moulding) needs very high construction cost, and needs technical experience which the occupied territories lack at present. Therefore, the proposed project recommends to start by importing the raw material after the moulding process stage i.e., importing the solid plastic material (low density poly-ethylene, and high density poly-ethylene) to be used for the production of plastic films.

7. Manpower and Management

7.1. It is expected that the project needs production, technical, marketing and administrative staff. Consultation in this regard shows that the administrative and marketing staff needed are: a general manager, assistant manager, secretary, three staff for finance, three for marketing, three for personnel, 10 production and technical people (including chemical engineers, technicians for maintenance, and workers) one driver and two janitors. Therefore, the total staff required at the initial stage is 25.

7.2. Availability of manpower and training: Three types of workers are required: skilled, semi-skilled and non skilled. Skilled includes administrators, accountants, chemical engineers. Semi-skilled includes secretary, assistant technicians, semi-skilled workers; non-skilled includes janitors. The occupied territories have a surplus of all kinds of manpower due to the existence of many university and community college graduates who are unemployed. Therefore, the manpower needed is available. But in order to start working in this project technical and production training is needed. This could be done through a contract with the supplier of machines, for the required training either in the occupied territories or outside.

8. Project Scheduling

In order to start the project, an establishment team is required to prepare and help in the establishment stage, to obtain a licence both from Israeli authorities and from Jordan, which needs a period of not less than six months. During this stage preparation for finding a suitable site in Tulkarim or Jinin is to be done. Correspondence with suppliers of machines has also to be done in order to find a suitable offer, which will take about six months. The establishment of the plant and buying and erection of machinery require not less than one year. Thus two years are required to build the factory and start operation, assuming there will be no obstacles and delays from the authorities.

9. Financial Analysis

9.1. Investment costs: According to the suggested capacity and based on consultations with suppliers of machinery, the following investment costs are estimated:

- Land: five dunums are needed for the proposed capacity and for future expansion, costing $ 50,000
- Buildings: buildings needed for the plant and management $ 100,000
- Machines $ 745,169

(For more details about machine costs, see Appendix I).

- Other equipment (auxiliary and service equipment)	$ 50,000
- Furniture	5,000
- Cars (2) for transport and marketing purposes	60,000
- Organization and establishment costs	30,000
- Other precautionary expenses	5,000
Total fixed assets needed	$ 1,045,169
- Working capital consisting of three months' coverage of the following annual cost	637,427

Raw material	$ 2,367,900
Labor cost	$ 150,000
Maintenance	$ 31,806

In addition to selling costs which are estimated at about 5% of the sales value or about an annual amount of $ 172,125, three months' coverage is required (i.e., 25% of annual cost) = $ 43,031.

- Other additional funds for precautionary and liquidity purposes of about $ 10,000
- This makes total financial requirements for investment to be:

$ 1,045,169 + $ 637,427 + $ 43,031 + $ 10,000 = $ 1,735,627

9.2. Most of the machinery and equipment needed has to be imported from Germany or any other European country, moreover, raw material in the form of LDPE or HDPE is to be imported either from Israel or from any European country.

9.3. Financing: The legal form of the project is advised to be in the form of corporation in which capital is to be divided into shares of at least US$ 20 per share (i.e., about JD.10). Founders stockholders could participate in about 10% of the financial needs, the rest could be sold in the form of shares to other shareholders.

9.4. Production costs: The estimated production cost includes the following:

- Fixed cost which includes the depreciation cost of fixed assets. It is calculated as follows assuming straight line method of depreciation,with the following depreciation rates:

Building (4%)	$ 4,000
Machines and equipment (10%)	$ 79,517
Cars (25%)	$ 15,000
Furniture (25%)	$ 1,250
Establishment cost (15%)	$ 7,500
Total depreciation cost	$ 107,267

- Operational cost (variable cost) which consists of raw material labor and maintenance cost, calculated as follows:
- Raw material cost: In order to produce 2,025 tons of plastic films annually out of HDPE with a 10 micron thickness, the plant needs about 2,631 tons of raw material, at a cost of US$ 900 per ton. Thus raw material cost is 2,631 x $ 900 = $ 2,367,900 annually.
- Labor and administrative cost: The plant is expected to recruit about 25 employees including management, production and marketing employees at an average annual wage of $ 6,000 per employee; this makes the total labor cost to be: $ 6,000 x 25 = $ 150,000 annually.
- Maintenance cost is estimated at about 4% of the machines and equipment value annually. This makes annual maintenance cost to be: $ 31,806. In this regard, it is advised that a maintenance contract is signed with the suppliers of machines and equipment.

- This makes the total operational cost before depreciation to be: 2,367,900 + 150,000 + 31,806 = $ 2,549,706. It is clear that raw material cost represents a very high percentage of the operating cost. Marketing cost is expected to be about 5% of the sales value or about $ 172,125. This makes the total annual cost to be: depreciation cost + operational cost + marketing and selling cost, i.e.,

  107,267 + 2,549,706 + 172,125 = $ 2,829,098

9.5. Commercial profitability: The estimated annual revenue will be 2,025 x 1,700 = $ 3,442,500 assuming that 2,025 tons are to be produced annually and to be sold at a price of $ 1,700 per ton. Based on the sales value and the sales program suggested earlier, and the total cost of production, administration and selling, and the legal form of business (i.e., corporation form), the following commercial profitability is calculated:

A. Rate of return: The annual simple rate of return is calculated as follows: $\frac{\text{Net profit after tax}}{\text{Total investment}}$

   The Du Pont system could be used which will give the same result. According to the Du Pont system two financial ratios are multiplied: the profitability ratio with the turn over ratio.

   Net profit before tax = total revenue - total cost

   3,442,500 - 2,829,098 = $ 613,402, assuming 38.5% income tax according to the income tax law this makes

   Net profit after tax to be:

   613,402 - 236,160 = $ 377,242 annually.

Rate of return on investment (ROI): $\frac{377,242}{1,735,627}$ = 21.74% annually

Using the Du Pont system the return on investment (ROI):

$$\frac{377,242}{3,442,500} \times \frac{3,442,500}{1,735,627} = 21.74\%$$

This reflects a good investment turnover and a good profit margin.

B. Repayment period: Payback method is used to determine the repayment period,which is the period needed to recover total investment out of the net operating profit and depreciation, thus:

$$\frac{\text{Total investment}}{\text{Net operating profit after tax and before depreciation}}$$

$$\frac{1,735,627}{377,242 + 107,267} = 3.58 \text{ years}$$

Total investment in the project is expected to be recovered in about 3.58 years.

10. Conclusions and Recommendations

10.1. The plant is expected to produce about 2,025 tons of plastic films annually in order to supply agricultural purposes, plastic bags needed for packaging and marketing, and other plastic materials which are demanded in the occupied territories.

10.2. It is expected to meet the increasing demand in this area for plastic products, and could be expanded in the future to meet an export market.

10.3. The project is considered economically feasible, it is expected to produce a high return on investment, about 21.74% annually. Investment cost is expected to be recovered through net inflows represented by net operating profit and accumulated depreciation in about 3.58 years.

10.4. It is expected to create about 25 opportunities for employment in the first stage of operation, and this labor force is available in the occupied territories. Annual sales is expected to be about $ 3,442,500; sales yield per employee is expected to be about $ 137,700.

10.5. Other benefits: This project will substitute for imports of this type of product which costs around $ 3,442,500 annually; Moreover, 25 jobs are expected to be created to work in this plant, with an annual wage income of $150,000; additional jobs are expected to be created in related fields (i.e., transportation, trade, services) as a result of establishing this project.

10.6. Therefore, the project is recommended. Some sort of primary consultation and communication may be useful before the starting of the implementation stage including decisions regarding:

1. a detailed marketing study
2. a detailed technical study

AN OPPORTUNITY STUDY

ON

A TUBULAR STEEL PRODUCTS MANUFACTURING PLANT

Based on the work of Ziad Khalaf,
Saro Nakashian and Hanna Quffa, UNIDO Experts

TUBULAR STEEL PRODUCTS MANUFACTURING PLANT: An Opportunity Study

Introduction

The steel industry in the West Bank and Gaza Strip is still in its infancy . It mostly consists of job-lot workshops, most of which are family owned and run, with the majority employing between four to ten unskilled and/or semi-skilled labourers whose work encompasses the final stages of production, mainly machining, binding, welding, and joining operations. These operations are performed mostly on sheet metal,bars,and tubular products.

Preliminary investigations have shown a considerable local use of steel tubular products especially in the small size range. We propose to carry out an opportunity study of a tubular steel products manufacturing plant based primarily on local market demand.

1. General Economic Data

1.1. Product Characteristics and Use; The allotropic property of iron lends its effect to steel,imparting a wide range of mechanical and physical properties. Steel possesses good fabricability, due to its high ductility, corrosion resistance, which could be enhanced considerably by coating and/or painting, and strength. ASTM A500 grade B steel is widely used in the hot-rolled sheet form for the manufacturing of cold-rolled tubular steel products. This grade is the raw material of choice in coil form. It is widely available from different European countries, and at the present has an average price of 500 dollars/ton. Table 1 gives the mechanical properties of this grade of steel.

Table 1

Mechanical Properties of ASTM A500 Grade B Steel

Property	MPa
Tensile Strength	400
Yield Strength	298
Modulus of Elasticity	206,000
Elongation	23%

Good ductility and formability contributes to the wide range of shapes (Fig.1) of tubular steel products.

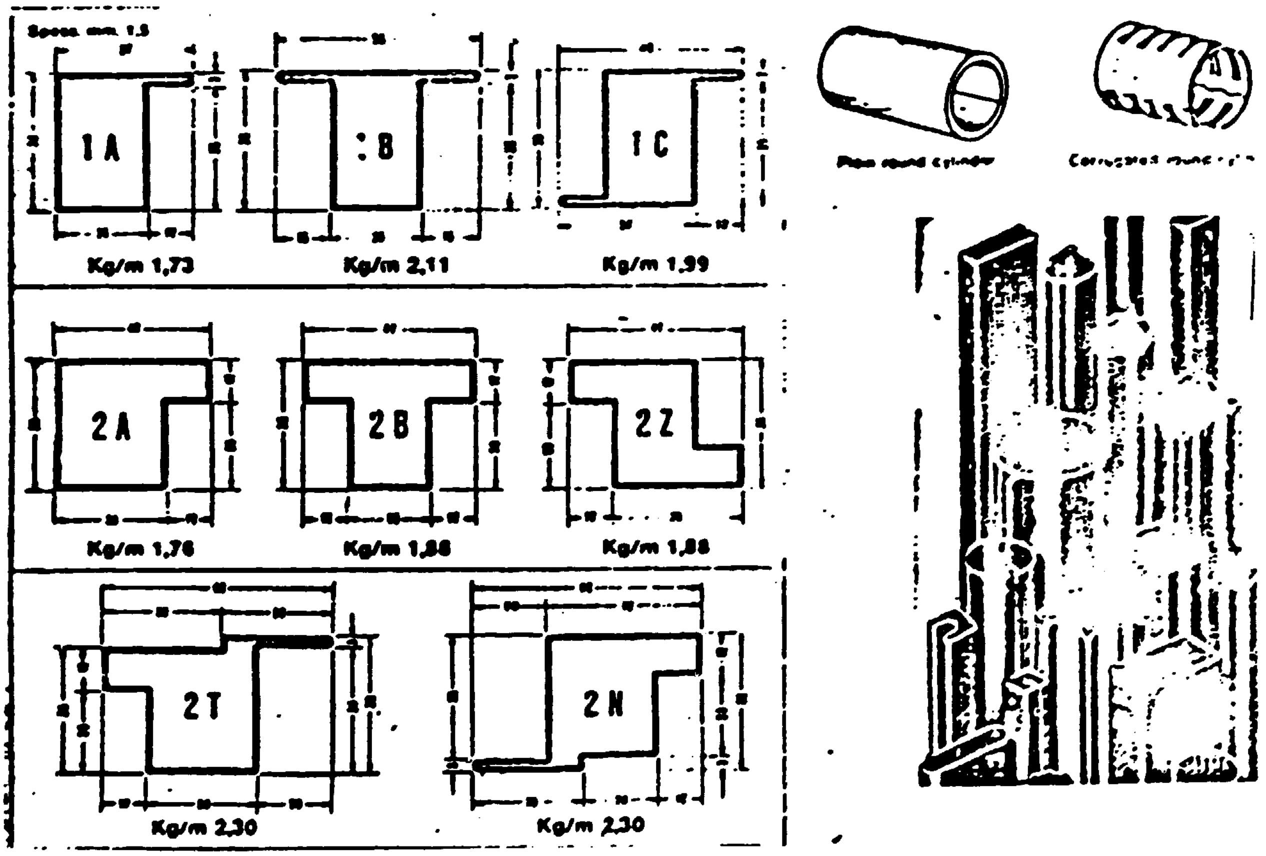


Figure 1 - Diversity of size and shape of tubular steel products.

Coupled with excellent weldability, corrosion resistance, and enhanced strength properties due to cold-working, cold-rolled tubular steel products enjoy a wide range of applications locally. These applications include main and domestic water distribution systems, structural and architectural applications, such as in the construction of greenhouses, animal shelters, industrial structures , rails, windows, gates, and doors. They are also used in the manufacturing of solar collection panels,fire protection systems, metal furniture products, machinery, and many other applications.

1.2. Justification for Selecting the Product: It is estimated that local consumption, which is at present exclusively purchased from Israeli manufacturers, constitutes not less than 15 percent of total Israeli production (based on personal interviews and data collected from local merchants and Israeli manufacturers). Tubular steel products play a vital role in construction and agro-based applications, the two major sectors of the local economy. Hence, they are deemed strategically important. Local manufacturing of these products will result in greater economic independence and maintenance of capital in the local economy. Modernization of agriculture methods ,enhanced industrialization , growth and greater absorption of skilled - labor into the local economy will inevitably enhance the demand. Also, at just over half the price of comparable aluminum products, plated tubular steel products could prove decent competitors in the housing industry.

1.3. Product Specification: As mentioned, tubular steel products within the small size range constitute the overwhelming percentage of local consumption. Table 2 details the specifications and dimensions of the three major profiles to be considered for manufacturing.

Table 2

Dimensions and Specifications of the Most Widely Used Tubular Steel Products

External Dimension A x A mm	Gauge Thickness (mm)-S 1.2	1.5	2
	Weight	Kg/m	
20 x 20	0.71	0.87	1.13
25 x 25	0.90	1.11	1.44
30 x 30	1.08	1.34	1.76
35 x 35	1.27	1.58	2.07
40 x 40	1.46	1.81	2.39
45 x 45		2.05	2.70
50 x 50		2.28	3.01
60 x 60		2.76	3.64

External Dimension mm - D	Gauge Thickness (mm)-S 1.2	1.5	2
	Weight	kg/m	
* 17	0.47	0.57	0.74
* 22	0.62	0.76	0.99
* 28	0.79	0.98	1.28
35	1.00	1.24	1.63
* 42	1.21	1.50	1.97
* 55		1.98	2.61
* 80		2.90	3.87

Table 2 (continue)

External Dimension A x B	Gauge Thickness (mm)- S 1.2	1.5	2
	Weight	kg/m	
20 x 15	0.61	0.75	0.97
25 x 10	0.61	0.75	0.97
30 x 20	0.90	1.11	1.44
40 x 20	1.08	1.34	1.76
40 x 30	1.27	1.58	2.07
50 x 30	1.46	1.81	2.39
50 x 40		2.05	2.70
60 x 40		2.28	3.01
60 x 50		2.52	3.33
70 x 40		2.52	3.33
70 x 50		2.76	3.64

2. Market and Demand for Specific Product

2.1. Current and Projected Demand: For the purpose of estimating local market demand for tubular steel products a survey was conducted through a questionnaire identifying the quantities and range of products used in the West Bank and Gaza Strip. The questionnaire was distributed to major wholesalers and retailers. Based on responses received and on in depth personal interviews with engineers, directors of water distribution authorities, Israeli manufacturers, product end-users, wholesalers, and retailers, the local demand was estimated at 6000 tons/year, the equivalent of 3,600,000 meter run. Over 90 percent of the demand is within the small size range . Demand for tubular steel products has been steady for the years 1981-87: A marked increase in product use was noticed in 1982/83 due to the increased number of villages granted licences to establish water supply systems during that period . The diversity of applications of tubular steel products translates any growth in user industries (e.g.,construction,agrobased industries), into a positive increase in demand for these products. It should be noted here that over 85% of respondents to the questionnaire, and 100% of those interviewed showed interest in investing in such a project.

2.2 Sales Programme and Sales Revenue: Tubular steel products are exclusively purchased from Israeli manufacturers. There are seven Israeli factories producing all types and sizes of tubular steel. Two of these factories, based in Acre and Netanya, supply over 70% of West Bank and Gaza Strip consumption. Israeli products satisfy the Israeli Institute of Standards specifications. To assure the quality and marketability of the proposed plant products, they should meet and/or exceed Israeli specifications. Prices should follow established market prices and practices. During the start-up period some price concessions should be made in order to break into the market. It is suggested that a 5-10 percent reduction from established market prices be offered on the first year output. Reduced transportation costs due to location should give the products a competitive price edge. The possibility of an export market is almost non-existant due to existing regulations.

Sales quantity and total revenue for the proposed plant are shown in Table 3.

Table 3

Sales Quantities and Revenues

Type	Quantities in Tons	Price per Ton	Total Revenue
Galvanized Pipes	2,160	1,175	$ 2,538,000
Pipes	420	767	322,140
Rectangular Tubes	1,440	767	1,104,480
Square Tubes	980	767	751,660
TOTAL :	5,000		$ 4,716,280

The above sales quantities will be 5,000 tons, which constitutes 83.3% of the total market demand. Since the standard length of the tubes is six meters, the five thousand tons are equivalent to 500,000 units or 3,000,000 meter run and a total revenue of $ 4,716,280 .

3. Plant Capacity

The proposed plant has a production capacity of 6,500 tons annually, with initial production concentration on the most widely used profiles. Diversification of products will be dependent on market demand. The maximum capacity of the galvanization plant is set at 7,200 tons annually .

4. Supply of Raw Material and Other Inputs

4.1. Raw Material, Availability and Source: Work material is ASTM A500 grade B steel or its equivalent in coiled sheet form. Width up to 150 cm maximum and gauge thickness range from 1-2 mm. Zinc and lead for the galvanization plant are in block form; fluxing, bleaching, and pickling agents are in liquid form. All materials are available from several European countries.

4.2. Utilities:

a. Electric power supply in 380 volt, 50 Hz, 3 phase is available from the Jerusalem District Electricity Company.

b. Fuel used is heating oil #2 for burners and furnace, locally available.

c. Cooling water of cold rolling mill is recycled.

5. Approximate Location and Site

The central region of the West Bank, i.e., Ramallah, Jerusalem, or Bethlehem areas, constitute the best possible plant location for minimizing transportation costs and the availability of utilities and land.

6. Project Engineering

6.1. Process and Technology: Several manufacturing processes are found for producing tubular steel products. They include bend forming, casting (for circular sections only), piercing, and roll forming. The latter was selected as the manufacturing process of choice because it offers the greatest versatility and lowest production cost.

Cold roll forming consists of charging slitted rolls into an unwinding reel. The slitted coil(skelp) is then discharged into a winding/unwinding reel which in turn charges the coil into the rolling mill where, and through successive pairs of roll dies , the skelp is gradually formed into the desired shape. Fig.2 shows typical forming sequences for producing pipes.

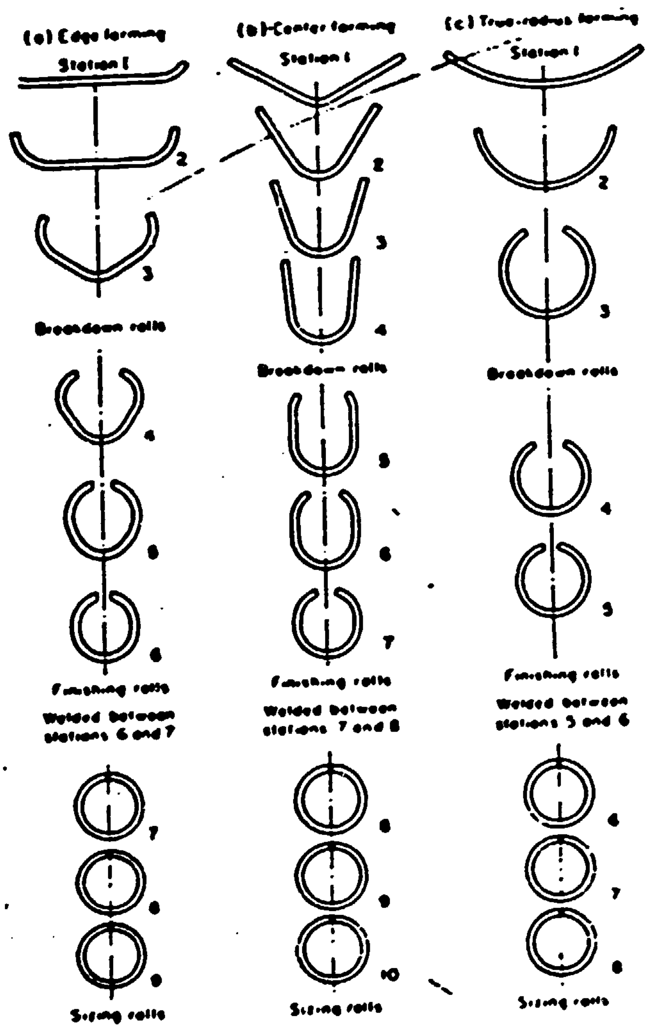


Fig.2- Typical forming sequences for producing round pipes and tubes.

The rolls are designed with a single forming radius for each roll pass. The radius progressively decreases with each roll pass. The last two or three rolls are provided with fin rolls at the top to guide the two edges of the metal to prevent twisting of the tube and to assure accurate positioning of the weld. The metal then passes through a number of idle rolls (2 or 3) to assure positioning before the edges are welded. Welding usually causes a slight deformation as a result of high heat input, so the welded tubes are charged through a series of sizing and straightening rolls to produce the desired accurate size and shape. A typical set of sizing and straightening rolls consists of three driven roll passes with one or two idle rolls placed in between. The tube is then cut to length using a synchronized flying cutter and then discharged . Except for pipes, all other products are now ready for shipment. Good quality necessitates leak testing of pipes. Hydrostatic testing is proposed. Pressure is applied gradually and for a sufficient period of time within the range from 210 bar for larger diameter pipes to 400 bar for small diameter pipes. As it is clear, each cross section requires its own set of roll dies, which constitutes a considerable amount of the total plant cost.

6.2. Machines and Equipment

General Information:

a.	Start-up material	Sheet metal in coil form. ASTM A500 grade B steel.
b.	Gauge thickness	minimum 1 mm maximum 2 mm

c. Pipe diameter — minimum 12 mm

maximum 80 mm

For size range of other cross sections see Table 2.

d. Electric power — 380 volt 50 Hz

3 phase feeding system

Components of the plant:

a. Unwinding reel - slitting machine - recoiler. Driven system which can handle coils from 90 to 150 cm in width . Edge conditioning and scrap disposal mechanisms are included .

b. Unwinding reel :

Capacity	3 ton
band width	500 mm
expansion min. dia.	470 mm
expansion max. dia.	520 mm
coil's external max. dia.	1500 mm

c. Head and bands joining unit:

max.width of strip	500 mm

d. Winding/unwinding reel:

capacity	50 + 50 ton
coil's external dia.	4000 mm
coil's internal dia.	500 mm
band width	500 mm
continuous current engine	30 hp

e. Profiling (forming)machine:

Consists of : - band guide group

- tube guiding carriage
- upsetting unit
- carriage of scapers with winder of shavings
- cooling cage

- calibrating unit
- double turkish heads
- straightener group

f. High frequency induction welder:

- welding power 100 KW

g. Automatic flying cutter:

- tube dia. max. capacity	80 mm
- min. cutting length	4,000 mm
- max. cutting length	12,000 mm
- electric motor	10 hp
- disc dia.	400 mm

h. Measuring and discharging bench:

- min.length	4,000 mm
- max. length	12,000 mm
- dragging device	2 hp

i. Hydrostatic Testing Station :

A pressure within the range of 210 - 400 bar (depending on bar diameter) is applied for a sufficient period of time to detect any defects.

j. Sets of rolls :

Complete set of rolls for the production of tubular products, Each set is comprised of :

- forming rolls
- auxiliary rolls
- calibrating rolls
- straightening rolls

Material : UNI 88 Mn VCr8 KU tempered and partially rectified, with a hardness > Rc 58

k. Galvanizing Plant:

The following is a description of the process and the equipment required :

The tubes to be galvanized, in bundles, are chemically pretreated in the following sequence :

1. Degreasing bath - heated to approximately $80^{o}C$.
2. Rinsing bath - ambient temperature $20^{o}C$
3. Pickling bath - ambient temperature $20^{o}C$
   Pickling time 20 - 40 min.
   Equipped with a rocking device .
4. Rinsing bath - ambient temperature $20^{o}C$
5. Fluxing agent bath - heated to approximately $60^{o}C$.

Degreasing and rinsing baths are from sheet steel construction with welded sectional steel and provided with resistant paint on the inside and outside. Heated baths are insulated with mineral wool mats.

Pickling , rinsing, and fluxing agent baths are from sheet steel construction with an interior Rhepanol-Org foil protected by 65 mm acid-resistant brick lining. Outside walls are protected by an acid-resistant filling.

All baths stand in a concrete excavation with a pump sump.Groove walls, floors, and gutters are acid-resistant. After fluxing,the bundles are laid on a drip table. Collected dripping fluxing agent is circulated to the fluxing bath. A star-shaped feeding device charges individual tubes into a drying furnace ($120-150^{o}C$), then they are immersed into the zinc bath for galvanizing.

The galvanizing kettle stands in a sectional steel frame with welded sheets and lined with refractory bricks. Heating is done by a burner with hot gas circulation.

Proper ventilation and filtration is required. Released gases should have a maximum residual dust content of 20 mg/Nm^3. The collected dust should be properly stored.

Hooks are used to lift the zinc plated tubes,which are then led through a compressed air ring to remove excess zinc,and pressed against magnetic rollers. Under a pressure of 12 bar the tubes are blown out with steam to remove excess zinc from the internal surface. Excess zinc is recycled.

The tubes are then cooled in a water bath and collected in a trough.

Maximum capacity of plant - 3 ton/hour

Tube length - 6 m.

Tube dimensions - from 17 to 80 mm in diameter

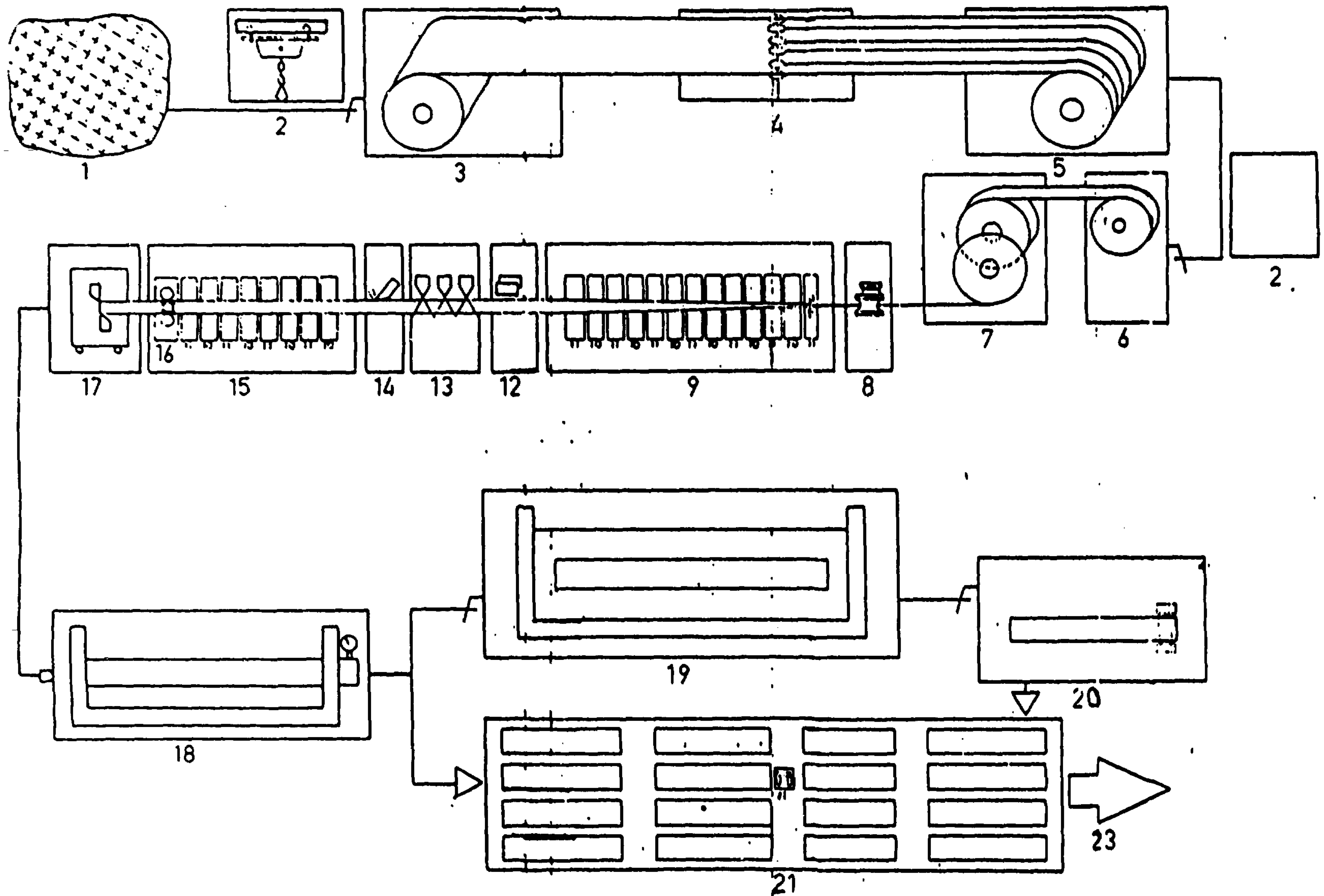
6.3. Plant Layout: The estimated overall area requirements for the proposed plant is 15,000 m^2 (15 dunums) comprising the stock yard and an estimated building area for the rolling mill , galvanization plant and administrative offices of 1500 m^2.

Figure 3 shows a flow sheet of the proposed plant.

7. <u>Manpower and Management</u>

Director	1
Secretary	1
Purchasing and Inventory	3
Accountants	3
Plant Manager	1
Plant Engineer	1
Fork lift and crane operator	3
Mechanical maintenance and die fitters	3
Electrician	2
Foreman	1
Quality controllers	2
Production labourers	10
Marketing Manager	1
Salesmen	4
TOTAL :	36

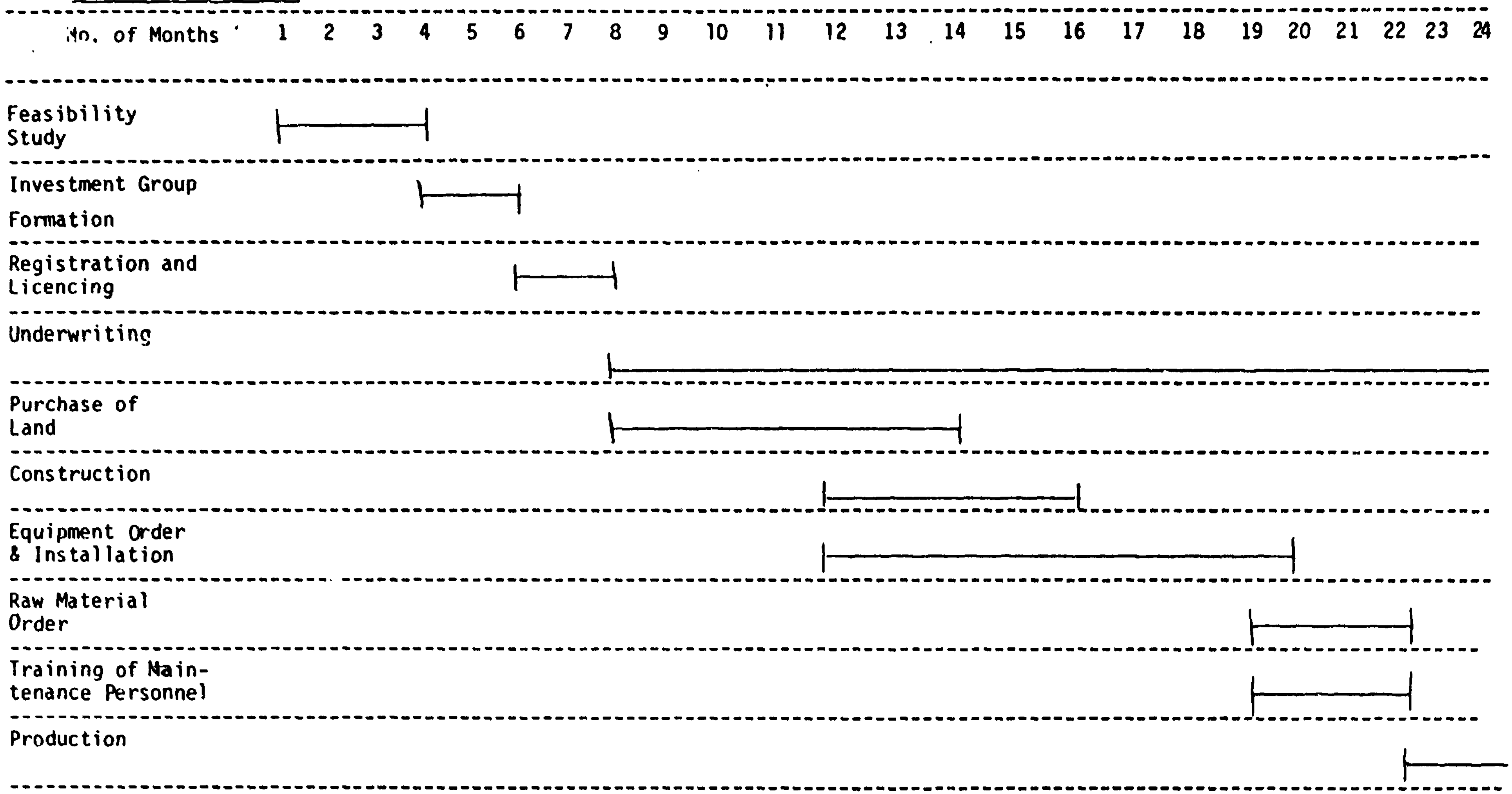
The number of employees needed for this project is 36. Most of the labour needed is available locally. Special training is necessary for the die fitting which the installation contract will include .



23	Transportation
22	Fork-Lift
21	Storage Area
20	Threading
19	Galvanizing Plant
18	Hydrostatic Tester
17	Flying Cutter
16	Driven & Idler Rolls
15	Sizer & Reshaper
14	Flash Removal
13	Cooling
12	Welder
11	Idler Rolls
10	Driven Rolls
9	Forming Mills
8	Guiding Rolls
7	Winding-Unwinding Reel
6	Charging (unwinding) Reel
5	Re-Coiler
4	Slitter
3	Un Coiler
2	Skelp Handling
1	Raw Material

PLANT LAYOUT
Fig. 3
S.1

8. Project Scheduling



9. Financial Analysis

The financial analysis for the proposed project is based on estimates of revenue, investment, and production cost. Table 3 in section 2 summarizes revenue. The other estimates will be presented in the following sections.

9.1. Investment Costs: The estimate of the total cost of assets and total investment is presented in Table 4 below:

Table 4

Investment Costs

Working capital	$ 600,000
Equipment,furniture and fixtures	2,620,000
Building	180,000
Land	150,000
Organizational costs	60,000
TOTAL INVESTMENT	$ 3,610,000

Equipment furniture and fixtures include the estimated cost of machinery,dies,office equipment, in addition to installation costs. Working capital includesraw materials, inventory calculated at 10% of the annual quantities needed for production as well as the costs of utilities, labour costs of one month and safety cash. Organizational costs are the legal fees of incorporation of 0.01% of total investment in addition to lawyers', accountants' and consultants' fees .

9.2. Financing:The capital for the proposed project will be local equity capital raised in the form of capital stock. The form of incorporation is that of a private corporation under articles of Jordan Corporate Law for 1964 .

9.3. Production and Other Costs: The total production as well as other costs are presented in Table 5 below:

Table 5

Total Production and Other Costs

	Amount in $	Ratio as % of revenue	of cost
Prime Costs :			
Direct material(steel,zinc)	2,604,000	55.2 %	74 %
Direct labour	238,000	5.1 %	6.8%
Fixed and semi-fixed costs:			
Other costs (selling and administrative expenses, indirect labour,indirect material, maintenance supplies,utilities etc.)	400,000	8.5 %	11.4%
Depreciation and amortization:			
Depreciation of property plant and equipment at 10%; amortization of organizational costs at 20 %	274,000	5.8 %	7.8%
TOTAL COSTS :	$ 3,516,000	74.6 %	100%

9.4. Commercial Profitability: The proposed projects' estimated net profit after tax is calculated based on 5,000 tons of production of which 2,160 tons are galvanized. Estimates of sales did not include the selling of excess capacity in the galvanization plant . A condensed forecasted income statement is presented in Table 6.

Table 6

Forecasted Condensed Income Statement

		Amount in $	Ratio of Sales
Estimated Revenue	Table 3	4,716,280	100%
Estimated Costs & Expenses	Table 5	3,516,000	74.6%
Net Profit before Tax		1,200,280	25.4%
Tax Expense @ .385*		462,108	
Net Profit after Tax		738,172	15.7%

* Corporate Tax is calculated at 35% of net taxable income ; 10% of the tax expense is levied as a social welfare tax,totalling 38.5% .

9.4.1. Rate of Return : The accounting rate of return on investment is calculated as follows :

$$\text{Rate of Return} = \left(\frac{\text{Net Profit After Tax}}{\text{Total Investment}}\right) \times 100\%$$

$$= (738,182 \div 3,610,000) \times 100\%$$

$$= 20.4\%$$

The rate of return can be calculated using a Dupont System combining profit margin on sales ratio and total assets turn over ratio. The equation appears below:

$$\text{Rate of Return} = \frac{\text{Net Profit after tax}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total Investment}}$$

$$= \frac{738{,}172}{4{,}716{,}280} \times \frac{4{,}716{,}280}{3{,}610{,}000}$$

$$= 15.7\% \times 1.30 \text{ times}$$

$$= 20.4\ \%$$

9.4.2. Pay Back : The period required to recover the total investment for the proposed project will be calculated as follows :

$$\text{Pay Back} = \frac{\text{Total Investment}}{\text{Net Profit after Tax+Depreciation and Amortization}}$$

$$= \frac{3{,}610{,}000}{738{,}172 + 274{,}000}$$

$$= \frac{3{,}610{,}000}{1{,}012{,}172}$$

$$= 3.57 \text{ years}$$

That is, the investment will be recovered in approximately three years and seven months.

Conclusion

Three factors combine to suggest that the proposed project is a good venture , namely,1) the possibility of lessening the dependence of the local economy of the West Bank and Gaza Strip on Israeli manufacturers,2) the vital role of tubular steel products in various enterprises of the area,and 3) a projected rate of return on investment of 20.4%, which is greater than the return on long-term deposits .

The profit to sales ratio is 15.7% and assets turnover ratio of 1.30 with recovery of total investment in three years and seven months.

We recommend that a feasibility study should be conducted for further investigation of the proposed project to aid in the final decision.

AN OPPORTUNITY STUDY

ON

A WIRE NAILS MANUFACTURING PLANT

Based on the work of Said Haifa, UNIDO Expert

1. <u>General Economic Data:</u>

1.1. Product Characteristics and Uses: The proposed plant will be designed to produce various types of wire nails as well as various kinds of nails with specially shaped heads and/or points.

The most common nails that have been used in the occupied Palestinian territories are nails for the construction industry with length of 10cm, and 5cm, and thickness of 4.5mm, and 2.5mm. respectively.

The nails are sold in packages weighing up to 5kgs.

1.2. Justification for Selecting the Product: At present the consumption of various types of nails in the occupied territories is supplied by and usually bought from Israeli producers or wholesalers who are able to command sometimes very high prices. The establishment of the proposed plant will decrease the heavy dependence on Israeli producers by enabling the occupied territories to be self-sufficient in certain kinds of nails, especially those used in the construction and in the shoe industries . It will also improve the balance of payments of the West Bank and Gaza Strip and will create new job opportunities for 15 persons.

1.3. Product Specification : This project is aimed at producing the following kinds of wire nails:

a. Nail Lengths about 6.5 - 40 mm.

Wire diameters - ca. 0.8 - 1.8 mm.

b. Nail Lengths - ca. 10 - 50 mm.

Wire diameters - ca. 1 - 2.4 mm.

c. Nail Lengths - ca. 13 - 150 mm .

Wire diameters - ca. 3.1 - 5.2 mm.

The plant's output will be filled in cartons, each carton weighing up to 5 kgs.

It should be pointed out, that with minor additions of equipment and machines to the plant, it will be possible to produce other metal products such as fencing and tightening-wires.

2. Market and Demand for Wire Nails:

2.1. Current and Projected Demand: The potential market for the proposed product will be limited to the West Bank and Gaza Strip. Besides the potential domestic market , possibilities for export to the Arab Countries are available.

The demand for wire nails as for any other input is called a derived demand because it is derived from the underlying demand for other activities— construction industry in this case . Therefore, it is reasonable to base our estimation of actual and projected demand for wire nails on the actual and projected housing units in the potential domestic market. Table I shows the area of civil buildings completed in the West Bank and Gaza Strip during the period 1979-1986.

Table I

Area of Completed Civil Buildings

in the West Bank and Gaza Strip (Thousand sq.m.)

Year	W.B.	G.S.	Total
1979	725.6	293.9	1,019.5
1980	749.7	260.6	1,010.3
1981	716.7	312.7	1,029.4
1982	686.1	362.6	1,048.7
1983	748.8	319.9	1,068.7
1984	695.1	288.0	983.1
1985	777.6	227.9	1,005.5
1986	823.7	281.8	1,105.5

Source: Judaea, Samaria, and Gaza Area Statistics. vol.XVII, Israel Central Bureau of Statistics, 1987 - p.47.

The average annual area of completed building in the potential market is calculated to be 1,033 thousand sq.m. If it is assumed that the area of a standard housing unit is 120 sq. m., then the average housing units constructed in the West Bank and Gaza Strip is equal to 8,608 units per year. It is estimated that a housing unit with area equal to 120 sq.m. needs about 200 kgs of nails (i.e. 40 cartons). This makes the total annual demand for nails for construction purposes in the potential market equal to 1,721 tons which is equivalent to about 6 tons daily assuming 286 working days. Another source of estimating the current domestic demand for wire nails is a field survey covering all whole-salers of construction materials in the region; the survey showed that the actual monthly consumption of wire nails is about 150 tons, distributed among different districs as follows:

District	Monthly Consumption(Tons)
Ramallah and Jerusalem	45
Nablus	25
Hebron	20
Gaza Strip	50
The rest of territories	10
TOTAL	150

Source : Personal interview with whole salers of construction materials.

Regarding the projected demand, Table I reveals that if the conditions prevailing in the potential market during the period 1979-1986 remain the same in the future, then a substantial growth is not expected in the demand for wire nails in the West Bank and Gaza Strip, and the annual demand will be fluctuating around 1,721 tons per year .

2.2 Sales Programme and Sales Revenue: The expected productive capacity of the proposed plant is 3 tons of wire nails per day, working schedule is 300 days per year, one shift per day. In order to be able to fix the factory price of the product, prices were checked with various merchants of construction materials and manufactures in Jordan and Israel.

The prices obtained were similar at all sources for one ton of wire nails. The quoted prices were NIS* 1100/Ton in the West Bank and Gaza Strip which is equivalent to about U.S.$ 632 and $ 560 in Jordan. In order to be conservative and taking into consideration allowances for contingencies, the price of $ 588 /Ton of wire nails will be established as a factory selling price . Given the expected productive capacity, the annual revenue will be U.S. $ 529,200 .

* New Israeli Shekel

3. Plant Capacity:

The annual output of the proposed project is to be approximately 900 tons, based on the process of drawn bright wire. This amount of output represents about 50% of total quantity demanded in the West Bank and Gaza Strip. It should be pointed out that the plant can produce double of the stated productive capacity simply by operating two shifts.

4. Supply of Raw Material and Other Inputs:

4.1. Raw Material, Availability and Source: The major raw material required for the production of wire nails is drawn bright wire. The main source of bright nail wire for the West Bank is Europe, namely, East Germany and Hungary as well as Israeli agents .

Since an adequate supply of raw material - bright nail wire - is a vital requirement, the proposed plant should enter into a supply agreement with a reputable foreign company which shall assume regular supply under competitive prices.

The following details should be considered when ordering wire :

a. Short Description :

D 9-1 material No. 1.0010 according to a specification DIN 17140 bright wire .

b. Melting Analysis :

c = Less than 0.1 %

mn = Less than 0.5 %

p = Less than 1.07%

s = Less than 0.06%

However, the supplier of machines can help to nominate a suitable wire supplier and obtain the required quotations for suitable nail wire .

4.2. Utilities : The basic utilities needed for the proposed project are electricity and packing materials. It is estimated that the plant needs 90,000 K.W. per year . The electricity can be supplied either by the plant's generators or by electricity from the electrical company in the area. The electric power rate for industrial use is about 8.3¢/KW. The packing materials are estimated to cost about U.S. $ 7,000 per year .

5. <u>Approximate Location and Site:</u>

It is recommended that the proposed project be located in one of the industrial zones of major Arab Cities in the West Bank . Ramallah City is nominated as a good location for the proposed plant.

6. <u>Project Engineering:</u>

6.1. Process of Production : The process of production is completely automatic. A gripping device pulls the wire from the coil through a 5 roller straightening apparatus and pushes it so far forward that just the right amount of wire lies beyond the anvil for the head to be formed. The cramping jaws now close and hold the wire tightly while the hammer forges the nail head. The jaws now open again and the wire with the ready formed head is fed forward as far as is necessary for the length of nail desired .

The jaws now close again and two opposing knives cut off the nail and at the same time form the point. The finished nail is ejected in downward direction by the bottom ejector which is controlled by the movement of the punch. The hammer forms a new head on the already projecting wire end and the cycle begins again.

6.2. Machines and Equipment: The machines and equipment for wire nail production can be ordered from WAFIOS Maschinen Fabrik GMBH and Co. - West Germany . This company has long experience in building machines for this purpose which have proved themselves world wide .

Recently the company has developed N-series Nail Presses , which offer considerably higher rates of output. There is a choice of eight models available from 0.7 to 10 mm. wire thickness and for nails 6.5 to 300 mm. long .

The following are different types of machines that Wafios can supply upon request :

Type	Wire diameter aprox. mm.	Nail Length aprox. mm.	Nails/ Minute
N1	0.7 - 1.4	6.5 - 28	900
N2	0.8 - 1.8	6.5 - 40	800
N3	1.0 - 2.4	10 - 50	700
N4	1.8 - 3.4	13 - 80	550
N5	2.2 - 4.2	13 - 105	430
N6	3.1 - 5.2	13 - 150	370
N8	4.0 - 10.0	50 - 300	150

The following are the machines required for the proposed plant:

a. Heavy-Duty High Speed Wire Nail Press , Model N2.

Working range: Wire diameter abt. 0.8-1.8 mm.

nail lengths abt. 6.5 - 40 mm.

Output : about 800 wire nails per minute .

Price : Machine including :

1 set of tools for a given type of nail and wire diameter.

1 sealed circulating lubrication system.

1 automatic centralized lubrication.

1 horizontal wire straightener with 5 rollers.

Tools and spare parts.

Total Cost: U.S.$ 31,400

b. Heavy-Duty High Speed Wire Nail Press, Model N3

Working range : Wire diameter abt. 1-2.4 mm .

nail lengths abt. 10-50 mm .

Output : about 700 wire nails per minute .

about 570 staples per minute .

Price : machine including :

1 set of tools for a given type of nail and one wire diameter .

1 automatic centralized lubrication .

1 horizontal wire straightener with 5 rollers .

Tools and Spare parts

Total cost : U.S. $ 60,000

c. Heavy-Duty High Speed Wire Nail Press, Model N6

Working range : wire diameters abt. 3.1-5.2 mm .

nail lengths abt. 13-150 mm.

Output: abt. 370 wire nails per minute .

Price : machine including tools and spare parts

Total cost : U.S. $ 72,800

d. Tumbling,Polishing and Scouring Drum, Model PT2.

For cleaning wire nails, cut nails, buckles and other mass-produced articles .

Price : U.S. $35,435

e. Special Cutter Grinding machine, Model MSD 500 For preliminary and finish grinding, as well as regrinding of hardened steel cutting blades for wire nail presses.

Price : U.S. $20,730

f. Recommended Accessories: Dust exhaustor and other equipment,including connecting pipes.

Price : U.S. $4,190

Grand total cost of machines and equipment :

U.S. $ 224,555

6.3. Process Flowsheet : The flowsheet of nails manufacturing is as follows: (Using the symbol ➔ to denote transportation, ◯ to denote operation , □ to denote inspection, D to denote delay and △ to denote storage).

Wire Nails Manufacturing Plant Flowsheet:

Process / Operations	Preparation	Processing	Finished Goods	Control
Raw Materials	⇒			
Carton Boxes			⇒	
Receiving Stations	△			
Inspect Quality				□
Gripping the Coil		0		
Head Formation		0		
Length of Nail		0		
Cost of Nail		0		
Inspection				□
Packaging			0	
Storage			△	
Shipping			⇒	

7. Manpower and Management:

The manpower requirement for the proposed plant is expected to be about 15 persons, for administration, production and service activities. The following is a list of all employees required for the plant's operation :

General Manager	1
Financial Controller & Co-Manager	1
Marketing and Sales	1
Secretary	1
Machine Operators	3

Filling	5
Stores and Handling	3
TOTAL	15 Persons

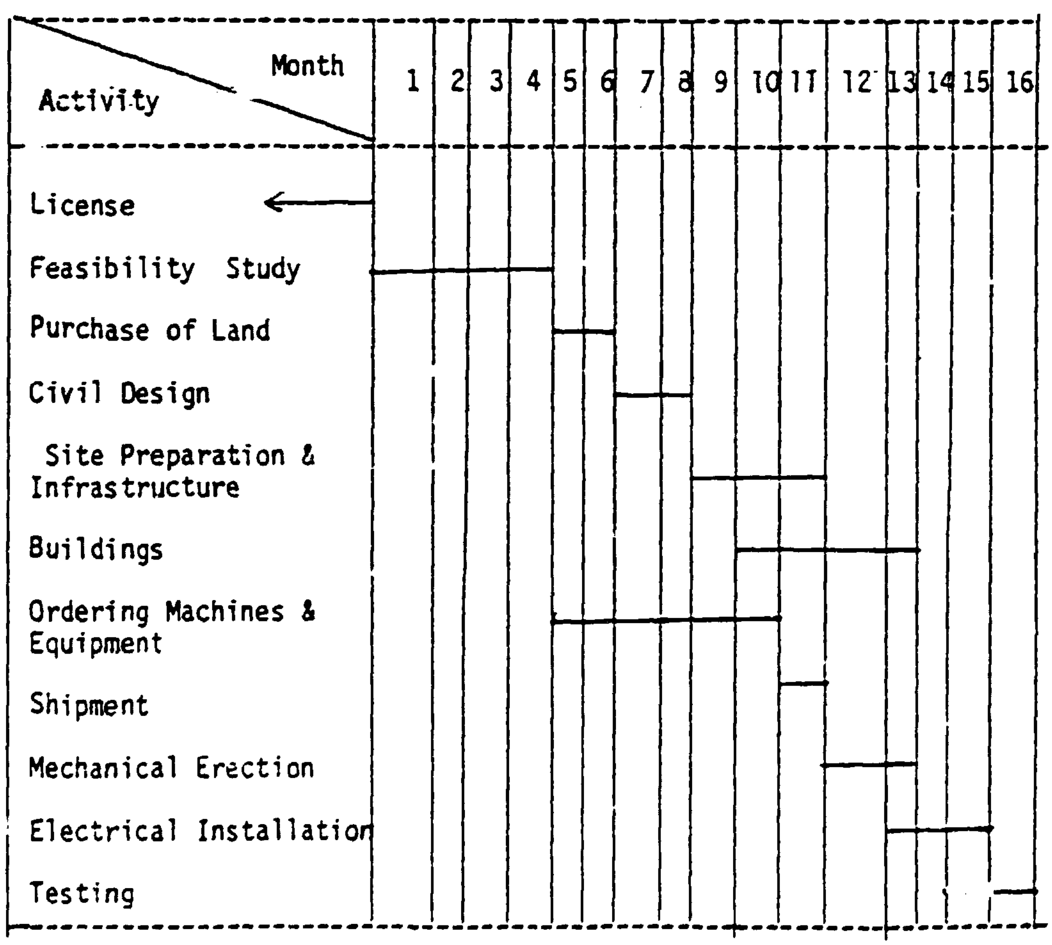
It should be pointed out that semi-skilled labour is sufficient for operating the machines. All kinds of manpower required can easily be recruited from the occupied territories.

The total payroll per year is calculated to be U.S. $63,000.

8. Project Scheduling :

The total period required for the implementation of the project is 16 months.

The various activities, their starting times and respective periods are described in the following chart:



The plant needs two dunums of land in an industrial area. The nail factory should include the following departments:

- Manufacturing room
- Wire store
- Cleaning department
- Packing department
- Wire nail store
- Saw dust stock room
- Tool shop or mechanical workshop
- Electric power room

It is recommended to have the wire store near the nail machines. It is very important that the wire is kept dry and does not rust . It is also recommended to store the wire coil not directly on concrete, but on wood if possible . The estimated cost of land and building is about $ 126,000 of which $ 42,000 is for land.

9. Financial Analysis:

The following calculations are based on the annual figures set out in the previous sections :

9.1. Investment Costs:

Item	Cost(U.S.$)	Economic Life	Salvage value($)
Machines & Equipment	224,555	20 years	33,683
Land & Building	126,000	20 years	56,000
Erection & Installation	28,000	---	---
Working Capital	53,000	---	---
Sub-Total	431,555		89,683
5% unforeseen	21,577		
Grand Total	$ 453,132		$ 89,683

9.2. Production Costs:

Item	Cost($)	Notes
Manpower	63,000	15 x $14 x 300 (day)
Drawn Bright Wire	302,400	900 Tons x $336/ton
Electricity	7,497	90,000 KW. x 8.3 ¢
Packing Material	7,000	
	$ 379,897	

9.3. Annual Revenue:

Total Income = 3 (tons) x 300 (days) x US$ 588/ton = $529,200

9.4. Commercial Profitability:

a. Rate of Return:

Sales Revenue	$ 529,200
Production Cost	- 379,897
	149,303

$$\text{Depreciation} = \frac{\text{Investment Cost - Salvage Value}}{\text{Economic Life}}$$

$$= \frac{400,132 - 89,683}{20} = \$\ 15,522$$

Operating Profit	133,781
38% Corporation Tax	-50,837
Net Profit after tax	82,944

$$\text{Rate of Return} = \frac{\text{Net Profit}}{\text{Total Investment Cost}}$$

$$= \frac{82,944}{453,132} = 18.3\%$$

b. Repayment Period: Determines the number of years that will have to elapse for the invested capital to be recovered out of the net incoming cash flow.

$$\text{Repayment Period} = \frac{\text{Total Investment Cost}}{\text{Net Profit + Interest + Depreciation}}$$

$$= \frac{453,132}{82,944 + 15,522} = 4.6 \text{ years}$$

10. Conclusiors and Recommendations

This proposed project is planned to produce various types of wire nails for construction. The shoe industry and other activities are not considered in the market analysis.

This plant is expected to produce 900 tons of wire nails per year with an annual sales value of U.S.$529,200. The operating profit per employee is expected to be U.S.$8,918 which is the standard value in the industrial sector in the West Bank. The asset ratio per employee is about $30,200, which is less than the standard in the developing countries. The financial analysis indicates that the project is expected to provide an annual operating profit of U.S.$ 133,781 before tax and U.S.$ 82,944 net profit after tax, and to generate a simple rate of return of 18.3% with a repayment periof of 4.6 years.

Based on the above findings we recommend that a feasibility study be carried out, and that consideration be given to the profitability of adding other lines of production to the proposed plant such as fencing, tightening wires and other wire products.

AN OPPORTUNITY STUDY

ON

A POULTRY FARM COMPLEX FOR BREEDING STOCK AND A HATCHERY

Based on the work of Ziad Khalaf,
Hanna Quffa and Oden Shenadeh, UNIDO Experts

1. General Economic Data

1.1. Products Characteristics and Use: Poultry products and meat play an important role in the agro-based industry of the West Bank and Gaza Strip, and are an essential of daily diet. The aim of the proposed project is to supply the West Bank and Gaza Strip of 14% of their need of the following products:

a. One day-old broiler chicks for raising

b. One day-old layer chicks for raising

c. Spent hens and eggs

1.2. Justification for Selecting the Products: The following are the main reasons for selecting the project:

a. Providing Palestinian poultry growers with locally hatched one-day-old broiler and layer chicks of the proper breed(s) at competitive market prices. Such a project, the first of its kind and size in the West Bank and Gaza Strip, will break the Israeli total monopoly of this strategic industry.

b. Although the proposed project is to supply initially around 14% of the local market demand, if successful, it could be expanded and will undoubtedly serve as a nucleus for other similar projects which could eventually lead to self-reliance.

c. The proposed project will have positive effects on a number of agro-based activities, especially on chicken feed processing plants. The Israeli practice of conditional supply of chicks and feed has adversely affected the chicken feed industry in the West Bank and Gaza, and is one of the main reasons why most of the existing plants work at not more than 25% of their production capacities.

d. Enhancing local employment opportunities of both professionals and unskilled laborers.

e. Enhancing knowledge and research in a most basic field.

1.3. Product Specifications: The following lists the specifications and characteristics of both parentstock and commercial stock for both broilers and layer breeds selected for the proposed project:

a. HYPECO Broiler Parentstock:

- Female (Plymouth Rock): White feathered, yellow-skinned.
- Male (Dominant White Cornish): White feathered, yellow skinned.
- Rearing Period: 1-24 weeks

  Mortality Selection: 4 - 6

  Feed Consumption:

1 - 18 weeks	:	6.8 kg/bird
19 - 24 week	:	4.7 kg/bird
Total	:	11.5 kg/bird

- Production Period:

Peak Production	:	83 - 85%
Number of eggs produced per H.H. in 40 weeks	:	170
Number of hatching eggs (over 51 gr) per H.H.	:	162
Hatchability average	:	83 - 84%
Number of broiler chicks produced per H.H.	:	136
Feed consumption during production period	:	40 - 42 kg
Weight at end of production period - females	:	3.4-3.5 kg
males	:	4.5-4.8 kg

b. HYPECO Commercial Broiler:

White feathered, no black spots, with high disease resistance, rapid growth, excellent livability, and low feed conversion rate. Table 1 gives the HYPECO broiler standards.

Table 1: HYPECO BROILER STANDARDS

Age in weeks	Average Live Weight (gr) End of week	Growth/day	Feed intake (gr) Total	per day this week	Total feed conversion
0 - 1	120	-	120	17	-
1 - 2	295	25	420	43	1.43
2 - 3	570	39	880	66	1.54
3 - 4	920	50	1520	91	1.65
4 - 5	1300	54	2300	111	1.77
5 - 6	1690	56	3200	129	1.89
6 - 7	2090	57	4220	146	2.02
7 - 8	2490	57	5350	161	2.15

Above results are obtained under normal housing and management conditions and are based on a feed with a M.E. of 3150 kcal/day.

c. NERA Sexlink Layer Parentstock:

- Female: Barred Rock Type. Grey feathers with white stripes.
- Male : Rhode Island Red Type. Red with some black feathers.

Rearing Period : 1-20 weeks

Mortality and selection : 3 - 5

Feed consumption : 7.9 kg/bird

Female weight at point of lay: 1650 gr.

Production Period: 21-68 weeks:

Mortality and Selection	: 8
Peak Production	: 91%
Number of total eggs produced per H.H.	: 232
Number of hatching eggs produced per H.H. (over 52 gr)	: 194
Hatchability average	: 85%
Number of female chicks per H.H.	: 82
Sexing offspring	: black/barred
Females	: black
Males	: black with white spot on head

d. NERA Sexlink Commercial Layer:

- Mainly black feathers with some red

Feed consumption during rearing period (18 weeks)	:	6100-6200 gr.
Body weight at 13 weeks	:	1500 gr.
Peak production	:	93%
Production in 13 laying months	:	285-295 eggs
Average egg weight	:	64 gr.
Feed conversion in 13 laying months	:	2.40-2.50 kg/feed per kg/eggs
Mortality; rearing period	:	2-3%
laying period	:	0.3-0.6% per month
Shell quality	:	excellent
Egg colour	:	brown
Body weight at end of lay	:	2300-2400 gr.

In addition, the Goldline 54 layer parentstock/commercial, and the Bovans White Leghorn parentstock/commercial are worthy of considering.

Source: HYPECO Poultry Breeders, Nuland, Holland.

2. Market and Demand for Specific Product

2 1. Current and Projected Demand: The West Bank and Gaza Strip with a population of around 1.5 million have an estimated number of layer hens of 365,000 and 24 million broiler chickens are grown annually. Table 2 provides a poultry census and distribution of farms for the West Bank and Gaza Strip.

Table 2: Poultry Census for the West Bank and Gaza Strip, 1987

District	Laying hens No. of Farms	Broiler No. of Farms	Mixed No. of Farms	Total No. of Farms	No. of Laying hens	No. of Broilers/ month
Jenin	6	232	4	242	28500	246150
Nablus (Salfit included)	5	66	3	74	16500	75400
Tulkarm and Qalqilya	9	186	8	203	34800	629200
Ramallah	23	195	4	222	106250	241150
Bethlehem	9	13	1	23	11400	22400
Jericho	-	11	1	12	1000	39000
Hebron	9	215	1	225	18770	269100
Total West Bank	61	918	22	1001	217220	1522400
Total Gaza Strip	7	195	5	147	115000	268334
Total West Bank and Gaza Strip	68	1113	27	1148	332220	1790733

Sources: Agricultural Departments in the West Bank and Gaza Strip

Veterinary Department, Ramallah

There are more than 500 specialized shops in the West Bank and Gaza Strip where chickens are slaughtered and sold directly to customers, and about 1800 outfits where eggs are sold.

Based on available data and results of the market study the following are concluded:

a. Based on a conservative estimate, each layer hen of the present local stock produces 190 eggs annually. Therefore, the total local annual production of eggs is estimated at 69.40 million eggs, of which 47.50 million eggs in the West Bank and 21.90 million eggs in Gaza Strip.

b. The total annual local consumption of eggs is estimated at 125 million; 81 million eggs of which are consumed in the West Bank (for a per capita annual consumption of 91 eggs), and 44 million eggs consumed in the Gaza Strip (for a per capita annual consumption of 67.59 eggs).

c. The shortage is 55.60 million eggs annually, which is totally bought from Israel and constitutes 44.4% of the total local production.

d. On the average broilers are slaughtered when 6 weeks old at 1.7 kg total weight , 50% of which is meat. Therefore, the annual local production of poultry meat is estimated at 20,595 tons, of which 16,965 tons of poultry meat are produced in West Bank and 3,630 tons in Gaza Strip .

e. The total annual consumption of poultry meat is estimated at 31,340 tons, 21,330 tons of which are consumed in the West Bank (for a per capita consumption of 23.7 kg), and 10,010 tons consumed in the Gaza Strip (for a per capita consumption of 15.4 kg).

f. The annual shortage is 10,745 tons of poultry meat, which is bought from Israel and constitutes 34% of total local consumption.

g. Almost 100% of one-day-old broiler and layer commercial chicks are bought from Israel.

h. The projected market demand for both eggs and poultry meat is expected to increase at an annual rate of 10% based on demographic, social, and economic factors .

2.2. Sales Programme and Sales Revenue: With full capacity operation the proposed project is expected to produce 2.65 million one-day-old commercial broiler chicks and 200,000 one day-old commercial laying chicks annually. Table 3 gives the main sources of revenue for the proposed project.

Table 3: Estimated Sales Revenue

Product Type	Price $/unit	Expected Quantity to be produced annually	Expected Revenues $
1. One day-old broiler	0.50	2,648,635	1,324,318
2. One day-old laying chicks	1.10	199,863	219,850
3. Table eggs-broiler	0.05	248,380	12,419
4. Table eggs-layer	0.06	129,533	7,772
5. Spent hens-kg.broiler	1.00	75,553	75,553
6. Spent hens-kg. layer	0.80	7,892	6,314
7. Chicken feces - ton fertilizer	8	1,561	12,488
Total Revenue ($)			1,658,714

3. Plant Capacity

The proposed project is an integrated complex of four farms each designed to accommodate 7700 female and 1155 male broiler parent-stock; 1210 female and 145 male layer parent-stock. Extension is possible to accommodate a greater number. The proposed hatchery is selected to produce 2.65 million one-day-old broiler chicks and 200,000 one day-old female layer chicks annually. Design and construction is such that an extension to accommodate twice the initial proposed production is possible.

4. Supply of Raw Material and Other Input

4.1. Raw Material, Availability and Source: The basic raw materials needed are feed which is locally available; one day-old parent stock which is available from Holland and other countries; chemicals, vaccines, medication, and disinfectants which are available from Israel. Table 4 gives the quantities needed annually, prices, and sources of raw materials required.

Table 4: Raw Materials Requirements

Raw Material	Unit Price $	Quantity required annually	Annual Expenditure $	Source
Rearing Period Feed - layer	390/ton	36.98	14422	local
Rearing Period Feed - Broiler	370/ton	305.91	113187	local
Production period feed - layer	370/ton	141.19	52240	local
Production period feed - broiler	320/ton	1112.38	355962	local
Vaccines, medication, and disinfectants for farms	0.40/H.H	24754	9901	Israel
Hatchery/disinfectant	2/liter	350	700	Israel
Hatchery/vaccine	5/1000 dose	2,800,000 dose	14000	Israel
Hatchery/IB/ND/FP	20/1000 dose	200,000 dose	4000	Israel
Hatchery/formeldehyde	3/kg	500	1500	Israel
Hatchery/cleansers			800	local
One day-old chicks-layer	5/chick	4800	24000	Holland
One day-old chicks-broiler	3.25/chick	30800	100100	Holland
Wood shavings	1/m^2	1200	1200	local
Total Expenditure Annually			$ 692012	

4.2. Utilities: Electric power supply in 3-phase for the hatchery and in 1-phase for the farms is available locally from the Jerusalem District Power Company. Water, fuel, and gas are also available locally. Table 5 gives a listing of utilities requirements and expected annual expenditure.

Table 5: Utilities Requirements and Expenditure

Utility	Unit price $	Annual quantity	Annual expenditure $
Water - farms	$0.50/m^3$	8605	4200
Water - hatchery	$0.50/m^3$	1500	750
Fuel - farms	0.40/liter	11900	4760
Fuel - hatchery	0.40/liter	25000	10000
Electricity - farms	0.10/KW	64170	6417
Electricity - hatchery	0.10/KW	130000	13000
Gas	0.901/Kg	4580	4122
Total Expenditure			$43249

5. Approximate Location and Site

Ramallah district is the suggested location of the proposed project for the following reasons:

a. Central location

b. Availability of utilities, and a sewerage system in Ramalla h

d. Availability of labour

e. The existence of a poultry growers' cooperative.

Specific farm sites must submit to the following criteria:

a. Four individual farm sites are required

b. A minimum of ½ km should separate the sites from each other

c. A minimum of 1 km should exist between each farm site and any other poultry farm and household with rural poultry

d. A minimum of 250 m between each farm site and any major road

e. The hatchery site should ensure that no other hatchery, poultry farm and household raising poultry exists in a 1 km radius

Guarantees that no infringment of the aforementioned criteria should be obtained from Ramallah municipality, the village council where the specific farm sites are to be built, and the planning council

6. Project Engineering

6.1. Process and Technology: The process involved in the proposed project is one of raising broiler and layer parent-stock of the proper breed; eggs collection, transporting, grading and selection; incubation and hatching, followed by sale of commercial one day-old broiler and layer chicks.

The process and technology involved maybe divided into two categories:

a. Farm process and technology: where the parent-stock flock is received one day-old or more, placed in the sanitized farm, which consists of four different sections, three of which are for housing broiler parent-stock, and one section for housing layer parent-stock. Each two sections have their own service and observation room. Each farm has the capacity to house 8855 broiler parent-stock (7700 female / 1155 male) distributed equally in three sections, and 1355 layer parent-stock (1210 female / 145 male) housed in the fourth section. Each section should be equipped with an automatic egg collection system, an automatic feeding system, and a drinking water distribution system. Each broiler parent-stock section should have 1923 laying nests and each layer parent-stock section should have 303 laying nests. The stocking of the farms should be done with a 17 weeks intermittent period, i.e., if farm A is stocked at the beginning of week 1, then farm B should be stocked 17 weeks later, and farm C should be stocked at the end of week 34. This will ensure an intermittent no-bird period of four weeks for each farm to assure proper cleaning , sanitization and maintenance.

b. Hatchery process and technology: The basic hatchery process includes the following steps:

Step 1 - Receiving

Step 2 - Grading and selection

Step 3 - Storing in special trays

Step 4 - Fumigation

Step 5 - Cool storage

Step 6 - Hatching

Step 7 - Grading of chicks

Step 8 - Loading and dispatching

The flow of eggs in the hatchery building should be in one direction, swinging doors with a view window should be used between different sections. The incubator and hatching machine should be equipped with automatic temperature and humidity control mechanisms ensuring a temperature range of 21-25°C and a relative humidity range of 55-60%. Total capacity recommended is 269,500 hatching eggs per month. A positive air pressure of 0.02-0.03 spwg is recommended the incubator and hatcher room.

The egg storage room should be equipped with temperature and humidity control mechanisms, such that a temperature range of 12-18°C and 70% humidity could be maintained.

6.2. Machines and Equipment: The following is a list of the machinery and equipment required for the proposed project and their estimated cost.

a. Farm equipment and machinery: Table 6 lists the equipment and machinery required on each farm.

Table 6: Farm equipment and machinery

Item	Estimated Cost in U.S.$
Automatic feeding system	20,000
Feed silo (12 m^3 capacity)	7,000
Drinking water system	8,000
Gas heaters system	5,000
Air conditioning system	15,000
Humidity control system	7,500
Lighting system	4,000
Laying nests (¼ laying hens)	15,000
Egg collection system	6,000
Incinerator	1,000
Stand-by electric power generator	10,000
Water tank	10,000
Total/farm	$ 108,500
Total (4 farms)	$ 434,000

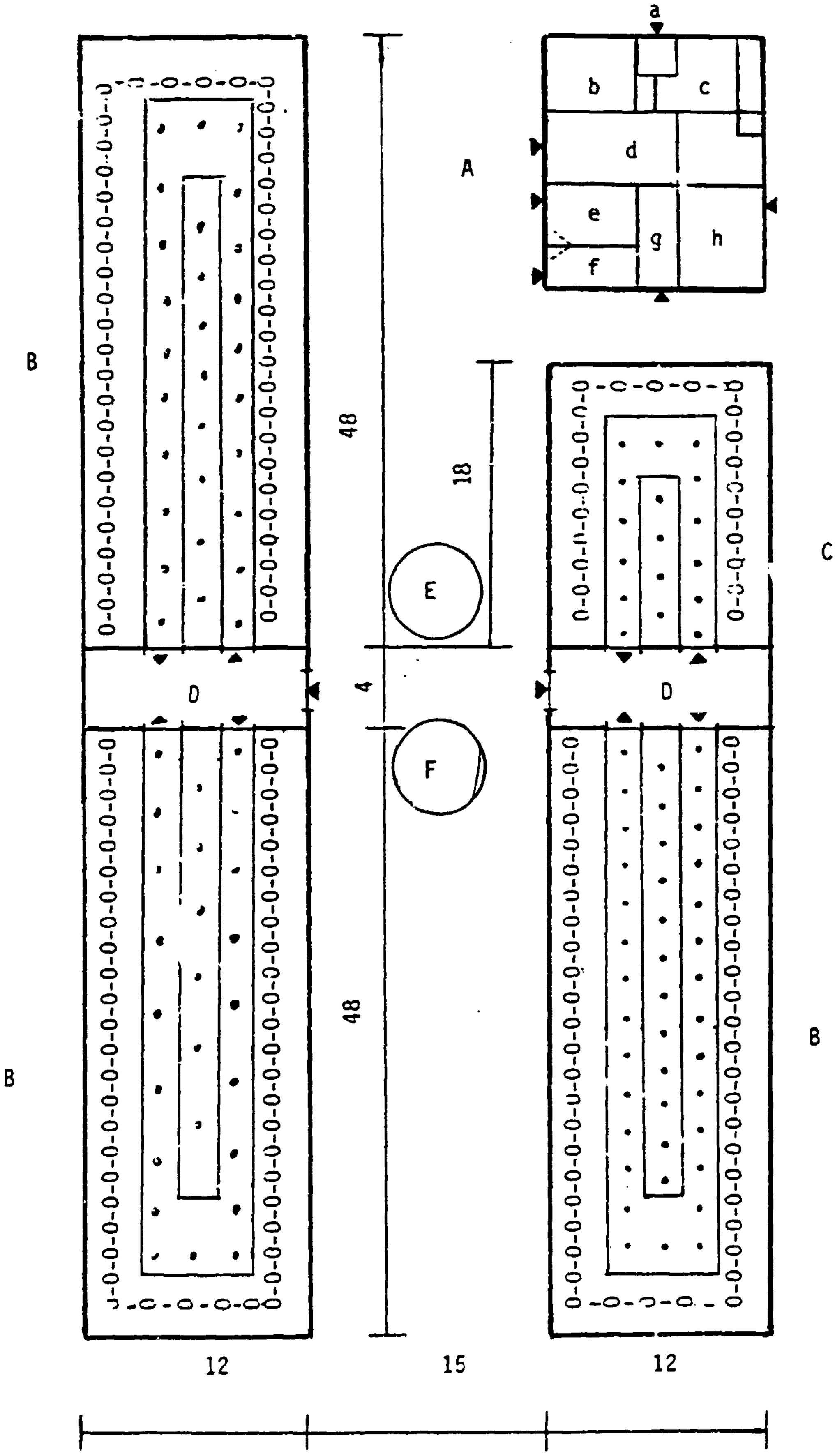
b. Hatchery equipment and machinery: Table 7 lists the equipment and machinery required for the hatchery.

Table 7: Hatchery equipment and machinery

Item	Estimated cost in U.S.$
Incubator and hatcher machine	187,500
Chiller unit	15,000
Building A/C, heating and humidity control system	80,000
Stand-by electric power generator	12,000
Laboratory equipment	100,000
Transportation vehicles	40,000
Spare parts and miscellaneous	37,500
Total	$ 472,000
Total 4 farms and Hatchery	$ 906,000

6.3. Plant Layout: The following are preliminary suggested layouts for a typical farm and the hatchery.

Fig. 1: Typical Farm Layout



Farm Layout-Key

A. Utility Building (116 m^2)

a: main entrance

b: showers/bathrooms/dressing room (women)

c: showers/bathrooms/dressing room (men)

d: office and canteen

e: egg storage room

f: egg fumigation room

g: storage

h: generator room

B. Broiler parentstock section

C. Layer parentstock section

D. Service and observation room

E. Water tank

F. Feed storage silo

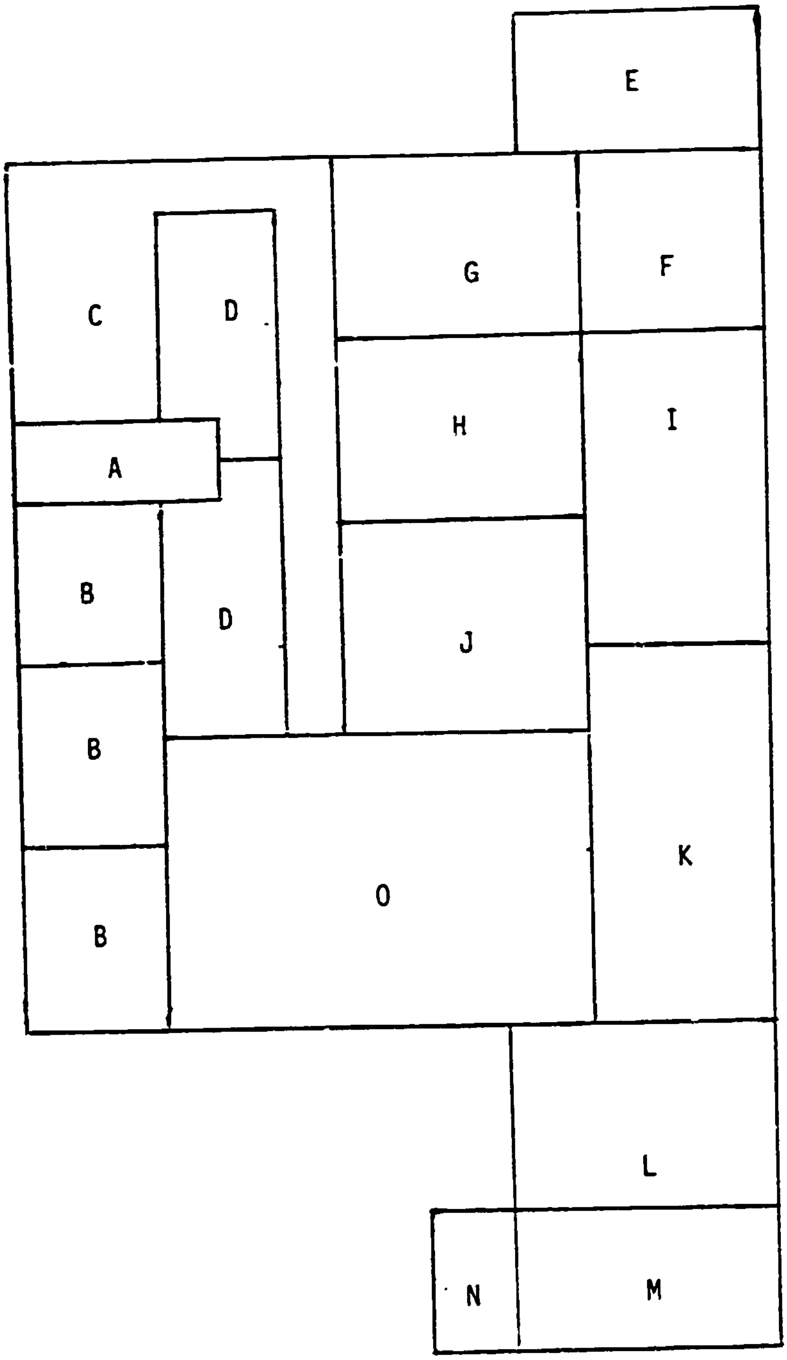
----. Egg collection system

____. Feeding system

..... Drinking water system

oooo. Laying nests

Fig. 2: Hatchery Layout



A: Entrance

B: Administration and Management

C: Canteen

D: Showers/Bathrooms

E: Loading dock

F: Receiver room

G: Grading

H: Storage (in trays)

I: Fumigation room

J: Setter room

K: Hatcher

L: Chick grading room

M: Chick dispatch room

N: Unloading dock

O: Laboratory

7. Manpower and Management

The proposed project will employ 41 people. Table 8 gives the employment category and the expected salaries.

Table 8: Employment and Salaries

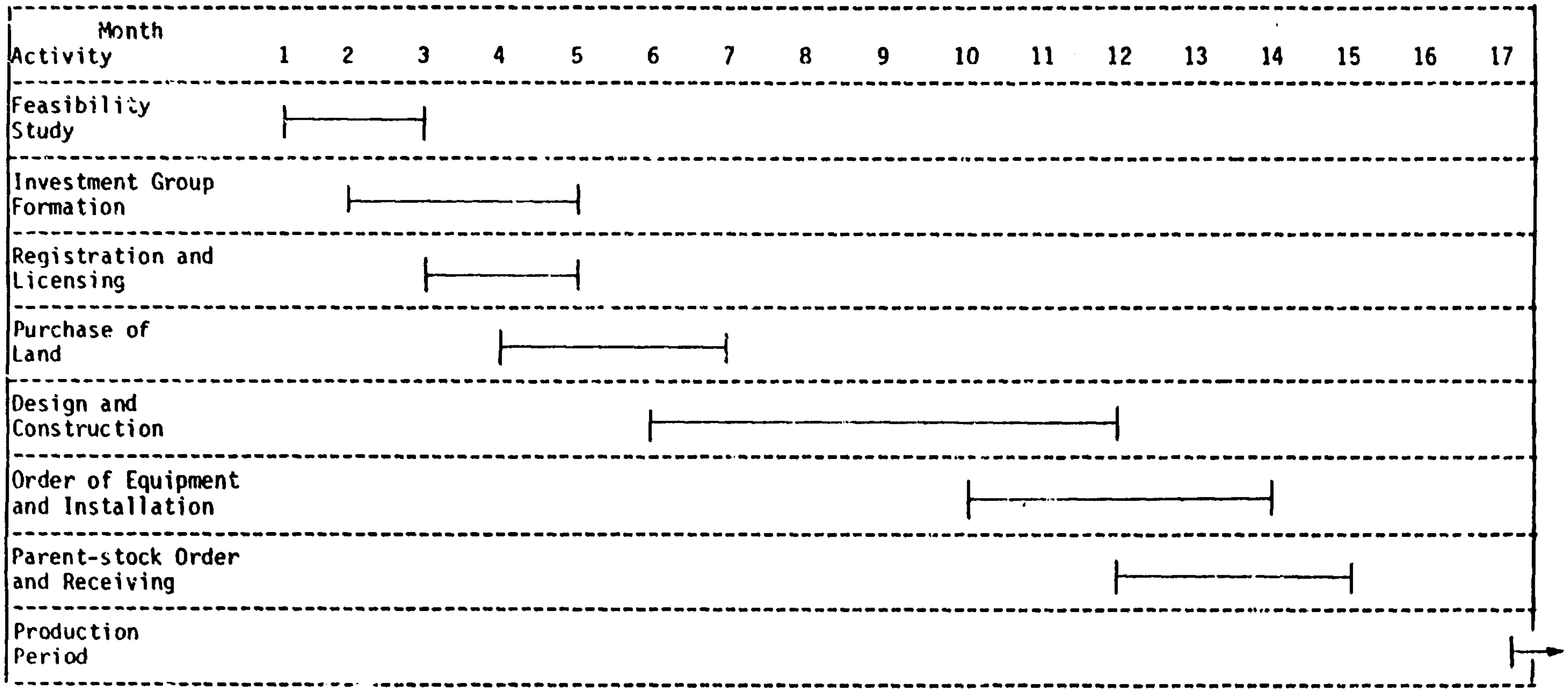
Employment Category	Number	Expected Salary (monthly) in US$
General Manager	1	1000
Technical Manager	1	800
Department Manager	7	650
Accountant	1	600
Office Clerk	1	400
Skilled Labor	6	500
Unskilled Labor	14	400
Electrician	1	600
Driver	2	500
Watchman	5	400
Lab Technician	2	600

The total expected annual salaries to be paid is 249,000 dollars.

8. Project Scheduling

The total period required for the implementation of the project is 12 months. The various activities, their respective periods are described in the following table:

Table 9: Project Scheduling Chart



9. Financial Analysis

The financial analysis for the proposed project is based on estimates of revenues from section two and estimates of total investment cost and production costs which follow:

9.1. Investment Costs: The total investment for the proposed project appears below in Table 10:

Table 10: Investment Costs

Working Capital	$ 308,000
Buildings	614,700
Machinery and Equipment	906,000
Land	4,500
Organizational Costs	30,000
Total	$ 1,863,200

Working capital includes the cost of two flocks of parent-stock chicks, feed for seven months, in addition to salaries and safety cash.

Buildings are composed of several types: (1) Farmhouses 7775 m^2 at a cost of $60/$m^2$; (2) Utility building 384 m^2 at a cost of $110/$m^2$; (3) Hatchery 706 m^2 at a cost of $150/$m^2$

9.2. Financing: The best form of business for the proposed plant is that of a cooperative. Cooperatives are hard to establish due to existing regulations in the West Bank. A private corporation under articles of Jordan Corporations Law 1964 will be established. Capital will be raised through issuance of capital stock to farmers. This will approximate a cooperative business form where the market is guaranteed for the project and the farmers will benefit from the project as shareholders and customers .

9.3. Production Cost and Other Expenses : The cost of production and other period costs and expenses for the proposed project appear below in Table II .

Table II : Production Costs and Other Expenses

			As A % of cost	As A% of Revenue
Raw Materials (parent-stock, vaccine, mediction cleansers, feed)		$ 692,012	60.7%	41.72%
Labor		249,000	21.8%	15.01%
Other costs (utilities selling and administrative expenses etc.)*		76,423	6.7%	4.61%
Depreciation and amortization :				
Building @ 5%	30,735			
Equipment @ 10%	89,850			
Organizational Cost @ 10%	3,000	123,585	10.8%	7.45%
Total =		$ 1,141,020-	100%	68.79%

* Was calculated as total cost of utilities and a 2% of total revenues for selling administrative and other expenses.

9.4. Commercial Profitability : In order to calculate commercial profitability, a condensed forecasted income statement appears below in Table 12.

Table 12 : Condensed Forecasted Income Statement

		% of Revenue
Revenue (Table 3)	$ 1,658,714	100%
Costs and Expenses(Table II)	1 141,020	68.79%
	517,694	31.21%
Net Profit Before Tax		
Tax Expense @ 38.5%	199,312	
Net Profit After Tax	$ 318,382	19.19%

9.4.1. Rate of Return : The simple rate of return will be calculated as follows :

$$\text{Rate of Return} = \frac{\text{Net Profit After Tax}}{\text{Total Investment}}$$

$$= \frac{318,382}{1,863,200}$$

$$= 17.09\%$$

An alternative way to calculate rate of return would be to use a Dupont system which combines profit margin and total asset turnover ratio thus :

$$\text{Rate of Return} = \frac{\text{Net Profit After Tax}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total Investment}}$$

$$= \frac{318,382}{1,658,714} \times \frac{1,658,714}{1,863,200}$$

$$= 19.19\% \times 0.89 \text{ times}$$

$$= 17.09\ \%$$

9.4.2. Pay Back : The estimated average amount of time required to recover the total investment for the proposed project can be calculated as follows :

$$\text{Pay Back} = \frac{\text{Total Investment}}{\text{Net Profit After Tax + Depreciation}}$$

$$= \frac{1,863,200}{318,382 + 123,585}$$

$$= \frac{1,863,200}{441,967}$$

$$= 4.22 \text{ years}$$

Thus total investment can be recovered by 4 years and 3 months.

Conclusion

Considering the total dependence of our poultry growers on Israeli suppliers of commercial one-day-old broiler and layer chicks; the strategic importance of this sector of industry; and based on the results of the primary analysis which shows a rate of return on investment of 17.09% and a payback period of 4.22 years. We recommend that a feasibility study for further more comprehensive investigation should be carried out.

AN OPPORTUNITY STUDY

ON

A RECYCLING FACTORY OF AUTOMOBILE TIRES

Based on the work of Dr. Nidal R. Sabri, UNIDO Expert

1. General Economic Data

1.1. Product Characteristics and Uses: This project is aimed at retreading the worn-out tires. Today, the vehicle's tire is a long lasting product with a high cost that ranges from $40 to $365 per tire according to its size. Therefore, it is worth to re-process the tire once it is worn out, especially that the recycling tire business is now so precise, and a tough retread tire can be produced exactly as the original. The tire business is growing very vast since the cost of tires represents a substantial share of the cost of having a private car. The same applies to commercial and agricultural transportation operations, including running of taxis, buses, trucks and tractors. In the occupied Palestinian territories, the only means of transportation which are available for goods and passengers are taxis, buses and trucks.

1.2. Justification for Selecting the Product: The annual demand for tires of all kinds of vehicles in the occupied Palestinian territories has been increasing very rapidly. For example, the number of vehicles in the area increased from 6,200 vehicles in 1970 to 37,844 vehicles in 1980 and to 72,254 vehicles in 1985 and 81,400 vehicles in 1987. This means that the number of vehicles has multiplied 12 times (1165%) in 15 years, with an annual average increase of 30% in the last five years. These figures include private as well as commercial cars including buses, trucks and tractors. However, the number of taxis has not increased in the last fifteen years, while buses have not increased since 1980.

1.3. The annual cost of tires for both the West Bank and Gaza Strip is about $9.2 million a year. All of these tires are either imported from Israel or from foreign countries through Israel.

1.4. A tire recycling factory is so proper for underdeveloped countries, since it has low-scale of production, needs no high sophisticated technology and valuable products can be reproduced from waste materials, i.e., a worn out tire can become a valuable commodity instead of being discarded.

1.5. A good shape rolling tire improves the ratio of fuel consumption as well as reduces traffic accidents. Therefore, this proposed project has social and economic benefits as well as environmental advantages. A worn-out tire can be recycled at a price that ranges from 35% to 50% of the brand new tire.

2. Market and Demand

2.1. A market survey has shown that the need for tires by private cars as well as commercial taxis, buses, trucks and tractors has been increasing very rapidly. It has also indicated that there are about 81,450 vehicles of all types in both the West Bank and Gaza Strip. About 70% of these vehicles represent private cars, while 21% represent trucks and the remaining 9% represent commercial buses, taxis and tractors. The consumption of tires depends highly on the number of miles travelled by the car, the conditions of the roads and the quality of tires. However, it has been estimated (in this study) that a private car consumes an average of one tire a year, light trucks consume an average of 1.5 tires a year, and taxis, heavy trucks and buses which have 6 wheels or more consume an average of 2 tires a year.

2.2. Considering the number of each type of vehicle which are now in use in the West Bank and Gaza Strip, the current demand for tires is as shown in the following table: (next page)

2.3. The study indicates that there is a demand for about 95,000 tires valued at 9.2 million dollars based on the average wholesale prices of both Israeli and foreign products.

2.4. There is no chance for exporting to foreign markets due to the recycling products characteristics as well as the fact that raw materials, which are the worn-out tires,are originally imported.

2.5. The demand for vehicle tires is increasing rapidly. All the tires used in the occupied Palestinian territories are either foreign or Israeli tires. However, there is a small old plant for tire recycling which produces only 2% of the total local market demand.

2.6. Sales Program and Sales Revenue: Based on the market survey, findings have indicated that the recycled tires are accepted by about 40% to 60% of the customers if the products are durable and the retail prices are not more than 50% of the brand new tire price. Therefore, the sales program of the project is expected to be around 40% share of the local market needs. Accordingly, the annual sales program of the proposed plant may be stated as follows: (on page 5).

Demand for Tires in 1987

Type	Size Cross-Sectional Width	Number of Vehicles	Annual Local Market Need (in tires)	Average Wholesaling Price/New Brand	Total Value
Private Cars	145-12 155-12 145-13 155-13 165-13 155-14 165-14	57,100	57,100*	$ 40.00 45.00 50.00 55.00 60.00 65.00 70.00	$ 3,140,500
Taxis	185-15	1,700	3,400***	$ 75.00	255,000
Light Trucks	700-15 750-15 700-16 900-20	17,000	25,500**	$ 105.00 110.00 150.00 175.00	3,442,5C0
Heavy Trucks	1200-24	400	800***	$ 330.00	264,000
Buses	1100-20 1100-22	650	1,300***	$ 210.00 230.00	286,000
Tractors-Front Tractors-Back	750-16 28-13 28-12	4,600	6,900**	$ 175.00 248.00 365.00	1,812,000
Total		81,450	95,000		9,200,000

Average: *1 tire a year **1.5 tires a year ***2 tires a year

Annual sales program of the proposed plant

Type	Sizes	Estimated Quantity (Tires)	Competitive Wholesale Average Price	Total Value ($)
Private Cars	145-12, 155-12, 145-13, 155-13, 165-13, 155-14, 165-14	15,000	$ 36	$ 540,000
Taxis	185-15	2,000	42	84,000
Light Trucks	700-15, 750-15, 700-16, 900-20	16,000	65	1,040,000
Heavy Trucks	1200-24	800	130	104,000
Buses	1100-20, 1100-22	800	100	80,000
Tractors	750-16 (Front) 28-13 (Back) 28-12 (Back)	2,100	120	252,000
Total		36,700		$ 2,100,000

2.7. The sales revenue is expected to be $2,100,000 annually as shown above.

3. Plant Capacity

3.1. The suggested plant is expected to retread 36,700 tires a year, i.e., 118 tires a day or 14 tires per hour.

3.2. Considering the fact that the average size for a private car tire needs about 50 minutes to be processed in the main machine (The Curing Machine) and that the large size tire needs about two hours, then this means that seven curing machines for private car tires and ten curing machines for large truck tires are needed to meet the daily demand.

4. Supply of Raw Materials and Other Inputs

4.1. Raw Materials: The raw materials required for the suggested plant are worn-out (slick) tires: Every new tire purchased will become one day a worn-out tire to be disposed. Therefore, if 95,000 new tires are needed each year by the local market this means that there are about 95,000 discarded tires a year or about three times the planned needs for the proposed project. The cost of the worn-out tire ranges from $5 up to $30. The proposed factory will buy worn-out tires from special contractors or collect them from the tire workshops.

4.2. Tread Rubber: is also known as camelback and it is the rubber which is applied to the slick tire to replace the worn-out tread. This may be purchased in premeasured widths with an average cost of $4 per piece for private cars up to $40 per piece for large cars. This material should be imported. The tread rubber weighs from 3.5 kg up to 30 kg. The weight of the tread rubber should be equal to the difference between the buffed and the new tire.

4.3. Cement: The cost of cement is about $30 per gallon.

4.4. Other indirect materials such as bandages, solvent materials, fuel oil for operating two boilers, lubricants, cleaning materials, and other factory supplies.

4.5. The average cost of raw materials including worn-out tires, tread rubbers, cement and others for the tire is estimated to be 42% of the total cost of production and period expenses.

4.6. Materials and Products Losses: Some of the purchased worn-out tires are expected to be discarded because of either nail holes or broken beads, especially when the purchase is made through contractors.

Therefore, a careful inspection should be conducted before starting the operations. In addition, there is also a possibility of discarding the tire after being retreaded for possible ply separation or any other defects.

5. <u>Location and Site</u>

5.1. There is no definite location for the proposed project to be recommended; however, it will be very proper to select that location in one of the industrial areas of the major cities, e.g., in the Jerusalem district or in Gaza City, in order to be close to the tire workshops which are going to supply the proposed factory with the worn-out tires.

6. <u>Project Engineering</u>

6.1. Process and Technology: The retreading of vehicle tires may be classified into three major processes: First, preparing the tire for retreading. Second, processing and third, finishing.

6.2. Preparing the tire for retreading: This preliminary operation constitutes half the total operation of recycling the tire. As a first step, each worn-out tire is checked in order to decide whether it is proper to recycle it or discard it. To be recycled the worn-out tire should have no holes, no nails, no broken beads, or ply separation. However, tires with minor holes may be repaired before further processing. The second step in this process is the buffing operation. Every tire should be buffed to a certain level in order to remove the worn-out tread. This buffing operation needs high skills, since the tire should become a straight slick surface, and therefore, should be scaled before cementing the new rubber.

6.3. The Processing Operations: The major processing operations include the following steps:

* Cementing the slick tire surface
* Applying the new tread rubber (camelback), in a warm condition, to the tire tread as well as to the tire walls. The tread rubber pieces should be perfectly adhered to the tire.
* Scaling the processed tire once again.
* Curing the processed tire using the needed pattern and the proper machine according to the size of the tire. In this process the tire is reformed using very high pressure and heat for a range of time of 30 minutes up to 2 hours.

6.4. The Finishing Process: The finished processed tires should be inflated and inspected carefully then, marked and transferred to the warehouse.

6.5. To meet the capacity of 36,700 tires per year as stated in paragraph 3.1, the proposed project needs the following production, auxiliary and service equipment.

6.6. The production equipment (all to be imported):

Item Description	Quantity
Inspection worn-out tire equipment	2
Buffing tire machine	3
Cementing tire equipment	2
Building tire equipment	2
Curing tire machine (private cars size)	7
Curing tire machine (large size)	10
Inspection finished tire equipment	2

6.7. The needed auxiliary equipment for the proposed project is:

* Generating plant for steam (boiler) 2

* Compressed air	1
* Trucks	3
* Fork lifts	2
* Emergency power equipment	1
* Tire shapes (different sizes and tread patterns)	24

6.8. The service equipment that are needed for the proposed project are expected to be as follows:

* Storage and warehouse shelves for worn-out tires and finished products.
* Electricity fixtures.
* Compressed air fixtures.
* Cold water fixtures.
* Steam fixtures.
* Other furniture
* Large scale (for tires).
* Plant security fixtures and equipment.

6.9. The Flow Sheet for Production: The major processes and suboperation of recycling vehicle tires may be stated for the proposed project as follows:

(the following symbols are used: ⇨ transportation, ○ operation, □ inspection, D delay, △ storage)

Operations \ Processes	Preparing the Tire	Processing	Finishing	Warehousing
Purchasing △	⇨			△
Inspecting	□⇨			
Buffing	○ ↓			
Scaling	○ ⇨	D		
Cementing		○		
Applying New Rubber		○		
Building		○		
Waiting		D		
Curing		○ D ⇨	△	
Inflating			○	
Final Inspection			□	
Transfer to Warehouse			⇨	△

7. <u>Manpower and Management</u>

7.1. The time required for processing varies with the size of the tire. In general, the small tire of a private car needs 30 minutes in the curing machine and a total of 1.5 hours in the other operation (buffing, cementing, building and inspecting). While, the light truck tires need 150% of the labor time of the small tires,and the tires of buses and trucks need 250% of the labor time of the small tires,and those of the tractors need 350%.

7.2. The average standard labor cost per tire is estimated to be $7 for a private car tire up to $25 for a tractor tire.

7.3. The manpower for the proposed plant is estimated to be 65 employees distributed as follows:

Operations	Characteristic	Labor Required
Handling materials and other unskilled labor	unskilled	6
Inspecting and buffing	skilled	10
Cementing and building	skilled	12
Curing	skilled	20
Final inspection	skilled	3
Service and maintenance centers	skilled	5
Supervisors		2
Marketing		3
Administration and Finance		4
Total Production Labor, Marketing and Administrative Staff		65

7.4. It is recommended that the workers who will be working in the buffing, cementing, building and curing operations be trained.

8. Project Scheduling and Construction Periods

8.1. The scheduling and construction periods may be estimated as follows:

Activities	Time (18 months)																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Establishing of founders group	o																	
Apply for registration & get a licence	o	o	o															
Open a bank account			o															
Collect instalment Shares as stated				o			o			o			o			o		o
Primary communications with tires suppliers					o													
Primary communications with tires workshops					o													
Land purchase				o	o													
Design & draw blue prints					o	o	o											
Get permits for building							o	o										
Building & civil works								o	o	o	o	o	o					
Design factory layout													o	o				
Arrangements for technology supply													o	o				
Tendering														o	o			
Evaluation of Bids															o	o		
Select equipment																o		
Get licence to import																o	o	o
Install equipment																		o
Test the system																		o
Set up management																	o	o
Arrangements for training																	o	o
Arrangements for supplies																	o	o
Arrangements for marketing																	o	o

8.2. The above estimation of time tables for construction assume no obstacles, objections and/or delays from the occupation authorities with regard to registration, licence for building and importing of equipment .

9. Financial Analysis

9.1. This suggested project is expected to have low capital requirements. The estimated figures are as follows:

- Land	$ 100,000
- Building and fixtures	400,000
- Production Equipment	650,000
- Auxiliary Equipment	250,000
- Organizing costs and licence	30,000
- Working capital	70,000
Total Investment	$ 1,500,000

Most of the desired equipment is to be imported from Germany or from the U.S.A. However, some of the auxiliary and service equipment may be manufactured locally.

9.2. Financing: According to the above data a total of $1.5 millions are needed to finance the suggested project. It is recommended that a private or public corporation be established to carry out this project with a par value of $15 per share.

Founder stockholders	10%	$ 150,000
Other stockholders	90%	1,350,000
Total Owner Equity		$ 1,500,000

9.3. Other external sources of funds such as short and long term loans may be used further in order to finance any possible developments of the project capacity, or credit policy.

9.4. However, a cooperative entity may be considered instead of a corporation, if this project is to be established by tire workshop owners. In this case the factory will retread the tires offered by customers who are the cooperative members.

9.5. Production and Other Costs: The total annual production cost for the recycling of 36,700 tires of different sizes as stated in the proposed sales program, and the periodical administrative and marketing expenses for the proposed project may be estimated as follows:

I. Production Costs:	Ratio %	$ Value
1. Direct Materials:		
- worn-out tires	14.3%	244,000
- tread rubber	23.5%	400,000
2. Direct Labor	25.9%	440,000
3. Factory Overhead:		
- Indirect materials e.g., cement, solvent and other materials	4.7%	80,000
- Depreciation and amortization (10% of plant assets other than land and 20% of organization costs)	8.0%	136,000
- Other factory costs (semivariable costs)	7.4%	125,000
Total Production Costs		1,425,000
II. Marketing, Selling and Administrative Expenses:		
- Fixed Administrative and Marketing	10.0%	170,000
- Marketing Variable (5% of Sales Value)	6.2%	105,000
Total Production, Marketing, Selling and Administrative (period) expenses	100%	1,700,000

9.6. The raw materials of processing tires represent about 42.5% of total expected production cost and period expenses and about 34.4% of the total expected sales revenue. Direct labor is expected to be 25.9% of the total expected production and administration cost and about 20.9% of the total sales value. The total production cost is expected to be about 68% of the total expected sales value which will generate a gross profit of 32%, while the total production and periodical costs is expected to be about 81% of the expected total sales value which will generate a net profit ratio of 19% after taxes.

9.7. Commercial Profitability: Based on the estimated data related to total investment costs, sources of financing and the annual production and periodical costs, the following financial analysis may be concluded. Considering the fact that the income tax rate in the area is about 38%, then the after tax net profit may be computed as follows:

	Ratio	Amount ($)
Estimated Sales	100%	$ 2,100,000
− Production and Periodical Costs	81%	1,700,000
= Profit before taxes	19%	$ 400,000
− Income taxes (38%)	7.2%	152,000
= Net Profit after taxes	11.8%	$ 248,000

9.8. The simple Rate of Return for the proposed project may be calculated by dividing the net profit after taxes over the total investment value (equivalent to total assets) i.e.,

$$\frac{248,000}{1,500,000} = 16.5\%$$

Or, it may be calculated using the Du Pont system i.e., by multiplying the net profit ratio by the total investment turnover, as follows:

$$\frac{248,000}{2,100,000} \times \frac{2,100,000}{1,500,000} =$$

$$11.8\% \times 1.4.\ \text{times} = 16.5\%$$

9.9. Payback Period: the payback period for this investment may be calculated as follows:

$$\frac{\text{Total Investment}}{\text{Net Profit after taxes + Depreciation (noncash cost)}} = \frac{1,500,000}{248,000 + 136,000} = 3.9\ \text{years}$$

10. <u>Conclusions and Recommendations</u>

10.1. This proposal is related to a recycling industrial project which aims to reprocess (retread) automobile tires for local use by private cars, commercial taxis and buses, trucks and tractors, and which cost more than 2.1 million dollars to meet the local demand of these tires. The proposal is aimed to recycle (retread) one third of the worn-out tires which is about 36,700 tires of different sizes. This may meet a substantial part of the needed tires which will reduce the imported value of the tires needed by the local market. Moreover, the prices of the produced tires will be reduced by about 40% - 50% and will have the same mileage service as that of the original (new brand) tires if processed properly.

10.2. This project will add value to the worn-out tires which after being processed will have an average price from $36 to $130 per tire.

10.3. The preliminary financial analysis indicated that the annual sales revenue from the project is expected to be $2.1 million with an annual net profit of $400,000 before taxes and $248,000 net profit after taxes. It also indicated that the total required investment is expected to be about $1.5 million. This presents a profit to sales ratio of 11.8% and it also means that this project is expected to generate a simple rate of return of 16.5% and that the total investment (cash outflow) value is expected to be recovered in 3.9 years.

10.4. Beside the economical, environmental and social benefits there will be an opportunity for 65 jobs for low as well as middle skilled labor and other marketing and administrative staff who will be offered annual wages and salaries of about $500,000.

10.5. Considering the high percentage of increasing demand, the proposed project can extend its share of the local market if the quality and durable long lasting treads are guaranteed. Therefore, the proposed project has to offer a guarantee certificate for each reprocessed tire against separations of new tread rubber in order to extend its sales using a special trade mark.

10.6. Finally, based upon the above findings, it is recommended to implement such a project. However, communication with international retreading tire companies is very useful in order to use one of their trade marks as well as their experience ,such as the American Bandage Company in New York.

AN OPPORTUNITY STUDY

ON

NATURAL LEATHER PRODUCTION PLANT

Based on the work of Dr. Nidal R. Sabri
and Alex Kuttab, UNIDO Experts

1. General Economic Data

1.1. Product Characteristics and Uses: This project is aimed at processing the animal raw skin and produce useful leather products which, in turn, can be supplied as basic raw materials for different industries, such as the shoe industries, the leather fashion industries, the baggage industries and others. The cow, sheep and goat skin represent the raw material used in the leather industry. The process of producing a durable and suitable leather product from the raw animal skin is a very complex operation.

1.2. Justification for Selecting the Product: The majority of the shoemakers, leather fashion and baggage businesses import their needs of raw material leather from Israel and/or the foreign countries. What is surprising is that most of the animal skins produced by the slaughterhouses in the occupied Palestinian territories are exported to Israel after being collected and cured by Arab contractors and then imported as leather by the Arab factories to produce their leather products, mainly shoes.

1.3. Therefore, this project may serve as an inter-industry linkage by supplying the shoemakers with the required natural leather and other leather products factories, such as leather fashion, baggages and furniture.

1.4. Beside being used locally, natural leather and natural leather products, if produced locally stands a good chance to be exported to the Arab countries except Jordan. Jordan prohibits importing leather products in order to protect the domestic industry.

1.5. To process the raw animal skin will raise its value by three times.

1.6. Processing animal skins to produce leather and parchment is one of the oldest professions in Palestine and may be traced to 2000 years ago, and represents a symbol of heritage and culture. Therefore, it is time to revive such an industry by introducing the most modern production ways of soaking, tanning, dyeing and finishing.

1.7. Product Specification: This project is aimed at processing raw animal skins which can be obtained from Arab slaughterhouses in the occupied Palestinian territories in order to produce durable and useful leather, which may be processed further to produce leather products such as shoes, fashion leather, bags, baggage and other leather products such as chairs, document rolls, braces, gloves, etc. The different kinds of leather include the following:

- Cow skin-leather: to be used for shoes (face, sole), baggage and book binding materials.
- Goat skin-leather: to be used for shoes (face) and baggage .
- Sheep (lamb) skin-leather: to be used for leather-fashion and lines of shoes and baggage .

1.8. The leather may be produced with different thickness, patterns, tannage and colors.

2. Market and Demand

2.1. Current and projected demand for the local market: The natural leather may be processed to produce several leather product groups, these are:

1. Shoes
2. Leather fashions

3. Other leather products such as:

   a. Furniture (chairs, beds, etc.)
   b. Bags, baggage , purses and wallets
   c. Document rolls and leather office tools
   d. Textbook bindings
   e. Musical instruments

1. Shoes: The shoe industry consumes most of the natural imported leather. A substantial part of adult men* shoes are made of natural leather for the three parts of the shoe i.e., the face, the line and the sole. About 300,000 pair of shoes made of natural leather are produced every year in the occupied Palestinian territories. The Market Survey indicated that the following are needed to meet the local shoe industry needs:

   - 900,000 sq. ft. of goat skin and/or cow skin (grain split and/or flesh split) for the faces of the shoes (i.e., 3 sq. ft. per one pair).
   - 900,000 sq. ft. of sheep skin for the lines of the shoes.
   - 300,000 sq. ft. of thick cow skin for the sole of the shoes.

   However, most of the shoemakers use artificial leather for the sole because of the lack of the proper natural leather.

2. Leather Fashion: The local consumption of natural leather by the fashion industry is currently very limited and is based on the sheep skin. However, this area may be very promising. Most of this leather is imported from Israel or from some foreign countries. The current demand for leather fashion is estimated to be 100,000 sq. ft.

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* However, ladies, and babies shoes, sport and light shoes, are made by synthetic leather

3. Other Leather Products: This group of products includes leather furniture, bags, baggages, textbook bindings and others. Although the current demand for natural leather for this group of products is very limited yet these activities could become very promising if the natural leather can be available in proper quantities, qualities and prices. The current demand for this group of products is estimated to be 250,000 sq. ft.

2.2. Therefore, the total current local market demand for natural leather in the occupied Palestinian territories is about 2.4 millions sq. ft. of cow, goat and sheep leather to meet the shoe industries as well as other leather products.

2.3. There are few old plants of skin processing located in Hebron which produced an annual average of 400,000 sq. ft. However, most of this quantity is exported to the Israeli market and not consumed locally.

2.4. Sales program and sales revenue: Considering the local market for leather and other competitive factors; the proposed factory may contribute to the local leather market needs as follows, (which is about 37% of the market share):

The Annual Sales Program for the Proposed Factory

Animal/Type	Uses	Quantity units	sq.ft. per unit	Total sq.ft.	Wholesale price per sq.ft.	Total Value $
1. Cow leather - grain split	face of the shoe, baggage	12000	22	264000	$ 4	1,056,000
2. Cow leather - flesh split	chamois shoes, baggage	12000	22	264000	$ 2.3	607,200
3. Cow leather - thin grain split	Textbooks bindings	3000	22	66000	$ 2.5	165,000
4. Cow leather - thick flesh split	sole of the shoe	3000	22	66000	$ 3.5	231,000
5. Goat leather	face of the shoe	18000	6	108000	$ 2.6	280,800
6. Sheep leather	leather fashion and line of the shoe	20000	7	140000	$ 2.3	322,000
Total Sales				908000 sq.ft.		$2,662,000

3. Plant Capacity

3.1. The capacity of the plant is expected to process 15000 cow skins, 18000 goat skins and 20000 sheep (lamb) skins. The average cow skin size is about 22 sq. ft., the average goat skin size is about 6 sq. ft. and the average sheep skin size is about 7 sq. ft. This leads to a capacity of producing 330,000 sq. ft. of the two-split cow leather (grain and flesh) or 660,000 sq. ft. of the one-split cow leather, 108,000 sq. ft. of goat leather and 140,000 sq. ft. of sheep leather.

3.2. Therefore, the plant capacity is expected to be 908,000 sq. foot of different animal leather per year, or 17,461 sq. ft. per week or 364 sq. ft. per hour.

3.3. It is expected that 70 cow skins, 85 goat skins, and 94 sheep skins per day or about 31 skins per hour to be processed assuming there are 213 working days per year and 8 hours a day.

4. Supply of Raw Materials and Other Inputs

4.1. Raw Materials: The basic raw material of the proposed project is the animal skins. The animal skins available in the occupied Palestinian territories are cows, goats and sheep. The estimated average annual slaughtered cows, goats and sheep in the occupied Palestinian territories is more than 130,000 animals.* The skins of the slaughtered animals may be bought directly from the slaughterhouses in the Arab cities or through special contractors who collect the skins of the animals slaughtered outside the slaughterhouses. Therefore, the basic raw material for this project or factory will be available.

4.2. The size of local cow skin ranges from 18 to 26 sq. ft. with an average size of 22 sq. ft., the size of local goat leather ranges from 4 to 8 sq. ft. with an average size of 6 sq. ft., while the size of local sheep leather ranges from 5 to 9 sq. ft. with an average size of 7 sq. ft. The quality of the local animal skins are good and relevant to the stated leather uses. However, to assure a top quality of raw material skins, modern tools for slaughtering should be introduced and to be used by the local slaughterhouses.

4.3. The average cost of each cow skin is about $30 or about $1.36 per sq. ft. But every 1 sq. ft. of the cow skin will be split into 2 splits producing 2 sq. ft. of leather. Therefore, the average cost per 1 sq. ft. is about $0.68. The average cost of each goat skin is about $4.5 or $0.75 per sq. ft., and the average cost of each sheep skin is about $8 or $1.14 per sq. ft.

* This figure includes Jerusalem District consumption and slaughtered animals outside the slaughterhouses.

4.4. Salt: The salt is used only in the curing process to save the skin of the animals slaughtered. However, if the skin can be processed promptly, then there will be no need for the curing process i.e., no need to salt the animal skins.

4.5. Other indirect materials and chemicals: This includes lime, sodium sulphide, caustic soda, arsenic and aqueous liquor. In addition, coloring and dyeing materials are needed. Most of these materials have to be imported.

4.6. Water: Soaking the skins in running water is very essential.

4.7. Other Utilities: These include fuel oil, cleaning materials, office supplies and parts.

5. Location and Site

5.1. Traditionally, leather workshops are located mainly in the city of Hebron. However, the proposed project may be located in any of the industrial areas of the main cities of the West Bank or Gaza Strip. In deciding on the location three major factors should be considered and these are: 1) enough water should be available; 2) enough power supply; and 3) waste disposal facilities.

6. Project Engineering

6.1. Process and Technology: The processing of raw skin in order to convert it to leather (finished product) is very complex and passes generally through three major processes.

6.2. Primary preparation of the raw skin: This is the first major process and includes the following operations.

1. Skin Curing: This operation takes place to prevent the spoilage of the skin while waiting for processing. The curing operation is conducted by adding salt to the skin. This operation is not needed if the fresh skin is to be processed promptly.

2. Soaking: This operation is intended to clean the skins from salt, dirt, blood and other materials. This may be done by using two separate tanks of running cool water and/or by adding special chemicals. This operation is very precise and recently computerised machines are being used to control this soaking operation.

3. Unhairing: In this operation, the hair is removed and the pelt is cleaned and pulled, using chemical materials such as lime.

4. Fleshing: In this operation the other face of the skin (called the fleshing) should be cleaned out.

6.3. The Splitting Process: The second major process starts immediately after the skin becomes clean and firm. The major operation in this process is known as splitting. This operation is necessary to determine the desired thickness. The skin of the cow is usually split into 2 splits known as the grain split and the flesh split. After that the skin can be trimmed and inspected.

6.4. The Finishing Process: This process includes the following operations:

- Dyeing and spraying
- Rolling
- Staking
- Pressing
- Final inspection, measuring, marking and transferring the finished product to the warehouses.

6.5. Additional operations are needed if embossing and/or glazing the final product, for example, is desired.

6.6. Plant Sanitation and Waste Disposal: The above processes may produce toxic wastes that should be disposed off properly. Therefore, a special waste processing equipment should be considered so as to protect the local environment.

6.7. Machines and Equipment: The proposed leather project may need the following production, auxiliary and service equipment:
First; the production equipment (all to be imported).

Item Description	Quantity
A. Soaking equipment with a computer unit for controlling purposes (2 stores for processing)	1
B. Unhairing equipment	3
C. Fleshing equipment	3
D. Scudding equipment	2
E. Splitting equipment	2
F. Automatic dyeing and coloring equipment	2
G. Trimming equipment	2
H. Pressing machines	3
I. Embossing machines	2

Second; the auxiliary equipment (all to be imported)

Item Description	Quantity
A. Measuring machine (to measure the area of the final product)	1
B. Laboratory and control equipment	1
C. Boiler	1
D. Emergency power equipment (stand-by diesels)	1
E. Fork lifts	2
F. Trucks	2
G. Waste disposal (processing) equipment	1

Third; the service equipment

A. Large tanks for water

B. Waste disposal fixtures

C. Storage equipment and warehouses shelves (for raw skins and processed leather)

D. Plant security fixtures and equipment

E. Other furniture

F. Cold and hot water fixtures

G. Waste disposal containers

6.8. The Flowsheet of Production: The flowsheet for processing the animal skins to produce useful and durable leather may be stated as follows (the following symbols are used ⇒ transportation, ○ operation, □ inspection, ▷ delay, △ storage):

Operation \ Process	Storage	Preparation of skin	Processing	Finishing	Storage
Curing △	⇒ ○ △				
Soaking I	⇒	○			
Soaking II		○			
Unhairing		○			
Fleshing		○ ▷ ⇒	□		
Scudding			○		
Splitting			○		
Trimming			○		
Inspection			□ ⇒		
Dyeing and Spraying				○	
Inspection				□	
Rolling				○	
Staking				○	
Pressing				○	
Inspection				□ ⇒	△
Embossing) if required				○	
Glazing)				○ ⇒	
Measuring and transferring to warehouses					○ △

7. The Manpower and Management

7.1. The labor and staff requirements are estimated to be about 80 employees distributed as follows:

	No. of workers
a. Direct production labor (variable)	
Unskilled labor	8
Skilled labor (curing, soaking, unhairing, trimming, rolling, pressing, etc.)	52
b. Indirect production labor (fixed)	
Maintenance engineers and technicians	3
Leather specialists	2
Tannage and dyeing specialists	2
Supervisors and inspectors	3
c. Marketing employees	4
d. Administrative staff	6

7.2. The maintenance engineers and technicians, the dyeing specialists, the inspectors and the supervisors will need special training programs in advanced leather factories in Italy, England or in the U.S.A.

8. Project Schedule for Construction Periods

8.1. The estimated construction period for the proposed leather project may be scheduled as follows:

Time: 20 months

Activities	1	2	3	4	5	6	7	8	9 10	11 12	13 14	15 16	17 18	19 20
- Establishing steps to formulate founders group	o													
- Apply for registration/licence	o	o												
- Open a bank a/c			o											
- Collect instalment shares			o				o		o		o			o
- Acquire the land				o	o									
- Get permits for building					o	o	o							
- Building and civil works							o	o	o	o	o	o		
- Design production layout										o	o	o		
- Communication to technology supply				o	o	o	o							
- Get tendering							o	o	o					
- Bids evaluation									o	o				
- Import and install of equipment										o	o	o	o	o
- Arrangements for training (10 employees)										o	o	o	o	o
- Arrangements with slaughterhouses to get raw skins											o	o	o	o
- Arrangements with leather product factories												o	o	o
- Test the system														o

8.2. The above estimated construction timetable assumes that there will be no obstacles, objections and/or delays from the occupying authorities regarding the licence, registration, building, importing and installing of machines and equipment .

9. Financial Analysis

9.1. Based on the estimated sales revenue as indicated in paragraph 2.4, the plant capacity as indicated in part 3, the needed production and the machines and equipment required, the following investment cost may be estimated:

Assets	Value
Land	$ 100,000
Building	530,000
Furniture and fixtures	100,000
Production, auxiliary and service equipment	1,500,000
Working capital	200,000
Organization cost (licence, registration, etc.)	70,000
Total investment cost	$ 2,500,000

Two thirds of the total investment cost is allocated to buy the equipment which has to be imported.

9.2. Financing: The suggested project may be formed as either a co-operative firm or as a public corporation. Each form requires a different way of financing.

First: The cooperative firm will be owned by the shoemakers, leather fashion and baggages workshops owners. In this case the financing structure of the suggested project may be as follows:

Capital (100 members with 500 shares each at $30 par value)	$ 1,500,000
Grants	1,000,000
Total Equity	$ 2,500,000

In this case, the net refund (profit) will be distributed to the members in proportion to the purchasing amount of leather.

Second: The proposed project may be carried out as a public corporation i.e., owned by shareholders. The financing structure in this case may be as follows:

Founders stockholders (10,000 shares at $25 par value)	$ 250,000
Other stockholders (90,000 shares at $25 par value)	2,250,000
Total stockholders equity	$2,500,000

However, it is recommended to use the second form i.e., the second way of financing unless there is a possibility of getting a grant.

9.3. Production Cost: The annual production cost for producing 908,000 sq. ft., of leather may be estimated as follows:

	Ratio	Value
A. Variable Production Costs:		
- Direct Materials:		
Cow skins $30 x 15,000		$ 450,000
Goat skins $4.5 x 18,000		81,000
Sheep skins $8 x 20,000		160,000
Total materials	34.5%	$ 691,000
- Direct labor	29.6%	592,000
B. Fixed Production Costs:		
- Factory overhead:		
- Depreciation (10% of fixed assets except land and 20% of organization costs)	11.4%	227,000
- Other factory overhead costs including indirect materials	9%	180,000
Total annual production costs	84.5%	$ 1,690,000
C. Marketing and Administrative Costs		
- Variable (5% of sales value)	6.6%	133,000
- Fixed	8.9%	177,000
Total Production and Period Costs	100%	$ 2,000,000

The above estimated production cost and period expenses indicate that the cost of raw skins represent a substantial part of the total cost which is about 35%, while depreciation (non-cash expense) represents about 11% of the total cost. The variable marketing expense is expected to be only 5% of sales value, since the factory is expected to sell directly to shoemakers and other leather product factories.

9.4. Commercial Profitability: Based on the estimated data of the total investment cost, sources of financing, and the annual production cost and period expenses, the following financial measures may be derived:

9.5. Considering the fact that the corporate income tax rate is about 38% then the net profit after tax for the suggested project may be computed as follows:

	Ratio	Amount
Estimated total sales value	100%	$ 2,662,000
— Estimated production cost and period expenses	75%	2,000,000
= Net profit before taxes	25%	662,000
— Income taxes (38%)		251,560
Net profit after taxes	15%	$ 410,440

9.6. The simple rate of return for the suggested project may be calculated by dividing the accounting after tax profits by the total investment value i.e.:

$$\frac{\text{Net profit after taxes}}{\text{Total Investment}} = \frac{410,440}{2,500,000} = 16.4\%$$

OR, it may be calculated by using the DU PONT System i.e., by multiplying the net profit ratio by the investment turnover as follows:

$$\frac{\text{Net profit after taxes}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total Investment}} =$$

$$\frac{410,440}{2,662,000} \times \frac{2,662,000}{2,500,000} =$$

$$15.4\% \times 1,06 \text{ times} = 16.4\%$$

This shows a relatively low turnover of investment and that is because of the high cost of leather processing equipment, and the complexity of operation. However, the investment turnover may be improved by planning to increase the sales.

9.7. Repayment Period: The repayment period of the total investment may be calculated as follows:

$$\frac{\text{Investment Cost}}{\text{Profit after tax + depreciation}} = \frac{2,500,000}{410,440 + 227,000} = 3.9 \text{ years}$$

This means that the total investment of the project may be recovered in about four years.

10. Conclusions and Recommendations

10.1. This project is expected to process about 53,000 animal skins in order to produce a total of 908,000 sq. ft., of natural leather. Currently, most of the available raw skins are sold to the Israeli market after being cured. And at the same time, the majority of the shoemakers and other leather products workshops import the processed leather once again either from Israel or from abroad. This proposed project is intended to change a such situation.

10.2. Therefore, it is recommended to implement this project which creates about 80 jobs with an average annual labor cost of $ 592,000 and $ 100,000 for administrative and marketing staff salaries.

10.3. As shown in the financial analysis part, this project will generate an annual net profit of $ 410,440 i.e., a rate of return on investment of 16.4% and a profit to sales ratio of 15.4%. This preliminary analysis shows that this project is expected to be profitable and is expected to recover its capital in about four years. However, these profit ratios may be improved if sales are improved. Sales of leather may be improved if other projects to produce leather products are considered. Therefore,,a detailed feasibility study should consider production lines related to leather products beside the leather itself.

10.4. Using the local processed leather instead of importing, will lead to reduce the cost of leather products. For example, the cost of the imported cow leather reaches about $6 per sq. ft., while the stated price for this project is $4 per sq. ft. However, the quality should be guaranteed in order to be able to replace the imported product.

10.5. To assure the quality of the processed leather for the proposed project, three major conditions should be met and these are:

- The quality of raw animal skins should be assured by using modern ways and tools for slaughtering the animals. Therefore, the slaughterhouses in the Arab cities should be supplied with this equipment.
- The most advanced methods of soaking, processing and dyeing should be used.
- The employment of qualified experts and highly skilled labor.

10.6. It is recommended that the major shoemakers and other businessmen who are working in the leather goods industry be encouraged to share in the project's capital.

AN OPPORTUNITY STUDY

ON

BABY-FOOD PRODUCTION PLANT

Based on the work of Dr. Nidal Sabri and
Saro Nakashian, UNIDO Experts

1. General Economic Data

1.1. Product Characteristics and Uses: This is an opportunity study for a Baby Food Production plant where fresh vegetables, fruits and other proteins will be processed in order to produce several types of baby foods, which will be "ready to eat" by new born babies (4-7 months) and babies (8 months and older). This is an agro-industrial project where baby food will be produced in small jars and containers, each jar containing one meal. The products will offer Palestinian babies a variety of dishes and desserts.

1.2. Justification for Selecting the Product: The usage of canned baby food is new for the Palestinian family, but is increasing in demand rapidly. Today there are about thirty types of canned baby foods marketed in the occupied Palestinian territories, which are produced by various foreign and Israeli companies. All the available canned baby foods are imported; therefore, it is worthwhile to consider the production of such a product to meet the local needs.

1.3. This product will use local raw materials from the available surplus of vegetables and fruits. There is a surplus of 250,000 tons of fruits and vegetables in the occupied Palestinian territories. Processing part of this surplus will help to create fair price stability for fresh farm products.

1.4. By processing fruits and vegetables, it will help the consumers to have various products available in all seasons. This supports the FAO/UNICEF committee's statement "large seasonal shortages in food distribution could have disastrous effects, particularly for children". Therefore, it is important to process part of the surplus of fruits and vegetables in order to have them available through all the seasons, for a reasonable long life without spoilage.

1.5. The proposed project will consider only baby food products which are produced from those available fruits and vegetables in the occupied Palestinian territories. Therefore, products such as cornflour, cereals, and oatmeal that are scarce will be excluded.

1.6. Having a baby food manufacturing plant, will help parents to give the children healthy diets with the needed calories, and the recommended allowances of vitamins, proteins and minerals. In addition, it will help new babies to eat sieved and pureed foods, in conjunction with family food.

1.7. The use of local raw materials will facilitate the export of the products to Jordan and other Arab markets.

1.8. Product Specification: Three major groups of baby food products will be produced including fruit based, vegetable based and vegetable/protein based products. These will be divided to fourteen different types of meals and desserts to serve two age groups of babies. First group is the infant baby from 4 months to 7 months where the need will be for completely sieved food.Second group is from 8 months to 24 months, these babies can consume less sieved products. The fourteen different meals and desserts may be produced in either jars or cans in one or more sizes. Products such as cornflour, oatmeal and different types of cereals may be considered for possible production in the future after the needed raw materials are available.

2. Market and Demand

2.1. Domestic current and projected demand: These are based upon the findings of a situational analysis of the market of baby food products in the occupied Palestinian territories, the following conclusions are drawn:

2.2. The demand for baby food may increase in the coming years because of various factors such as: a) increase in population, especially children newly born, which is about a quarter of a million in the West Bank and Gaza Strip; b) an increase in substituting canned ready-to-eat food for regular cooked food, due to the environmental and working conditions of Palestinian women; c) the health consciousness towards feeding healthy and nutritious food; d) it is also expected that demand will increase if the product is manufactured locally at lower cost.

2.3. There are no factories producing baby food in the occupied territories; however, there are many foreign and Israeli companies which market their baby food products such as Gerber Corp., Beechnut Corp., Rudo Ltd., Familia Ltd., Remedia Ltd., Quaker Baby Cereal, Taami Corp. There are many types of baby food products, like barley cereal, rice cereal, cornflour, senolin, oatmeal, mixed cereal, various vegetable meals, fruits, desserts, and juices. These are found in different packages such as paper, aluminum, nylon, carton, cans and glass containers. The net weight in the packages vary between 100 gs., 135 gs., 200 gs., up to 500 gs.

2.4. The average demand for baby food products in the occupied Palestinian territories for ready-to-eat vegetables, fruits and protein based products for babies is about 5000 cases a month, which is about 120,000 jars (24 jars per case) per month and about 1,440,000 jars per year.

2.5. There are good opportunities to export to Arab countries up to one million jars of the baby food products, as local raw materials will be used. However, it is recommended to consider that about 30% of its sales program will be exported to Jordan and other Arab countries.

2.6. Sales program and sales revenue: This sales program is based on the following:

a. Raw materials available in the occupied Palestinian territories
b. Marketing research data
c. Balanced baby food formulas
d. Local demand as well as export markets for Jordan and Arab countries.

The Projected Annual Sales Program for the Proposed Factory

Type	Size (gs)	Age* (groups)	Quantity (jars)	Wholesaling Price (per jar)	Sales Value $
Fruit Based Products (dessert):					
1. Sieved apricot/orange	135	First	160,000	$ .65	104,000
2. Dextrolic pure grape sugar	200	Second	120,000	.80	96,000
3. Sieved Peach/orange	135	First	160,000	.65	104,000
4. Apple ˈrange	135	First	160,000	.65	104,000
5. Peach/apricot/orange	135	First	160,000	.65	104,000
6. Peach/apricot/orange	200	Second	100,000	.85	85,000
7. Banana/orange	135	First	160,000	.65	104,000
Vegetable Based Products:					
8. Tomato /potato/onion	200	Second	180,000	.80	144,000
9. Potato/carrot /tomato	135	First	180,000	.65	117,000
10. Peas/potato	135	First	180,000	.65	117,000
Vegetable/Protein Based Products:					
11. Tomato /cheese	135	First	200,000	.73	146,000
12. Tomato /potato/egg	200	Second	100,000	.90	90,000
13. Potato/egg/beef	200	Second	100,000	.95	95,000
14. Potato/carrot /chicken	200	Second	100,000	.90	90,000
Total			2,060,000		$ 1,500,000

*First stage (infants 4-7 months); Second stage (8-24 months)

2.8. 34% of the containers will be 200 gs., while the remaining 66% will be 135 gs.

2.9. The above sales program will produce 2,060,000 units of a total of 324 tons of finished goods, which will generate an estimated sales revenue of $ 1,500,000 a year.

3. Plant Capacity

3.1. The proposed plant is planned to produce 2,060,000 jars annually, of fourteen different types of ready-to-eat baby food. This means that the quantity per working day is expected to be 6582 jars or 822 jars per hour, assuming 313 working days per year and 8 hours per day.

3.2. The input-output ratio (fresh fruits, vegetables, potatoes) is expected to be about 30%. This means that the proposed plant will require about 1080 tons of raw materials in order to produce 324 tons of finished canned baby foods, which is equivalent to 2,060,000 jars, of which 700,000 jars of 200 gs., and 1,360,000 jars of 135 gs.

4. Supply of Raw Materials and Other Inputs

4.1. Several types of fruits, vegetables and other items are needed as it is indicated in the sales program. These are:

a. Fruits: grapes, oranges, apples, peaches, apricots and bananas.
b. Vegetables: tomatoes, potato, peas and carrots.
c. Other: beef, white cheese and eggs, and chicken.

All the above mentioned raw materials are available locally, most of them actually are in surplus, for example, oranges (180,000 tons), grapes (20,000 tons), tomatoes (27,000 tons), potato (5000 tons), other fruits and vegetables such as bananas, apples, peas, carrots are also available, however, in lesser quantities, which meet and exceed the proposed factory needs.

4.2. The average annual need of the proposed plant will be 507 tons of fruits, 555 tons of vegetables and 18 tons of beef, chicken, cheese and eggs, assuming the input output ratio being 30%.

4.3. The average local wholesale price of the needed fruits, vegetables and other raw materials are expected to be as follows:

Fruits	$ 335 a ton
Vegetables/potatoes	$ 235 a ton
White cheese	$ 4,500 a ton
Beef	$11,000 a ton
Chicken	$ 3,000 a ton
Eggs	$ 400 for 100 dozen

4.4. Fresh fruits and vegetables are needed to process baby foods, therefore, careful attention should be given to selecting, buying, collecting and storing the crops. The vegetables as well as the fruits should be mature, well colored and firm at the time they are picked, they must be free of toxic substances and other bacterial contamination. The fruits and vegetables will be available at various periods of time throughout the year, this will allow the factory to work through the four seasons.

4.5. All needed raw materials are available locally, and may be procured from various local farmers, these include fruits, vegetables, cheese, eggs, beef and chicken.

4.6. The containers are the next items in importance after the raw materials, the average price of a jar with a capacity between 135-200 gs., is expected to be 8 cents with a total cost of 164,800 dollars annually. This may be purchased locally.

4.7. Other additives and materials such as:

- Sugar: It may (or may not) be added to the sieved and other fruits to have the necessary balance of taste and flavor.
- Farina and other stabilizing materials, in case the sieved products may need to be firm.
- Vitamins, minerals, and salt.
- Packaging materials, carton cases, paper and labels.

4.8. Utilities such as fuel oil, cleaning materials, office supplies and equipment parts are all available locally.

5. Location and Site

5.1. The Jordan valley is considered to be the most proper place for the proposed project; most of the fruits, vegetables, and other protein materials are available in that area. It also has the advantage of water resources and relatively low cost of labor.

5.2. The proposed plant as an agro-industrial project will have several social and economical advantages, as well as it will assist in improving the rural areas of the Jordan valley.

5.3. A secondary site will be in the Gaza area, since it may meet the requirements of the proposed plant.

6. Project Engineering

6.1. Process and Technology: The first step will be to select the formulas and ingredients of the needed products. The baby foods for the first group (4-7 months) should be well sieved, wholesome and easily digestible, in addition, it should be well balanced regarding vitamins, proteins, carbohydrates and mineral contents, according to the above criteria. The baby foods for the second group (8-24 months) should also be well balanced and include more proteins, the beef should be soft. The different combinations are stated in section 2.7 which are classified into three major groups. For the above combinations two production lines may be used, one for fruits and the other for vegetables and/or vegetables mixed with meat and other proteins.

6.2. The operations processes and technology for the proposed baby food factory may be stated as follows:

A. Preparation Process: This should include the following operations:

First; washing, cleaning and sorting all raw materials.

Second; fumigation process to destroy and remove chemicals, insects and any other biological contaminators.

Third; cutting, sorting, trimming, and coring all vegetables, potatoes and fruits as required to be ready for processing.

B. Thereafter, processing of materials as stated in batches; this includes:

First; crushing, heating and pulping tasks.

Second; adding of required additives, proteins, vitamins and other materials.

Third; finalizing the processed materials through fine screening, homogenizing and sterilizing.

C. Finishing: The finishing process includes the following operations:

First; inspecting the finished products for consistency, uniformity, flavor, softness and vitamins.

Second; filling in sterilized jars.

Third; final inspecting, labeling, casing and transferring to storage.

6.3. Machines and Equipment: The proposed plant will need the following production, auxiliary and services equipment for processing the stated three groups of products, fruit-based, vegetable-based and vegetable/protein-based products. If other products in the future are to be produced, such as cereal based and cornflour-based, additional equipment is needed.

6.4. Production Equipment: (all imported)

- Washer equipment
- Fumigation equipment
- Sorting equipment
- Cutting equipment
- Trimming and coring equipment
- Main process equipment (crushing, heating and pulping)
- Fine screening equipment
- Homogenizing equipment
- Sterilizing tank and equipment
- Filling machines and equipment
- Labeling, casing and cartoning machines
- Tanks for cooling

6.5. Supportive and Auxiliary Equipment: (all imported)

- Freezers
- Conveyors
- Stainless steel tanks
- Fork lifts
- Boilers
- Stainless steel pipes
- Stainless steel fittings, pumps and valves
- Laboratory equipment for quality control and inspection

6.6. Other Service Equipment:

- Storage and warehouse shelves and equipment
- Trucks
- Steam and water fixtures
- Electricity fixtures
- Emergency equipment

6.7. Flowsheet: The estimated flowsheet of the proposed baby food factory for the main processes and operations may be stated as follows: (Using the following symbols) ⇒ Transportation, ○ Operation, □ Inspection, D Delay, Δ Storage:

Operations \ Process	Preparation	Processing	Finishing	Laboratory Control
- Supply raw materials	Δ ⇒			
- Wash raw materials	○			
- Fumigation process	○			
- Inspect raw materials	□			
- Sorting, trimming	○			
- Transfer to processing	⇒	D		
- State ingredients and component		○		
- Processing (crushing, heating, pulping)		○		
- Add required additives		⇒ ○		
- Fine-screening and homogenizing		○		
- Inspect vitamins and pH value		□		
- Inspect consistency and uniformity		□		
- Supply jars		⇒		
- Filling, sterilizing			○	
- Labeling, casing			○	
- Inspect final products				□
- Storing				⇒ Δ Δ Δ

7. Manpower and Management

7.1. All the needed manpower and management staff for the suggested project are available locally. The only outside training or experts will be needed in the position of the nutrition and food specialists.

7.2. The estimated needed manpower for the suggested project is about 50 employees distributed as follows:

Labor/staff required	skill	function	number
Production labor	unskilled	handling	4
Production labor	unskilled	services	5
Production labor	skilled	processing	27
Production labor	skilled	supervisors	3
Technicians	skilled	maintenance	2
Nutrition/food specialists	highly skilled	laboratory	2
Marketing staff	-	distribution	3
Administrative staff	-	management	4
Total needed manpower			50

8. Project Scheduling and Construction Periods

8.1. The schedule and construction period for the baby food project may be estimated as indicated in the following table:

Activities/Tasks	Time (20 months)									
	1,2	3,4	5,6	7,8	9,10	11,12	13,14	15,16	17,18	19,20
- Formulate founders group	o									
- Apply for registration	o	o								
- Apply for registration/Jordan	o	o								
- Get licence		o								
- Open a bank account		o								
- Collect instalments		o	—	o	—	o	—	o	—	o
- Primary communication with farmers	o	o								
- Acquire the land		o	o							
- Get permits for building			o	o						
- Building and Civil works				o	o	o	o			
- Arrangements for technology supply						o				
- Tendering						o	o			
- Evaluate bids and select equipment							o			
- Get permission to support equipment					o	o	o			
- Select formulas product brands							o	o		
- Determine ingredients								o	o	
- Arrangement for training							o	o	o	
- Arrangement for class jars supply							o	o	o	
- Test the system									o	o

8.2. The above estimates of the suggested project schedule is assuming no delays or objections from the occupying authorities.

9. Financial Analysis

9.1. Investment Cost: The total investment requirements are estimated as follows:

Land	$ 80,000
Building	400,000
Fixtures and furniture	100,000
Production,auxiliary and service equipment	500,000
Licence and establishment expenses	50,000
Working capital	170,000
Total Investment Cost	$ 1,300,000

The needed equipment for the suggested project is to be imported, some of the auxiliary and service equipment may be manufactured locally. The cost of production equipment will increase if other production lines are to be considered such as cereals and oatmeal products.

9.2. Financing: The estimated total investment cost which is about 1.3 million dollars may be financed by establishing a public corporation.

- Founders stockholders 10% $20 per share 6,500 shares	$ 130,000
- Other stockholders $20 per share up to 58,500 shares	1,170,000
Total owner's equity	$ 1,300,000

External sources such as loans and/or grants may be used to finance other production lines.

9.3. Production Cost: According to the planned capacity of the suggested project the annual production cost and period expenses may be estimated as follows:

	Ratio	Value
1. Variable Production Cost:		
Fruits		$ 170,000
Vegetables and potato		130,000
Beef, cheese, chicken, eggs and others		90,000
Total direct materials	32.5%	390,000
Containers	13.7%	164,800
Labor	25%	300,000
2. Fixed Production Cost:		
Depreciation (10% of fixed assets, except land and 20% of estab. expenses)	9%	110,000
Other factory overhead	6%	70,200
Total production cost	86.2%	1,035,000
3. Variable Marketing Expenses (5% of sales)	6.3%	75,000
4. Other marketing and administrative expenses	7.5%	90,000
Total Annual Production Cost and Period Expenses	100%	1,200,000

This indicates that one third of the total operational costs and period expenses is related to direct materials and about 25% of the total operational cost are related to labor costs and containers, while depreciation cost represents only 9% of the total operational costs and period expenses.

9.4. Commercial Profitability: On the basis of the above estimated sales revenues, investment costs, sources of financing, and operational costs, the following ratios may be derived:

9.5. Net profit after taxes: The following is the estimated annual net profit after taxes for the suggested project:

	Ratio	Value $
Estimated Sales	100%	1,500,000
− Production Cost and period expenses	80%	1,200,000
= Net profit before taxes	20%	300,000
− Corporate income tax (38%)	-	114,000
= Net profit after taxes	12.4%	186,000

9.6. The simple rate of return: The simple rate of return may be calculated by dividing the net profit after taxes and the total investment cost (total assets).

$$\frac{\text{Net profit after taxes}}{\text{Total Investment}} = \frac{186,000}{1,300,000} \times 100 = 14.3\%$$

or the simple rate of return may be found by multiplying the net profit ratio by the investment turnover ratio:

$$\frac{186,000}{1,500,000} \times \frac{1,500,000}{1,300,000} =$$

$$12.4\% \times 1.15 \text{ times} = 14.3\%$$

9.7. Repayment Period: The repayment period of the total investment (cash flow) may be calculated as follows:

$$\frac{\text{Investment Cost}}{\text{Profit after taxes + depreciation}} = \frac{1,300,000}{186,000 + 110,000}$$

$$\frac{1,300,000}{296,000} = 4.4 \text{ years}$$

10. Conclusions and Recommendations

10.1. This project is aimed to produce fourteen types of baby food products using local raw materials of fruits and vegetables. It is expected to sell and produce a total of 324 tons of finished canned foods in 2,060,000 jars of two sizes (135 gs. and 200 gs.). This will meet the local needs as well as possible export to Jordan and other Arab markets, 30% of the planned production will be exported.

10.2 The project will generate an annual sales volume of 1.5 million dollars, with 186,000 dollars of net profit after taxes, which will yield a simple rate of return of 14.3%, and it is expected to recover the total investment cost in about 4.4 years. In addition, it will offer 50 job opportunities .

10.3. The relatively low rate of return may be increased if the export sales increase more than the planned volume and/or other production lines are included such as cereals and oatmeal products.

10.4. It is recommended to implement this project after a complete feasibility study is carried out, it is also preferable to study the export possibilities to Arab countries in more detail .

AN OPPORTUNITY STUDY

ON

DAIRY PRODUCTION PLANT

Based on the work of Dr. Said Haifa, Mr. Adel Zaghah, and Mr. Abdel Hafiz Abo Sneineh, UNIDO Experts

1. General Economic Data

1.1. Product Characteristics and Uses: This opportunity study concerns the establishment of a dairy factory that will supply the residents of the Ramallah district with the following products:

a) Pasteurized drinkable milk packed in plastic bags.

b) Yoghurt marketed in disposable cups.

c) Lebaneh: produced by percolating yoghurt and marketed in disposable cups.

d) Soft white cheese, to be sold in disposable containers.

Moreover, it is suggested that the proposed project belong to a livestock cooperative that will raise Friesian cows in order to provide the plant with the substantial amount of milk essential for processing.

1.2. Justification for Selecting the Product: The main reasons for proposing this project are:

a) To meet the continually increasing demand for milk and milk products by local consumers.

b) To reduce the local dependence on similar Israeli products. Based on the official Israeli figures, approximately 46% of total milk consumption by residents of the Ramallah district has been supplied from Israeli resources. However, an ANERA expert believes this percentage to be approximately 61%. This proposed project will substitute for 18% of the Israeli dairy products sold in the Ramallah district.

c) To up-grade the quality of locally-produced milk and dairy products through the use of improved strains of Friesian cows and modern methods of processing. The cooperative will replace with Friesian cows the relatively unproductive local varieties of milk cows. Table 1 compares the quantities of milk production by local and improved Dutch cows in the West Bank.

Table 1 - Cow Breeds and Milk Production in the West Bank 1980/1981

Cow Breed	No. of Heads	Annual Production (liters per head)
Dutch	2,445	3,750
Local	6,131	500

Sources: Yearly Statistical Bulletin, Rural Research Center, Al-Najah University, Nablus, Vol.1, p. 130, 1981.

The Friesian cow, by contrast, produces about 5,000 liters per year. It should be pointed out that individual dairy farmers were unable to meet hygienic standards for dairy products under traditional processing methods. The discovery of contamination in traditionally produced cheese, milk, yoghurt and ghee in 1980 led the Israeli authorities to ban the marketing of these products.

d) To improve the income of local farmers by increasing their productivity through the introduction of Friesian cows, saving additional costs of transportation, and by sharing the cooperative's profits.

1.3. Product Specification: The products of the proposed project will consist of the following:

a) Pasteurized drinkable milk packed in hygienic plastic sacks of one liter each.

b) Yoghurt filled in plastic cups of 125 g, 250 g and 500 g.

c) Lebaneh filled in plastic cups of 250 g and 500 g.

d) White soft cheese packed in hygienic plastic cans of 500 g and 1,000 g.

2. Market and Demand for the Product

2.1. Current and Projected Demand: The total annual consumption of milk and dairy products in the West Bank and Gaza Strip was estimated to be 91,770.4 tons, while the total annual production of the territories for the year 1985/86 was 49,800 tons, 16.82% of which was produced in the Gaza Strip. Table 2 provides information about the consumption of milk and milk products in the West Bank and Gaza Strip.

Table 2 - Consumption of Milk in 1986

Region	Population (thousand)	Consumption (liters) per capita	Consumption (liters) total
West Bank	836	64.6	53,838,400
Gaza Strip	545	69.6	37,932,000
Total	1,381	66.45	91,770,400

Sources: 1) Statistical Abstract of Israel, Central Bureau of Statistics, Vol. 38, p. 701, 1987

2) Yearly Statistical Bulletin, Rural Research Center, Al-Najah University, Nablus, 1984, Vol. 6, p. 183.

As mentioned before, the potential market of this project is the Ramallah district. Given the per capita consumption of milk, it is easy to estimate the total quantity of milk demanded by the residents of the potential market. The total population of Ramallah district is estimated at 120,000 in 1987. A conservative estimate on the per capita consumption of milk products is equal to 66.45 liters/year. Thus the total quantity of milk demanded by the residents of the potential market is expected to be 7,980 tons per year, or 22 tons per day. The proposed project is planned to process only 4 tons of milk daily which is equivalent to 18% of total demand. No foreign demand is expected since the project is directed towards the fulfilling of domestic needs. The projected demand is expected to increase by at least 2% per year, coping with the population growth rate which stands at 2.5% per year.

2.2. Sales Program and Sales Revenue: With a capacity of 4.68 tons of fresh milk per day the proposed plant is expected to process approximately 1,460 tons of milk per year and to sell all of its production. For the purpose of satisfying the market need and profit optimization, it is believed that fresh milk should be processed in the following proportions:

30 percent to produce pasteurized milk

25 percent to produce yoghurt

25 percent to produce lebaneh

20 percent to produce soft white cheese

The main sources of revenue for the proposed project are:

1) Revenue from sales of dairy products. This is the primary source. It is projected to achieve an annual revenue of $ 1,017,328 from the ales of dairy products as illustrated in Table 3.

Table 3 - Projected Sales Program and Sales Revenue from Dairy Products (Price and Revenue in U.S.$

Product	Input		output-input ratio	output sales, tons	price per ton	sales revenue
	Milk requirement, tons	% of total requi.				
Pasteurized Milk	438	30	1	438	625	273,750
Yoghurt	365	25	0.8	292	850	248,200
Lebaneh	365	25	0.25	91	2,600	237,250
Soft White Cheese	292	20	0.20	58	4,420	258,128
Total	1,460	100				1,017,328

2) Revenue from meat production: This is calculated as follows:

Number of calves produced (100 cows produce 100 calves)	100
Less:	
4% mortality rate	4
10% replacement for cows	10
Number of calves available for sale	86
Price per calf (one-month old)	$ 250
Revenue from sales of calves	$ 21,500

3) Revenue from the sales of manure: The revenue from this source is estimated to be $1,500/year. The total revenue from the sales of dairy products, meat production, and sales of manure is projected to be $ 1,040,328 per year.

3. Plant Capacity

The annual capacity of the plant is expected to be 1,460 tons of fresh milk,4.68/t per day x 312 days per year. The plant will be able to process cow, sheep, and goat milk. The 1,460 tons of fresh milk will be processed as follows: 30% to produce pasteurized drinkable milk, 25% to produce yoghurt, 25% to produce lebaneh and 20% to produce soft white cheese.

4. Supply of Raw Material and Other Inputs

4.1. Raw Material Availability and Sources: The basic raw material needed for the proposed project is the fresh milk. During the first few years of the plant's operation, outside farmers would be the primary source of fresh milk. There are more than 85,000 heads of sheep in the Ramallah area of which 40,000 are milking. These heads can produce up to 2,800 tons of milk/year. The second source would be the plant-owned farm of Friesian cows. This plant-owned source is expected to supply about 490 tons of raw milk and the balance, 970 tons of milk, can be bought from outside farmers. Friesian cows can be bought from the Israeli market. Importing milking cows by local residents of the West Bank and Gaza is banned by the Israeli Military Authorities. Cow food is available from local produce in Ramallah.

4.2. Utilities: The proposed project does not require special sources of utilities. The needed utilities are available in the area (water, electricity, roads, etc....).

5. <u>Appropriate Location and Site</u>

Ramallah District has been selected due to the lack of any dairy plant in that area and the availability of raw materials. There are two dairy plants in Jinin and Tulkarim, a plant in Hebron and a fourth in Jericho. The village of Kufur Ni'mah was found to be the best possible location in the Ramallah area for the following reasons:

1) The village is just a 30 minute-drive from Ramallah city, which would make it easy to market the production in Ramallah city.

2) With a population of 4,000 plus 25,000 people in surrounding villages, Kufur Ni'mah could provide both the required market and manpower.

3) The availability of required fresh milk in the village and surrounding villages.

4) Kufur Ni'mah livestock cooperative is interested in participating in such a project by providing land and some 100 heads of sheep. Moreover, this cooperative has the permission to set up a dairy plant. The Kufur Ni'mah livestock cooperative has 63 members from Kufur Ni'mah farmers.

6. Project Engineering

6.1. Process and Technology: The basic technology used in such a plant is to pasteurize the fresh milk, fill it in disposable nylon bags for sale or process it further to produce yoghurt, lebaneh, and soft white cheese. To produce yoghurt, pasteurized milk must go through the fermentation process. Fermentation process starts first by adding yoghurt to pasteurized milk in the ratio of 2:100 at a temperature of 37°C. The mixture will be filled in disposable cups and kept warm until the fermentation process is completed. Finally, the cups must be kept in a cool place, ready for shipment to the market. Lebaneh is produced by percolating yoghurt using large cotton bags. Lebaneh is then filled in disposable plastic cups and stored in a cool place, ready for shipment to the market. The production of soft white cheese starts by adding a rennet to pasteurized milk. Four grams of solid rennet are dissolved and added per 100 liters of pasteurized milk at a temperature of 37°C. The cheese milk is then sent to the cheese trolley for coagulation. Salt is then added to preserve the cheese and to give it a flavor.

6.2. Machines and Equipment: The follcwing machines and equipment are required:

a) A complete set of laboratory equipment for the purpose of inspecting the quality and content of the milk and the quality of the output.

b) Reception Tanks: Stainless steel, refrigerated reception tanks are used to store the fresh milk received from parlour or bought from outside for up to two days.

c) Thermal Milk Stabilization Equipment: This equipment is used for pasteurization of milk. It heats fresh milk to at least 72°C for at least 15 seconds to kill the pathogenic bacteria. The "Microtherm 600" produced by the Swedish Company Alfa-Laval can perform the pasteurization process, recool the pasteurized milk to 37°C, and pump it to the next work station. This pasteurizing unit is electrically supplied, not steam, and it includes a heat sealer and a 9 kw heater. A plate cooler can and should be added to the pasteurizing unit.

d) Centrifugal Milk Pump: Two milk pumps are required. The first one is used to ship milk from the reception tanks to the pasteurization machine and the second one to ship the milk mixture from the process tanks to either the filling machine or the cheese trolley.

e) Balance Tanks: This stainless steel tank is connected with the pipes that ship the fresh milk from the reception tank to the pasteurization machine. It will perform the function of equalizing the milk flow to the pasteurization machine whenever necessary.

f) Process Tanks: The processes of treating the pasteurized milk to become yoghurt or cheese take place in these stainless steel, insulated tanks.

g) Cup Filler: This machine performs hand-operated filling of yoghurt milk into disposable cups.

h) Cheese Trolley: Received from process tank, cheese milk is coagulated on the trolley. Cheese is then manually filled in special containers and stored in a cool place.

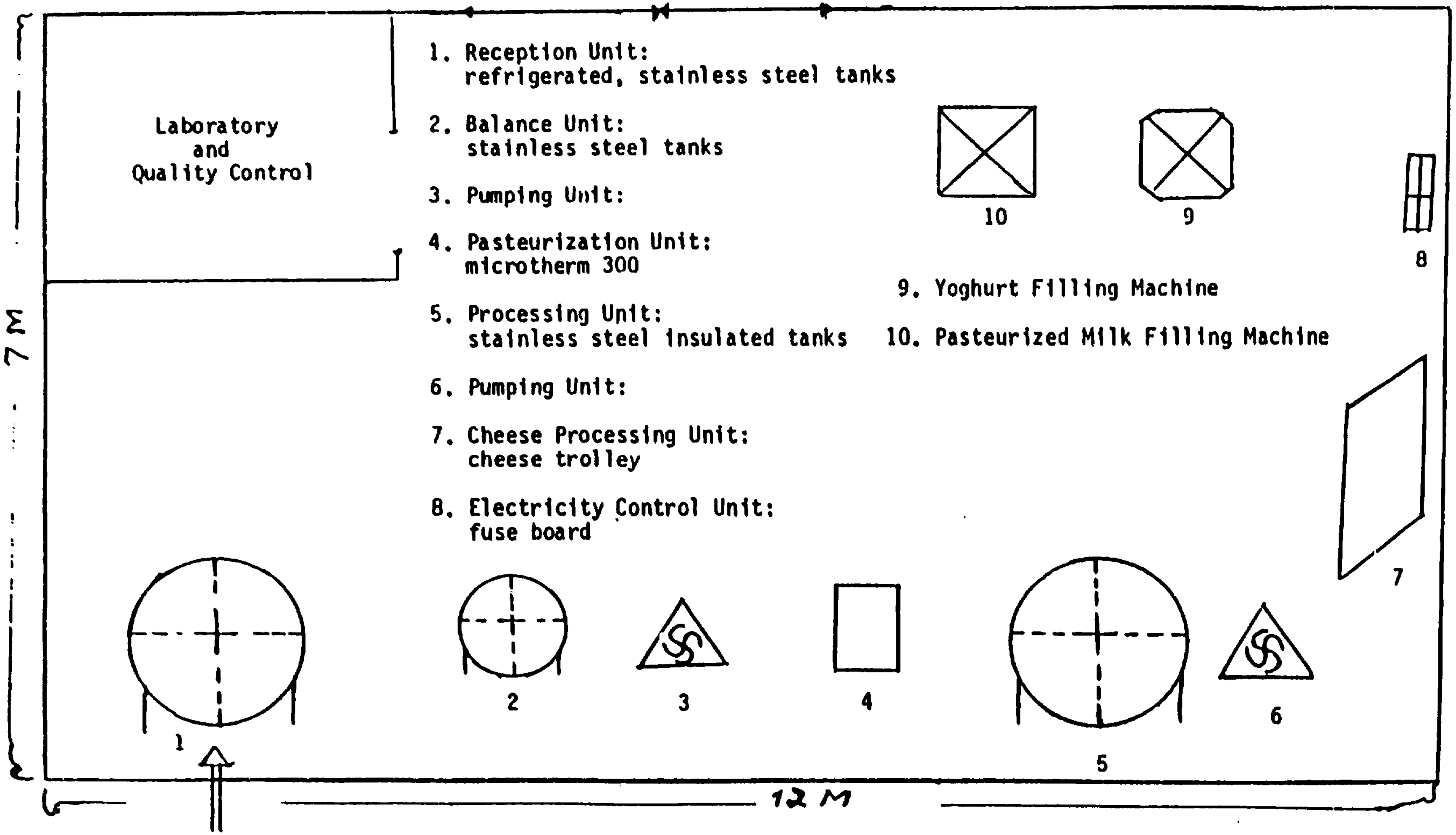
i) Pasteurized Milk Filler: Pasteurized milk may be sold to the customers in disposable nylon bags. This process requires a milk filling machine.

j) The plant will be equipped with two sets of stainless steel pipes and fittingsfor the interconnections of both the process equipment and tap water.

k) A set of electrical installation materials will also be required besides a fence board with switch buttons.

6.3. Flow Sheet

Using the following symbols, the flow sheet can be shown in the following chart:



7. Manpower and Management

The proposed plant does not need any sophisticated expertise. The Arab Development Society in Jericho and its Vocational Industrial Training Center could provide training required in the area of dairy production. The proposed plant would require the following personnel:

	No. of Personnel
Plant Manager	1
Maintenance man, mechanist	1
Truck driver	2
Labourers	2
Farmers	2
Lab technicians	2
Total	10

8. Project Scheduling

Once the funds are available, land must be bought and construction of plant building and the farm must be started. Land, however, may be provided by Kufur Ni'mah livestock coop if the coop decides to be a participant. It may take a few months to have the plant building and the farm constructed. The second step is to buy the required Friesian cows, equipment and tools which might require 4-10 months. The final step would be hiring and training the staff which might take a few weeks. In sum, a total of 18 months would be a realistic time to set up such a plant.

9. Financial Analysis

9.1. Investment Cost: The following are the estimated investment costs required for the suggested plant:

1.	Land - 4 dunums - estimated cost $4,500 per dunum		$ 18,000
2.	Shed for dry and green feed - 400 sq. m. - estimated cost: $ 30/sq.m.		12,000
3.	Shed for milking unit and newborn calves - 400 sq. m. - $ 50/sq.m.		20,000
4.	Shed for calf-fattening for sale - 200 sq.m. cost $ 30/sq.m.		6,000
5.	a) Building for dairy factory - 120 sq.m. cost $75/sq.m.		9,000
	b) Building for offices - 100 sq.m. cost $100/sq.m.		10,000
6.	Silos (2) fcr concentrated feed - cost $ 2000/silo		4,000
7.	Friesian cows (1-3 years old) estimated cost $ 1200/cow (100)		120,000
8.	Shed for cows and other equipment - 600 sq.m.: $40/sq.m.		24,000
9.	Machinery for dairy plant, including:		328,750
	- Stainless steel reception tank (2)	$ 8,000	
	- Stainless steel balance tank (2)	4,000	
	- Centrifugal pumps with meter (2)	4,000	
	- Pasteurizing unit (1) of microtherm type, (including a heater 9 kw)	25,000	
	- Stainless steel pipes and fitting and spare parts	20,000	
	- Plate cooler	13,800	
	- Cup filler (1)	10,000	
	- Stainless steel process tank (2)	9,000	
	- Milk filling machine (1)	18,000	
	- Cold storage and incubator	14,950	
	- Cheese processing equipment	10,000	
	- Stainless steel containers - volume 10 liters each (10)	2,500	
	- Milking parlour for farm	17,250	
	- Lab. equipment	20,000	
	- Automatic washing machine	10,350	
	- Truck	50,000	
	- Inventory trolley (1)	6,900	
	- Refrigerator truck	85,000	
	Total investment costs		551,750
	Working capital		88,000
	Grand Total		$ 639,750

9.2. Annual Production Costs:

1. Manpower expenses		
- Manager, dairy-products specialist	$ 6,500	
- Mechanic for maintenance	3,900	
- Lab. technicians (2)	7,800	
- Truck driver (2)	7,800	
- Unskilled labourers (2)	5,200	
- Farmers (2)	5,200	36,400
2. Raw Materials and Other Expenses		
- Raw milk (970 tons) cost $540/ton	523,800	
- Feed concentrate 14% protein: 5 kg/head/day for 365 days for 100 cows at $0.30/kg	54,750	
- Feed concentrate 16% protein: 10 kg/head/day for 365 days for 100 cows at $0.35/kg	127,750	
- Hay and dry alfalfa 18 kg/head/day for 365 days for 100 cows at $0.10 kg	65,700	
- Other expenses such as artificial insemination, medicines, etc.	10,000	782,000
3. Water and electricity consumption		10,000
4. Packaging expenses		
- 438,000 plastic bags for milk at $0.05/plastic bag	21,900	
- Plastic cups for yoghurt, labaneh and white cheese	22,080	43,980
Total annual production costs:		872,380

9.3. Commercial Profitability: Commercial profitability of the project is measured by net profit after tax. Net profit - Total revenue - Total cost - Tax. The following is a summary of the values of investment cost, annual production costs and annual revenue:

1. Investment Cost:

Item	Cost (U.S.$)
Land	18,000
Sheds	62,000
Buildings	19,000
Silos	4,000
Friesian Cows	120,000
Machines and equipment	328,750
Sub total	551,750
Working capital	88,000
Total	639,750

2. Annual Production Costs:

Manpower	36,400
Raw material and other expenses	782,000
Water and electricity	10,000
Packaging expenses	43,980
Total	872,380

3. Annual Revenue is expected to be $ 1,040,328. The feasibility of the project is measured by return on investment, and the payback period.

The following is a calculation of the Rate of Return and the payback period:

a) Rate of Return:

Annual Sales Revenue		$ 1,040,328
Annual operating cost		872,380
Annual Depreciation:		
5% of the value of silos, sheds and buildings	$ 3,050	
10% of machines and equipment	32,875	- 35,925
Annual operating profit		132,023
38% corporated tax		- 50,169
Net profit		$ 81,854

Simple rate of return: $\dfrac{\text{Net profit after tax}}{\text{Total investment cost}}$

$$\frac{\$\ 81{,}854}{\$\ 639{,}750} = 12.79\%$$

b) Repayment Period: determines the number of years that will have to elapse in order for the invested capital to be recovered out of the net incoming cash flow.

$$\text{Repayment period} = \frac{\text{Total Investment Cost}}{\text{Net profit + interest + depreciation}}$$

$$= \frac{\$\ 639{,}750}{\$\ 117{,}779} = 5.4 \text{ years}$$

10. Conclusions and Recommendations

The proposed dairy plant represents a sound business venture. The financial analysis indicates that the total investment cost is expected to be \$ 639,750, the annual revenue of the project is expected to be \$ 1,040,328, with an annual operating profit of \$ 132,023 before tax and \$ 81,854 net profit after tax. The plant is expected to generate a simple rate of return of 12.79% and the cost of invested capital to be recovered in approximately 5.4 years. Based on the above findings, we recommend that this project to be further studied in detail.